In the past decade, a total of 33 outbreaks of patient-to-patient transmission of hepatitis B virus (HBV) or hepatitis C virus (HCV) due to breaches in infection control by health care personnel have been reported in the United States. More than 60,000 patients were potentially at risk, and 448 acquired HBV or HCV infection. These numbers are likely a gross underestimate as the data only reflect recognized outbreaks of ≥2 persons who could be linked to a specific health care facility.1 Disease transmission in most cases was attributed to health care workers’ unsafe injection practices during the preparation and administration of parenteral medications and lapses in aseptic technique, primarily due to reuse of syringes and contamination of medications or flush solutions. Delivery of anesthesia care was involved in seven of the 33 outbreaks with more than 55,000 patients identified as at-risk, and 144 acquired HBV or HCV infection. Fifteen non-anesthesia incidents involved contaminated blood glucose monitoring equipment. While these 33 outbreaks occurred in non-hospital settings, a smaller number of outbreaks in hospital settings have also been documented.1 No cases of health care-associated human immunodeficiency virus infection have been identified since the 1990s.1

After investigating four of the largest outbreaks, the Centers for Disease Control and Prevention (CDC) published recommendations for “Safe Injection Practices” – adopted by its Healthcare Infection Control Practices Advisory Committee in 2007 as part of “Standard Precautions” – to define and reinforce principles of injection safety and aseptic technique.2 These recommendations were formulated to prevent or reduce the possibility of contamination of injection or infusion supplies and subsequent transmission of disease to patients.1,2,3 The CDC states, “These and other outbreaks of viral hepatitis could have been prevented by adherence to basic principles of aseptic technique for the preparation and administration of parenteral medications. These include the use of a sterile, single-use, disposable needle and syringe for each injection given and prevention of contamination of injection equipment and medication.”2

Aseptic technique for injection safety refers to handling, preparation and storage of medications, solutions and injection equipment to prevent microbial contamination. This applies to all supplies used for injections and infusions, including medication vials, ampules, syringes, needles, cannulae, fluid containers and tubing.1

Problematic practices relevant to anesthesia include: a) using the same needle/cannula and/or syringe to administer intravenous medication to multiple patients; b) inserting a used needle/cannula and/or syringe into a medication vial or solution container resulting in contamination of the contents and subsequent reuse for other patients; and c) using single-dose vials...
(SDVs) as equivalent to multi-dose vials (MDVs) where the vial is entered on multiple occasions for different patients.4

In 2002, the single largest outbreak resulted in HBV or HCV infections in 102 patients due to reuse of needles and syringes to inject midazolam, fentanyl and propofol into the intravenous tubing of multiple patients; a total of 908 patients required notification of potential risk.1,2 In 2008, the reuse of syringes on multiple patients and use of propofol SDVs for multiple patients resulted in six acute HCV infections with 40,000 patients requiring notification of potential risk; a new needle with a used syringe was used to draw more medication from the vials.5

The practice of changing a needle (or cannula) and reusing the syringe is DANGEROUS. Studies from the 1980s established that 1) removing a needle from a syringe produces a siphoning effect that aspirates needle contents into the syringe and 2) a needle containing viruses or bacteria will contaminate the syringe even if the needle is flushed prior to removing it from the syringe.6 It is NEVER acceptable to reuse needles, cannulae, syringes, medications or other solutions, fluid infusions (e.g., bags, bottles), administration sets or tubing for another patient (see CDC recommendations #2 & 5 in Table 1).

Studies in the mid 1990s indicated that 20-39 percent of anesthesia personnel reused syringes on multiple patients; in 2002, this rate decreased to 1-3 percent.8 Despite ongoing educational efforts, limited data in 2008 indicate that up to 27 percent of clinicians could be reusing propofol infusion syringes while changing only the microbore tubing between patients9; syringe re-use in this situation places patients at risk because the syringe contents and/or plunger could be contaminated by

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**Table 1: ‘Safe Injection Practices’**

(CDC Category IA: Strongly recommended and supported by well-designed experimental, clinical or epidemiologic studies. CDC Category IB: Strongly recommended and supported by some experimental, clinical or epidemiologic studies and a strong theoretical rationale.)

