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Prevention Strategies for IC Practitioners and Professional Nurses

In this issue

The CDC has categorized phlebotomy as one of the highest-risk sharps procedures. According to one study, 18% of sharps injuries reported were from a phlebotomy procedure. In attempt to address the high-risks faced by phlebotomists, OSHA issued a directive that states that in order to prevent potential worker exposure to contaminated needles, the blood-tube holders with the needles attached must be immediately discarded after the safety feature has been activated. Ms. Burns in her article addresses safety strategies for reducing the risks of needlestick injuries and an overview of the most recent developments in blood collection devices that conform to the OSHA mandate.

The rigid sharps disposal container (SDC) emerged as the first widely utilized sharps safety device in the early 1980s. Today, the USA sharps disposal market exceeds $200 million. It has been demonstrated that the correct and consistent use of SDCs in healthcare facilities can reduce the incidence of needlestick injuries. In her article, Ms. DeBaun outlines the major criteria for the ideal design of SDCs, their proper placement and filling. She discusses the use of reusable SDCs and the value- analysis her facility used to evaluate disposable versus reusable SDCs.

Phlebotomy: *Must it be a high-risk procedure?*

Continuing Education CE For Infection Control Professionals And Nurses

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by Lillian Burns, *MT, MPH, CIC*

The phlebotomy procedure is complex, requiring both knowledge and skill to perform. The phlebotomist must be knowledgeable in anatomy and physiology, be trained in all aspects of blood collection, and possess sufficient skill to perform the procedure safely. The importance of obtaining a good blood specimen cannot be overemphasized. Blood specimens are utilized to diagnose or confirm a patient's medical condition, to determine the effectiveness of chemotherapeutic agents, or to measure the level of medications in the patient's blood. Integrity of the sample is vital. Reusing blood-tube holders can affect that integrity. In addition, reused holders can expose healthcare workers and patients to bloodborne pathogens.

OSHA bloodborne pathogen standard

The phlebotomy procedure has always carried a high risk of healthcare-worker occupational exposures to pathogens: 32 % of accidental needlesticks to phlebotomists occur during blood drawing.[1] Studies have indicated that the risk of transmission of hepatitis C from a single needlestick with a contaminated needle is 1.8–3%; for hepatitis B the risk is 10–30%; and for HIV it is 0.03%.[2]

The Occupational Safety and Health Administration (OSHA), which had determined that healthcare workers faced a significant health risk as a result of occupational exposure to bloodborne pathogens, issued a regulation in 1991 to limit such exposure: 29 CFR 1910.1030, known as the Bloodborne Pathogens Standard (BPS).[3] Pathogens covered included HIV, hepatitis B, and hepatitis C. OSHA concluded that the hazards associated with the acquisition of these viruses could be minimized or eliminated by a combination of engineering controls, safe work practices, personal protective equipment, and training and education.[2] The BPS applied to all employees with an occupational exposure to blood and other potentially infectious materials. It required hospitals to implement an exposure-control plan that specifically addressed healthcare worker safety by incorporating all of the following: engineering controls, work-practice controls, protective equipment, training and education about bloodborne pathogens, and medical treatment after exposure to pathogens.

According to the CDC's National Institute for Occupational Safety and Health (NIOSH) an estimated 600,000 to 800,000 occupational needlesticks occur each year in healthcare workers.[4] In the EPINet 2003 Uniform Needlestick and Sharp Object Injury Report of 48 hospitals, 29% of all sharp injuries occurred as a result of a phlebotomy procedure.[5] The blood drawing devices responsible for these injuries are the vacuum-tube blood-collection needle (4% of injuries), the disposable syringe (32%), and the winged steel needle (7%).

EPINet data covering 1993 to 1995 indicate that 79% of needlesticks occurred during a phlebotomy procedure. Of the devices causing those injuries, the vacuum-tube blood-collection needle was responsible for 38%, the disposable syringe accounted for 23%, and the winged steel needle accounted for 18%.[6] Although the percentage of injuries occurring during phlebotomy procedures declined from 1993 to 1995, the over-all risk associated with the procedure did not abate. The type of needle used for phlebotomy—large, and with a hollow bore—was frequently cited as carrying the greatest risk for transmission of bloodborne pathogens.

Needlestick Safety and Prevention Act

Despite the Bloodborne Pathogens Standard of 1991, the number of needlestick injuries that occurs each year exceeds 380,000.[7] Before the year 2000, needlestick injuries that were caused by hollow-bore needles accounted for 60% of all percutaneous injuries.[8] The CDC estimated that, depending on the type of device used and the type of procedure, between 62 and 88 % of sharps injuries could be prevented by safer medical devices.[7]

In November 2000 the Needlestick Safety and Prevention Act (NSPA) was signed into law.[8] This law authorized OSHA to revise the 1991 standard to require the use of devices with sharps injury

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Sharps containers: *to reuse or not to reuse —that is the question.*

by **Barbara DeBaun,** *RN, MSN, CIC* ***and Kathy Sforzo,*** *CHSP, CIC*

The rigid sharps disposal container (SDC) emerged as the first widely utilized and accepted sharps safety device in the early 1980s. The emergence of HIV (human immunodeficiency virus) created a sense of awareness that SDCs played a role in the prevention of sharps-associated bloodborne pathogen transmission. Prior to commercially available containers, used sharps were either rendered non-usable with a needle cutter, placed in an empty irrigating solution bottle, or discarded in another equally inappropriate and dangerous manner.