<table>
<thead>
<tr>
<th>1. Aseptic Technique (IA)</th>
<th>Use to avoid contamination of sterile injection equipment.</th>
</tr>
</thead>
</table>
| 2. Syringes, Needles and Cannulae (IA) | a. Do not administer medications (or other solutions) from a syringe to multiple patients, even if the needle or cannula on the syringe is changed.  
   b. Needles, cannulae and syringes are sterile, single-use items:  
      i. Do not reuse for another patient or to re-access a medication or solution. |
   b. Do not administer medications (or other solutions) from single-dose vials or ampules to multiple patients or combine leftover contents for later use. |
| 4. Multidose vials (a multi-dose vial contains more than one dose of medication) (IA) | a. If multi-dose vials must be used:  
   i. both the needle or cannula and syringe used to access the multi-dose vial must be sterile.  
   b. Do not keep multi-dose vials in the immediate patient treatment area and:  
      i. store in accordance with the manufacturer’s recommendations;  
      ii. discard if sterility is compromised or questionable. |
| 5. Fluid infusion and administration sets (i.e., intravenous bags, tubing and connectors) (IB) | a. Use for one patient only and dispose appropriately after use.  
   b. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient’s intravenous infusion bag or administration set.  
   c. Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients. |

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handling, fluid splattering or retrograde flow during or between uses. Intravenous tubing and valves are not sufficient to prevent backflow and contamination of injection devices. Blood has a higher specific gravity than I.V. solutions, so passive backflow against forward flowing fluid is possible. Lack of visible blood in tubing or injection equipment does NOT eliminate the possibility of microbial contamination. Blood contamination was found in up to 3.3 percent of tubing injection sites; in only 33 percent of these instances was the contamination visible to the naked eye.7

For some of the recent CDC recommendations [Table 1], there was uncertainty as to their application to the practice of anesthesiology. To clarify these issues, representatives of ASA and the New York State Department of Health (NYSDOH) held discussions with CDC in November and December of 2008, with additional ASA-CDC communications continuing into February 2009. The following summarizes the CDC’s published recommendations [Table 1] 2,3 and specific recommendations to ASA.4,10

1. Definition of “Immediate Patient Treatment Area.” For the practice of anesthesia, the CDC defines the “Immediate Patient Treatment Area” [Table 1] to include, at minimum, surgery/procedure rooms where anesthesia is administered and any anesthesia medication carts used in or for those rooms. The CDC indicates these carts “represent mobile surfaces that can come into contact with body fluids and other soiled materials depending on how they are used, whereas the intended effect of the recommendation [‘Do not keep MDVs in the Immediate Patient Treatment Area’] is to ensure geographic separation of activities; thus, a cart would not be an appropriate place for MDV aliquotting for multiple patients, regardless of where it is [located] at the time.”

2. “Do not administer medications [or other solutions] from single-dose vials or ampules to multiple patients or combine leftover contents for later use.” Single-dose containers (SDVs, bags, bottles) are specifically for single patient use and must not be used as a common supply source for multiple patients even if a NEW needle/cannula and syringe are used. Potential hazards from reuse include contamination and microbial transmission to other patients.