SDCs have become ubiquitous objects that are present in all in-patient and out-patient clinical settings, many homes, and most airport restrooms. They range in size from one pint to 30 gallons and are available in different colors to meet the needs of customers who generate biohazardous, chemotherapeutic, and pharmaceutical waste.

The USA sharps disposal market exceeded $200 million in 2005.[1] Forty-one million disposable SDCs were sold in the United States in 2002, a number that is forecast to rise to 47.5-million in 2009. Market drivers include:

- increased use of safety devices that take up more space than conventional sharps devices;
- aging population contributing to a higher number of physician visits and hospital admissions;
- increased numbers of people with insulin-dependent diabetes;
- increased use of SDCs in home healthcare.

SDCs are classified by the Food and Drug Administration (FDA) as class-II medical devices that therefore must comply with a range of regulatory criteria from the FDA, the Occupational Safety & Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the Environmental Protection Agency (EPA), the Department of Transportation, the Nuclear Regulatory Commission, the Centers for Disease Control and Prevention, the Centers for Medicare & Medicaid Services, and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).[2] Wideman has published a comprehensive review of regulatory aspects applicable to SDCs in a previous issue of Infection Control Resource.[3]

Role of SDC in preventing sharps injuries

The correct and consistent use of SDCs in healthcare facilities has been demonstrated to reduce the incidence of needlestick injuries.[4] Numerous published studies have shown that placement of SDCs in all patient and treatment rooms decreases the frequency of sharps injuries.[4-7] Linnemann et al, concluded that appropriately placed sharps containers reduce needlestick injuries associated with recapping by as much as 80%.[7] Other studies have evaluated the cost, benefit of SDCs by comparing the increased cost of materials with the decrease in injury compensation costs and have concluded that SDCs are cost effective.[8]

Several early studies on the effectiveness of SDCs revealed that their use altered the nature of the percutaneous injury (PI) but did not affect the over all incidence of such injuries.[9,10] Ironically, their use triggered a new type of PI that is now referred to as "container-related sharps injury" (CRSI).

Studies have shown that many needlestick injuries occur after the device is used and during disposal activities.[6,8,11] As many as one third of all sharps injuries have been estimated to be related to the disposal process.

There is a multitude of reasons for CRSIs. Factors that are most frequently associated with these injuries include inappropriate sharps-disposal practices by the user, inadequate sharps-disposal container design, inappropriate sharps-disposal container placement, and overfilling of sharps-disposal containers.[2]

How do SDCs affect PIs?

Grimmond et al. reported on the introduction of a reusable SDC system in eight medical centers in Australia, New Zealand, and Scotland.[12] Nine brands of disposable SDCs and one brand of reusable SDC were being used by these medical centers prior to implementation of this particular reusable SDC system. Sharps injury rates before and after implementation of the reusable system were compared. The authors did not describe the characteristics of the SDCs; therefore it is not evident whether the disposable SDCs had safety features (e.g. forced horizontal drop, counter balanced door, overfill protection) incorporated into their design. The 86.8% reduction of container-related sharps injuries reported after introduction of the reusable SDCs certainly suggests that at least some of the disposable SDCs were lacking safety features that minimize sharps injuries.

Prior to this study, others had reported decreases in CRSIs associated with implementation of disposable sharps containers. McCormick et al, demonstrated a 56% decrease in CRSI.[6] Haiduven studied the effect of sharps containers on PIs and reported that the implementation of in-room SDCs had no effect on disposal-related sharps injuries and actually increased the CRSI.[4] The study conducted by Richard et al. did demonstrate a correlation between placement of SDC in patient rooms and a reduction of sharps injuries, including those related to disposal.[13]

Container design

Sharps containers should be easy to use and simple in design. The opening needs to be large enough to accept disposal of the largest sharps device used at the workstation it serves; however, if the opening is too large, it may pose a risk to those who intentionally or unintentionally place their hands near or in the opening. Safety features designed to restrict child access may inadvertently interfere with the healthcare worker's ability to visualize the opening or to dispose of a large device. It is imperative that

Table 1. **Ideal sharps-container design**

Functionality	**Visibility**
● Durable, leak- and puncture-resistant, closable	● Clear view of device and container opening
● Variety of sizes with adequate volume	● Fill status indicator
● Safe access to the disposal opening	● Hazard warning labels/color
● Safe closure mechanisms	**Accommodation/Convenience**
● Stable	● Environmentally sound
Accessibility	● Easy to store, assemble and use
● Simple, easy to use	● Training requirements stipulated
● Conveniently placed	● Promotes one-handed disposal
● Appropriate height	● Durable mounting systems
● No spillage	
● Portable if necessary	
● Secure from children, visitors, patients	

an institution provide SDCs in a variety of sizes to accommodate the volumes and types of sharps being discarded. For example, the SDC required by phlebotomists, who carry small supply trays, is quite different from the SDC that would be utilized by the intensivist who needs to dispose of a long central venous catheter guidewire. Table 1 outlines the major criteria for sharps containers.

Container placement

For an SDC to be useful, it must be readily visible and within easy horizontal reach of the user.[2] Too often, SDCs are installed too high or too low, or near or around obstacles such as furniture or patient-care equipment. If the SDC is not within arm's reach, the healthcare worker may be forced to carry the contaminated sharp in an awkward, unsafe manner. The worker may even be tempted to recap the used sharp, as this may be perceived as being safer than walking while carrying an exposed contaminated sharp. NIOSH guidelines recommend that fixed SDCs be at a height that will accommodate 95% of the adult population. An installation range of 52–56 inches at a standing workstation and 38–42 inches for a seated workstation is ideal; in other words, avoid enlisting a six-foot-five-inches tall engineer to "eyeball" the installation, as this is guaranteed to result in a hazardous situation.[2]

Overfilling

Passive overfill protection is key. Our experience has shown that healthcare workers can and do find ways to overfill SDCs. In our facility, it is the primary responsibility of environmental service workers to unlock the outer cabinet and remove the inner liner that contains the contaminated sharps. Observations made during scheduled environmental safety rounds revealed overfilled SDCs. When nurses were asked to help resolve this problem, it became clear that they needed to share the responsibility for this action, and therefore needed keys, which we added to the pharmaceutical dispensing machine.

Environmental considerations

The disposal of regulated medical waste, especially sharps waste, creates unique challenges for healthcare institutions seeking to adopt environmentally responsible systems and processes. In 1998, the EPA and the American Hospital Assocaition signed a memorandum of understanding to reduce total waste volumes in the healthcare industry by 33% by 2005 and 50% by 2010. This voluntary initiative is intended to drive change toward more responsible management of waste.[14] The challenge lies in maintaining a high level of safety standards and regulatory compliance for patient and staff protection without neglecting the responsibility to be friendly towards the environment.

Challenges for the infection control practitioner

OSHA requires a multidisciplinary team approach, with front-line worker involvement, to develop and maintain an effective sharps safety program.[11] This team is expected to review the facility's bloodborne pathogen exposure control plan annually. A critical component of the review is an evaluation of engineering controls currently in place in the facility, along with a discussion of new technologies that have entered the market since the last review. It is imperative that a team member be given primary responsibility for gathering information about new products so the team can review the materials and explore appropriateness of a trial or further consideration. The success of this process greatly depends on a champion to assure collaboration between the needlestick-injury data collectors (Occupational Health), the product purchasers (Materials Management), and the product consumers (Nursing, Clinical Lab, Environmental Services). This champion needs to understand the importance of internal data analysis and has the ability to direct the product decision makers towards choices that are most appropriate for the institution. It is also expected that the decision-makers understand the need to be cost-effective and environmentally friendly in their decisions. For these reasons, the person who drives the process is most often the infection control practitioner (ICP).

Alternatives to disposable sharps containers

ICPs must consider all means of reducing operating costs. One option is reusable SDCs. In this case, a supplier makes scheduled exchanges of emptied and reprocessed SDCs with filled containers. Such reprocessed containers have been available in the USA for two decades.[15] There are numerous infection-control, safety, and risk-prevention issues that should be considered when deciding whether to implement a reusable SDC program in your facility:

- The vendor must provide evidence that the SDCs are in compliance with all regulations.
- The ICP will need assurance that the vendor has a reliable and acceptable method of retrieving, decontaminating, and returning the reusable SDCs to the facility. Issues related to retrieval include access to patient rooms, confidentiality, and health status (e.g., tuberculin skin testing, immunizations) of the vendor's employees.
- The need for a variety of sizes must be considered; for example, small portable SDCs must be available for phlebotomists' trays.
- The ability to lock or secure the contents (if access by visitors, patients, or staff is a concern) is another important consideration. Storage of used SDCs awaiting pickup and reprocessed SDCs that have been returned to the loading dock must also be evaluated.
- To date, there are no published studies evaluating the cost effectiveness of disposable versus reusable SDCs in the USA. There is a tremendous amount of variation among states, counties, and even cities; therefore an individual institution would need to assess this on its own.

Microbial contamination of reusable SDCs

In 2003, Neely et al reported on their study that evaluated the presence of microbial contamination on single-use versus reusable infectious waste containers (IWC).[16] The impetus for this study was the observation of soiled "reprocessed" IWCs being returned to a facility. A total of 380 reusable and single-use IWCs was cultured upon arrival at the facility. Approximately 95% of the reusable container cultures were positive for bacteria, and 79.5% were positive for fungi. In comparison, 9.5% of the single-use IWCs were contaminated with bacteria, and 4.8% grew fungi. Most of the organisms isolated were either normal skin flora (e.g., coagulase-negative staphylococci) or common environmental microbes (e.g., Penicillium and Aspergillus organisms). However, a significant percentage of the reusable containers had potentially pathogenic bacteria present; gram-negative rods were isolated from 25%. None of the single-use IWCs grew organisms other than common environmental microbes or normal skin flora.