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**Table 2: ‘Medication and Fluid Use in the Immediate Patient Treatment Area’** 2, 3,4,6,10

- Follow “Safe Injection Practices” [Table 1].
- Use appropriate aseptic technique and hand hygiene.
- All medications and fluids are single-patient-use only (including single-dose vials, multi-dose vials, ampules, syringes, bottles and bags, and controlled substances from pharmacy).
- When any medication (or other solution) vial is accessed, both the syringe AND the needle/cannula must be sterile. Once a syringe has been used, it should not be refilled even for the same patient.
- If a medication (or other solution) is not available in the single-dose form and a multi-dose vial (MDV) must be used (e.g., neostigmine, succinylcholine), discard the MDV after single-patient use.
- Syringes should be capped when not in use.
- Discard all used and/or opened medication/fluid containers (e.g., cap off, bag entered) no later than the end of the patient’s anesthetic (exception: bag/bottle in use with administration tubing connected to patient’s vascular access).
- Discard used needles/syringes intact in a nearby sharps container after use or at the latest at the end of the patient’s anesthetic.
- Store unused syringes, needles and related items in a clean area to avoid cross-contamination from used items.
- Store medications and solutions in accordance with the manufacturer’s recommendations and discard if sterility is compromised.
3. A “double layer” of safety precautions is needed: 1) use a sterile syringe and needle/cannula each time any medication or solution is accessed, and 2) do not use a medication or solution for multiple patients in the “Immediate Patient Treatment Area.” CDC specifically states that “Healthcare providers should never reuse a needle or syringe either from one patient to another or to withdraw medicine from a vial.” Syringes, needles and cannulae are sterile single-use items and must not be reused to reaccess any medication or solution. Following basic infection control practices, two techniques are acceptable to CDC. One is to draw the entire contents of a vial (SDV or MDV) into a sterile syringe and then use the same syringe for sequential doses in the SAME patient. Alternatively, sequential doses may be obtained for the same patient from the same vial using a NEW needle/cannula/syringe each time the vial is accessed. The vial should then be discarded when empty or no later than the end of the case. Repeated use of the same needle/cannula/syringe to obtain doses of any medication or solution for a patient followed by using that medication or solution for other patients is a DANGEROUS practice, as the medication or solution may now be contaminated and a source of microbial transmission. Furthermore, if a medication or solution is reused for multiple patients, the clinician may not be aware of the access technique previously used.

4. All medications and other solutions (including SDVs, MDVs) used at the patient’s bedside or “Immediate Patient Treatment Area” must be for single-patient use only and be discarded at or before the end of the case [Tables 1 and 2]. To reduce the potential for disease transmission, CDC recommends that all medications and fluids used in these areas should be supplied, when possible, with single-patient-use-only containers (e.g., SDV). If an MDV must be used in the immediate patient treatment area (e.g., the medication is not supplied in SDVs, e.g., neostigmine, succinylcholine), discard the MDV after use for one patient. It is recommended that MDVs for use on multiple patients not be stored in immediate patient treatment areas and be discarded if sterility is compromised or questionable. While MDVs, unlike SDVs, contain bacteriostatic and/or bactericidal agents, it is incorrect to assume these agents are sufficient to prevent transmission of infection after extrinsic contamination nor do they have any anti-viral action. Only under controlled conditions in non-patient care areas (e.g., in a satellite pharmacy) may medications (or other solutions) from multi-dose containers be separated into aliquots for use in multiple patients.

Education and training on safe injection practices, aseptic technique, and other principles of infection control with monitoring for adherence are needed in all health care facilities. CDC recommends that all states as well as health care institutions and professional groups consider formal adoption of CDC’s recommendations, including regular infection control training. The June 2007 CDC recommendations were adopted by the NYSDOH, and all physicians were notified to review their infection control practices and those of their staff. To our knowledge, New York is currently the only state with mandatory infection control training for all licensed health care professionals (currently administered every four years). By July 1, 2009, New York office-based surgery facilities will be required to obtain nationally recognized accreditation, such as from The Joint Commission; CDC recommends similar oversight throughout the United States.

ASA published its first edition of “Recommendations for Infection Control for the Practice of Anesthesiology” in 1992 as a resource for principles of aseptic technique, safe use of injection supplies and other topics; the second edition was published in 1998. The third edition is in preparation and will include information on the application of CDC’s latest recommendations to the specialty of anesthesiology.

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References available from the ASA headquarters office upon request at kyetsky@asahq.org.