Runner recently reported results of a 2005 study designed to evaluate the microbial profile of reusable SDCs.[17] This study was a single-center, prospective, hospital-based microbiologic evaluation of reusable SDCs that were returned to the hospital after processing. It was conducted at a 130-bed hospital in the New England area of the United States. The hospital's infection control practitioner cultured 30 reusable SDCs after they were delivered to the facility's loading dock. Twenty-seven (90%) of the cultures were positive for bacteria. Of the 27 isolates, 24 were considered normal environmental flora. Gram-negative rods (Acinetobacter, Enterobacter, Escherichia) were cultured from 6 of the SDCs. Eleven (30%) of the SDC cultures were positive for either HIV or hepatitis viruses A, B, or C. While collecting the cultures, the ICP noted the presence of soiled gauze, dried blood, and other debris adhering to the sides of several of the "reprocessed" SDCs. One of the SDCs contained a biohazard bag full of used syringes.

Studies have demonstrated that both bacteria and fungi can survive for extended periods on plastic.[18-21] It has also been shown that microorganisms can be transmitted from plastics to human hands.[22]

It is unreasonable to expect all items that are placed in a patient-care area to be free of pathogens, due to the presence of environmental pathogens and human factors such as the need to physically touch equipment when delivering or placing it in the appropriate location. It is, however, quite reasonable to expect

patient-care equipment to be free of pathogens that suggest gross contamination and inadequate processing. If a nurse were to open an equipment tray from the hospital's central processing department, he/she would expect the items to be visibly clean. Presence of debris or other obvious contamination would surely trigger a call to the ICP and generation of an occurrence report. We should expect no less from an external company that is reprocessing equipment to be placed in critical areas such as patient rooms and operating suites.

Strategies

Concern for the environment, employee safety, patient safety and confidentiality, and operating costs are all compelling reasons to manage healthcare waste more responsibly. Most healthcare workers are not aware of how their personal actions affect the overall volume of medical waste. Most of them have not personally visited a landfill, nor do they pay the medical-waste disposal bills.

ICPs are certainly motivated to lead efforts to reduce generation of medical waste. In California alone, an estimated 100 million pounds (50,000 tons) of medical waste are generated annually.[23] The cost to handle and dispose of medical waste is substantially more than for solid waste. At our medical center we are charged $0.38/lb for general waste and $0.65/lb for medical waste. It is clearly in the best interests of healthcare facilities to keep regular waste out of the medical-waste stream. How do we do this? It takes a team of committed individuals who understand the challenges, barriers, and potential opportunities.

Staff training

We have focused our efforts on training our healthcare workers on the proper segregation of waste and have attempted to motivate them by developing a peer-to-peer education program. We are in the process of creating a team of staff nurses known as our safety stewards. They are the champions for promoting initiatives and creating and sustaining a culture of environmental safety in their departments or units. More than ever we need to be JCAHO-ready, especially since inspections are no longer announced. In attempting to achieve continuous excellence, the development and empowerment of staff nurses is critical to establishing a sustainable culture of safety. Our safety stewards conduct weekly inspections of 10 sharps, 5 pharmaceutical, and 5 biohazardous-waste disposal containers to evaluate the appropriateness of the items discarded in these containers. They have been instructed to be creative in how they capture and display data. We all know that a picture is worth a thousand words; therefore, the stewards have been encouraged to photograph their findings (alas—a pizza box in a biohazard container; gloves, gauze, and other regular trash in an SDC). At-a-glance guides have been developed and posted in all areas where medical waste is generated (see figure 1). These guides are a handy reference for nurses and other members of the staff who may be unclear about what goes where.

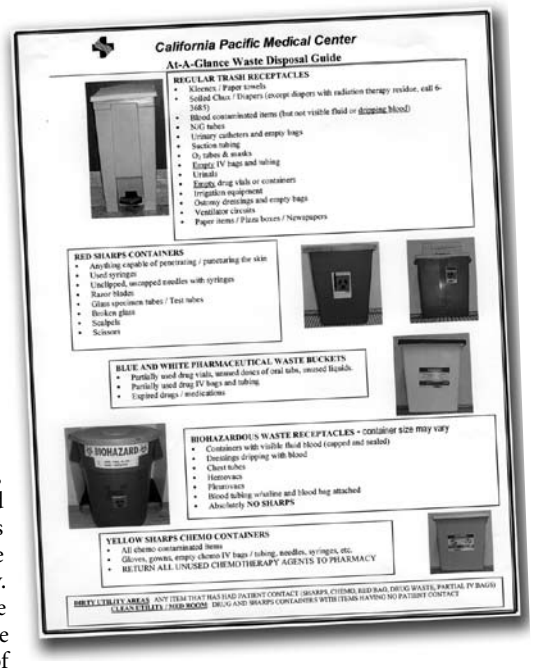

Figure 1. At-a-glance guides help staff to know what waste goes in which receptacle.

Our waste-management team developed a presentation—Let's Talk Trash—and presented it to the senior leaders and managers at our medical center last year. The intent was to educate them and highlight the enormous impact that waste management has on both the environment and our financial bottom line. Our ultimate goal is to meet regulatory requirements and maintain compliance with federal laws and statutes while providing the medical center with cost-effective and environmentally responsible waste-management options, including utilization of SDCs that are partially composed of recycled plastics.

Garcia describes an innovative nine-step process that was developed to reduce the waste stream in his medical center in New York.[24] The article includes practical suggestions for achieving success with a team approach.

To reuse or not to reuse?

At this point, our value-analysis team is not convinced that reusable SDCs meet our current needs and expectations. Preliminary internal cost-analysis has not compelled us to conduct an evaluation of such a product. In addition, the two studies mentioned above that describe microbial contamination of "reprocessed" reusable SDCs and IWCs raised serious concerns among our team members.[16,17] The multiple sizes and shapes of SDCs that we provide to our varied clinical areas are not currently available in reusable versions. Currently, we have access to a sufficient number of disposable SDCs in the event that a natural disaster prohibited delivery of replacement SDCs. We were all recently reminded of the need to expect the unexpected when hospitals in the Gulf region of the USA were paralyzed by the devastating effects of hurricane Katrina.

We respect our environment and we are well aware of our responsibility in cost reduction; however we will not compromise on our SDC requirements nor jeopardize the safety of our patients or employees in the process.

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Phlebotomy: Must it be a high-risk procedure? — Continued

protection, essentially mandating the use of safety devices in hospitals.

The NSPA added the term sharps with engineered sharps injury protections and defined this term as a non-needle sharp or a needle device with a built-in safety feature that effectively reduced the risk of an occupational exposure.[8] This term encompasses an array of devices such as syringes with sliding sheaths that shield the needles, needles that retract into a syringe after use, and shielded or retracting catheters. The revised definitions reflect the intent of OSHA to clarify certain aspects of the 1991 BPS, specifically with regard to safety-engineered medical devices. They made it clear that hospitals must acquire safety-engineered medical devices that were available and appropriate.

The NSPA classifies these devices as either an engineered control or a needleless system:[8]

- Engineered controls isolate or remove the bloodborne pathogen from the workplace. Examples of engineered controls are self-sheathing, retractable, blunt suture, and flip-cap needles. Needles in this category are used to administer medications or intravenous (IV) fluids and require the user to actively engage the safety mechanism. The built-in safety feature eliminates the risk of exposure to a contaminated needle.
- Needleless devices are for administering medications and collecting or withdrawing body fluids via venous or arterial access. These systems eliminate the risk of needlesticks and are a safe alternative to needles.

Phlebotomy technique: putting you and your patient at risk?

Phlebotomy procedures continue to present the greatest risk for transmission of a bloodborne pathogen, despite the development and availability of safety devices for venipuncture and fingersticks. According to data from Estimates by Medical Care Data International, accidental needlesticks account for 80% of all occupationally acquired diseases.[9] Studies show that 18% of needlesticks occur in phlebotomists and are caused by blood drawing devices (i.e., syringes, winged infusion sets).[5]

Another source of bloodborne pathogens is the blood collection tube holder. OSHA recognized this threat and issued a bulletin stating that "the best practice for prevention of needlestick injuries following phlebotomy procedures is the use of a sharp with engineered sharps injury protection (SESIP) (e.g., safety needle) attached to the blood tube holder and the immediate disposal of the entire unit after each patient's blood is drawn."[10] The bulletin also reiterated OSHA's BPS directive prohibiting "the removal of contaminated needles or sharps without documentation by the employer that alternatives are infeasible or that this action is required by a medical procedure." Furthermore, the bulletin noted that the BPS prohibits the use of blood-collection needles without SESIPs.

The Society for Healthcare Epidemiology of America (SHEA) recommends that noncritical patient-care equipment such as the tube holder be dedicated to single patient use.[11] The National Phlebotomy Association (NPA) has also issued a strong advisory against re-using tube holders in favor of one-use holders with pre-attached safety needles.[12] The NPA cited a study that revealed that 99% of sampled reusable holders were contaminated with blood and posed an occupational exposure risk to healthcare workers.[12]

Phlebotomy procedures are performed not only in hospitals but also in a variety of settings, including nursing homes, long-term care facilities, clinics, surgical centers, physicians' offices, and patients' homes. The healthcare professional performing a phlebotomy procedure may be a nurse, a doctor, a nurse's assistant, or other healthcare worker. It is not unusual for healthcare professionals performing phlebotomies to have very little formal training and education on patient safety, blood-drawing techniques, universal precautions, and specimen collection.[13] People who perform phlebotomy procedures in some non-acute-care settings may not draw blood frequently enough to have the expertise to avoid an injury.

All individuals performing phlebotomy should receive training on universal precautions, phlebotomy techniques (including anatomy), patient safety, specimen collection, test requests, draw restrictions, patient identification, number of blood draws, care of the venipuncture site, and appropriate use of the venipuncture device. Some important considerations:

- Before performing a phlebotomy, make sure that all of the necessary equipment is available and ready for use. Equipment and supplies should be orderly and within easy reach, thus reducing the possibility of injury or accident.
- Hands should be washed and gloves donned before each procedure. Gloves do not prevent needle penetration, but they will protect hands that are chapped, or have non-intact skin, from blood exposure.
- The phlebotomist should verify the patient's name, identification number, and test request; date and time; type and source of specimen; and ordering physician. The appropriate type of needle should be selected based on the patient's physical characteristics and the amount of blood to be collected.
- Once this is done, the patient should be placed in a position that is comfortable and safe and that allows for easy access to the vein.

Collection devices

The evacuated-tube system is the most commonly used means for collecting blood. It is preferable to the needle and syringe, since it allows the blood to pass directly from the patient's vein into the collection tube. After the blood is drawn, the needle and holder should be disposed of in a puncture-resistant sharps container. Tube holders should never be reused. Manipulation of the tube holder and needle could result in a needlestick; in addition, the tube holder can become contaminated with blood or body fluids, thereby posing a risk to patient and employee. According to OSHA regulations, "the increased manipulation required to remove a contaminated needle from a blood tube holder is unnecessary and may result in a needlestick from either the front or back of the needle."[10] OSHA also stipulates that "shearing or breaking of contaminated needles, such as when separating sharps from reusable syringes or reusable blood tube holders, is prohibited." Single-use needle holders are available and are more cost effective.

The winged (butterfly) infusion-collection set is also frequently used to draw blood because of ease of use, convenience, and patient's satisfaction. Although popular with phlebotomists, this collection system has been associated with a high incidence of needlesticks. The design of the set, with its long, coiled tubing, can make disposal problematic. Needlestick injuries have occurred when the device was being disposed of in the sharps container. With the availability of safety-engineered winged infusion sets, this problem is less likely to occur.

Syringes with needles are sometimes used for venipuncture, or to draw blood from central lines. The blood is then transferred from the syringe to a blood collection tube. This method offers significant risk of injury during the transfer; therefore, care must be taken.

Lancets are also used to obtain small amounts of blood from fingers or heels. These devices have safety mechanisms that prevent injury and allow for safe disposal.

Safety measures

Certain safety measures should always be utilized when performing phlebotomy procedures:

- Never recap needles.
- Always wear gloves when drawing blood.
- When using a syringe to draw blood, make sure that the tubes are upright in a holder so that the stopper can be punctured without your holding the tube.
- Do not separate the needle from the evacuated tube holder before disposal.
- Never put down an unsheathed needle or sharp. The needle or sharp should leave your hand only when it is being disposed of or has been rendered permanently safe.
- Never reach for a falling needle or sharp.
- Avoid distractions when drawing blood.
- Know how to activate the safety device and do so immediately after use of the sharp.
- Get help when dealing with a difficult patient.

Safety devices

Various safety-engineered phlebotomy devices are on the market. These include needles and tube holders, intravenous (IV) access devices with modified tube holders, winged-needle (butterfly) collection systems, and retractable or self-sheathing needles.

The choice of devices is considerable. When selecting one, there are numerous factors to be considered: functional reliability of the safety feature, suitability for the patient population and procedure, active versus passive mechanism, single-or two-handed use, indication of activation, how tamper-proof the safety feature is, permanent coverage of the sharp, patient safety, right- or left-hand use, efficacy studies, and extent of product line.[14] Special consideration should be given to the following:

- Single-handed activation
  After the phlebotomy procedure, one hand is usually occupied applying pressure to the venipuncture site. Any product that requires two hands for activation increases the risk of an injury.
- Minimal manipulation
  Devices should require minimal changes in current procedures.
- Evidence of activation
  The safety feature should have a visible or audible confirmation of activation.
- End-to-end protection
  Needles that are used with tube holders pose a risk because of the needle at both ends. Consider products that eliminate this risk.
- Permanent protection
  Once the safety mechanism is activated, it should continue to provide protection after disposal.[15]

Final selection of products should also take into account the input of the healthcare providers who will be utilizing them. Following is a sampler of safety-engineered devices available.

Safety needles and tube holders

The most recent development in safety needle and tube holder is the totally integrated blood collection device. The Magellan Safety Blood Collection Device (Covidien) incorporates an integrated safety mechanism, a blood collection needle (bevel-up orientation), and a blood tube holder all in one device (Figure 1,2). This device has a pre-attached needle and holder with a simple safety device, requiring one-handed activation, that cannot be removed. When the needle is withdrawn from the patient, the intuitive-use safety device is activated either by pressing it on a surface or with the thumb or a finger, and a shield covers the entire needle for complete protection. Both needle and holder are discarded as a unit.

The Vacutainer Eclipse Blood Collection Needle (BD) consists of a blood collection needle (bevel-up orientation) integrated with a safety shield and a built-in safety feature. One-handed activation of the shield covers the needle immediately upon withdrawal from patient. Both needle and holder are discarded as a unit. Attention must be taken to avoid blood splattering.

The Portex Needle-Pro (Smiths Medical) is a tube holder with an attached needle sheath; it requires a needle to be attached before use. Once the needle is withdrawn from the patient, the phlebotomist keeps holding the collection tube with one hand and gently presses the sheath against a hard surface; the sheath then swings to cover the needle. Both the needle and holder are disposed of as a unit.

Safety IV access

The Portex Saf-T blood collection set (Smiths Medical) is a modified tube holder that facilitates blood collection directly from a vascular access device. The holder incorporates a male Luer connector that is attached to the vascular-access system. The collection tubes are inserted into the holder and filled with blood as with conventional venipuncture. Once the blood has been withdrawn the tube holder is disposed of.

Another safety IV access device is the Angel Wing Luer lock collection set (Covidien) that eliminates the need for a needle when collecting blood from a valve-based IV port. The Luer lock adapter and blood tube holder allow for safe attachment to all standard IV valve-based ports. After the male adapter is locked onto the port a blood tube can be attached to draw directly from the site. There is no need for a needle or syringe.

Safety winged-needle systems

Monoject Angel Wing blood collection sets (Covidien) comprise a line of winged needles (with integrated safety mechanism) attached with tubes to one of three back-end connections: female Luer, multi-sample Luer, and tube holder. The textured wings afford easy one-handed safety-mechanism activation. During the removal process the tethered wings slide over the needle and lock it into a stainless steel clip.

The Punctur-Guard (ICU Medical) winged set has a built-in device that is activated while it is still in the patient's vein. By moving a third wing of the needle, the phlebotomist causes a close-fitting blunt cannula within the needle to slide forward beyond the sharp point.

The Vacutainer Safety-Lok Blood Collection Set (BD) can be shielded with one-handed activation. Upon completion of collection, the yellow shield is pushed forward until the safety shield is locked in place.

The Vacutainer Push Button Blood Collection Set (BD) uses a wingset with a built-in retraction device; a preattached tube holder is available. The safety mechanism's push button is activated with one hand while the needle is still in the vein.

Safer needles are not optional

There has been significant success in acute-care hospitals adopting these safety devices. In such hospitals, 95% of peripheral IV catheters have safety-engineered devices.[16] The use of safety devices in blood collection increased from 74% in 2002 to 83% in 2005 in acute-

Figure 1. All-in-one device (Magellan™ Safety Blood Collection)

Figure 2. Activating safety feature with one hand.

care settings.[17] In non-acute-care settings, such as doctors' offices, clinics, and surgical centers, only 45% of needles used are safety engineered.[17] The proportion of safety-engineered blood-collection devices used in non-acute-care settings is estimated at 57%.[17]

A number of factors contribute to the low use of safety devices in non-acute-care settings: an organization's culture of safety, unfamiliarity with the OSHA standard, lack of perceived need to change behavior, purchasing/distribution accessibility, lack of administrative support, and cost constraints. Some medical specialties are unwilling to adopt safety devices; for instance, only 59% of needles and syringes used for insulin administration and 26% used for allergy injections are safety-engineered.[18] Operating-room staff are resistant to adopting new technology; only 5% of reusable scalpels and 59% of disposable scalpels are safety-engineered.[18] Blunt suture needles, which are available, have been met with skepticism by surgeons, who cite difficulty of skin penetration.[18]

The good news is that a variety of safety needles and safety-engineered sharps is available for use. These products have played a leading role in the reduction of healthcare worker injury. From 1993 to 2001, percutaneous injuries from needlesticks decreased by 51% with the adoption of the needleless IV system.[16] A recent study on the impact of safety devices for preventing percutaneous injuries related to phlebotomy procedures in healthcare workers showed a significant reduction in injuries.[19]

Yet despite these encouraging data there is discouraging news: According to EPINet, 57% of the needlesticks that were reported in 2003 occurred with use of a non-safety device.[5]

While safety devices are a necessary tool to reduce injures, a second part of the equation is education. Healthcare workers performing phlebotomies as well as other risky procedures must be educated about the risk involved. They must be educated about correct technique, and patient safety as well as employee safety. In other words, the healthcare organization must have a culture of safety.

Conclusion

Manufacturers of needles and other sharps have stepped up to the table and do, in fact, provide a variety of safe implements, including safety-engineered needles, syringes, scalpels, and IV catheters. Manufacturers respond to market forces and continue to work with the healthcare community to innovate and develop even safer devices. It is up to the healthcare community to spread the message that we want safer medical devices so that procedures such as blood collection are no longer considered high risk.

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This continuing nursing education activity was approved by the Vermont State Nurses' Association Inc. (VSNA) an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.*

Provider approved by the California Board of Registered Nursing. Provider #1447.

This educational activity is available for Medical Technologists to earn continuing education credits. Certificate of completion can be submitted to the state board or certification agency.

Upon completion of this program, the participant will be able to:

1. Describe the best practices as defined by OSHA to prevent needlestick injuries after a phlebotomy procedure
2. List at least 5 safety measures that should be utilized when performing a phlebotomy procedure
3. Identify at least 3 safety features in selecting a safety-engineered phlebotomy device
4. List at least 3 reasons for the increase in the use of sharps disposal container
5. Describe the major criteria for the ideal sharps container design
6. Explain risks associated with the use of reuseable sharps containers

Instructions

1. Read both articles.
2. Complete the post-test. (You may make copies of the answer form.)
3. Complete the participant evaluation.
4. Mail or fax the complete answer and evaluation forms to address on back page.
5. To earn 1.2 contact hours of continuing education, you must achieve a score of 70% or more. If you do not pass the test you may take it one more time.
6. Your results will be sent within four weeks after the form is received.
7. The fee has been waived through an educational grant from Covidien.
8. Answer forms must be postmarked by July 11, 2010
9. Faculty Disclosure: No conflicts were disclosed.

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1. **What is the correct method for patient identification and verification?**
   a. The patients name and date of admission
   b. The patients name and date of birth
   c. The patients room number and bed location
   d. None of the above
2. **Which of the following is a safety device ?**
   a. Self-sheathing needle
   b. Blunt needle
   c. Retractable needle
   d. All of the above
3. **What factors should be considered when choosing a phlebotomy device?**
   a. The type of blood collection tube
   b. The skill of the phlebotomist
   c. The quality of the patients vein and the mount of blood to be collected
   d. The type of test
4. **Which blood drawing device is the source of the most needlesticks?**
   a. Lancet
   b. Evacuated tube and needle
   c. Syringe
   d. Winged infusion collection set (butterfly)
5. **Of the following, which is important before drawing blood?**
   a. How to start an IV
   b. Give IM injections
   c. How to dispose of trash
   d. How to activate the safety device
6. **After drawing blood with the evacuated tube holder you should:**
   a. Separate the needle from the holder and dispose of in the sharps container
   b. Remove the needle and reuse the holder for another patient
   c. Dispose of both the needle and the holder after activating the safety device
   d. None of the above
7. **Which is the appropriate way to dispose of a needle after use?**
   a. Recap the needle and dispose of in sharps container
   b. Place the needle down on the patients bedside table
   c. Toss the needle in the bedside trash
   d. Acivate the safety mechanism immediately after use and place in the sharps container
8. **What should be considered when selecting a safety device ?**
   a. Functional reliability of the device
   b. Permanent protection after activation
   c. Passive activation
   d. All of the above
9. **What factors are driving the increased need for sharps disposal containers?**
   a) An older, sicker population
   b) More insulin-dependent diabetics
   c) Increased use of safety needle devices
   d) All of the above
10. **SDCs are Class II medical devices therefore must comply with regulatory criteria from:**
    a. OSHA
    b. EPA
    c. NIOSH
    d. All of the above
11. **Which of the following statements is NOT true?**
    a. SDCs have been shown to increase the frequency of recapping
    b. SDCs have been shown to decrease the frequency of recapping
    c. SDCs have been shown to decrease the frequency of sharps injury
    d. SDCs have been shown to decrease compensation costs
12. **What percentage of sharps injuries are believed to be related to the disposal process?**
    a. 50%
    b. 33%
    c. 10%
    d. 5%
13. **Which of the following statements is not accurate?**
    a. Placement must comply with NIOSH guidelines in order to be in a safe position
    b. SDCs should be located in hidden areas as they are unsightly
    c. Poorly located SDCs may encourage recapping of needles
    d. SDCs should be available in a variety of sizes to meet the needs of the generating department
14. **There is a federal mandate that hospitals must reduce total waste volumes 50% by 2010.**
    a. True
    b. False
15. **Which of the following statements related to reusable SDCs is correct?**
    a. They have been proven to be less expensive than disposables
    b. They have been associated with a high number of percutaneous injuries
    c. They must comply with NIOSH and EPA criteria (correct)
    d. They are available in many different sizes

Participant's Evaluation

What is the highest degree you have earned (circle one) ? 1. Diploma 2. Associate's 3. Bachelor's 4. Master's 5. Doctorate

Indicate to what degree you met the objectives for this program: Using 1 = Strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.

	Strongly Disagree					Strongly Agree
1. Describe the best practices as defined by OSHA to prevent needlestick injuries after a phlebotomy procedure	1	2	3	4	5	6
2. List at least 5 safety measures that should be utilized when performing a phlebotomy procedure	1	2	3	4	5	6
3. Identify at least 3 safety features in selecting a safety-engineered phlebotomy device	1	2	3	4	5	6
4. List at least 3 reasons for the increase in the use of sharps disposal container	1	2	3	4	5	6
5. Describe the major criteria for the ideal sharps container design	1	2	3	4	5	6
6. Explain risks associated with the use of reuseable sharps containers	1	2	3	4	5	6

How long did it take you to complete this home-study program? _____

What other areas would you like to cover through home study?

_____

Name & Credentials _____
Position/Title _____
Address _____
City _____ **State** _____ **Zip** _____
Phone _____ **Fax** _____

	A	B	C	D		A	B	C	D
1	☐	☐	☐	☐	9	☐	☐	☐	☐
2	☐	☐	☐	☐	10	☐	☐		
3	☐	☐	☐	☐	11	☐	☐	☐	☐
4	☐	☐	☐	☐	12	☐	☐	☐	☐
5	☐	☐	☐	☐	13	☐	☐	☐	☐
6	☐	☐	☐	☐	14	☐	☐		
7	☐	☐	☐	☐	15	☐	☐	☐	☐
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