Chapter 4: Safe injection and drug administration practices

Needles and syringes[9,18-20]

- Needles and syringes are sterile items, intended for single-patient use only.
- A syringe and needle should be considered contaminated after contact with a patient, infusion bag or administration set, and must only be used for that patient.
- Medication should not be administered to different patients from the same syringe, even if a new sterile needle is used for each patient. Changing the needle, but not the syringe, is unacceptable practice.
- A syringe must not be reused, or a used syringe reinserted into a medication vial or solution bag or container, e.g. a saline flush or phenylephrine bag, even if it is for use in the same patient.
- A used needle must not be reinserted into a multiple-dose vial or solution bag or container, e.g. a saline flush or phenylephrine bag, even if it is for use on the same patient.

- The presence of a non-return valve (one-way valve) or the use of a syringe driver or infusion pump does not permit the reuse of syringes or their contents.
- Before use, prepared syringes should be capped to avoid contamination.
- After use or at the end of the anaesthetic, used syringes and needles should be discarded appropriately.
- Syringes must never be stored nor transported in clothing or pockets.
- The presence of a non-return valve (one-way valve) in the infusion set does not prevent the blood contamination of syringes or needles.

Preservative-free (single-dose) ampoules or vials[9,21]

- Preservative-free (single-dose) ampoules or vials are single-dose, single-patient items.
- Do not give drugs from preservative-free vials or ampoules to multiple patients or save the remaining contents for later use.
- Use of single-dose vials is preferred whenever possible over the use of multi-dose vials for parenteral medications.
- They must be disposed of after the drug dose has been drawn up and not reused for other patients.
- Cleanse the vial's rubber septum before entering, or the neck of glass ampoules before breaking, with an alcohol swab. Allow to dry before entering or breaking the vial or ampoule.

Multi-dose vials[9,18,21]

- Use of single-dose vials is preferred whenever possible over that of multi-dose vials for parenteral medications.
- The date and time that a multi-dose vial is opened should be indicated on the vial. If multi-dose vials must be used, then cleanse the vial's rubber septum with an alcohol swab and allow it to dry before entering the vial. A new sterile needle and syringe must be used each time the vial is entered. It must be stored in a clean area between patients, in accordance with the manufacturer's recommendations, in order to prevent cross-contamination from items that have already been used. It must be discarded if there is suspicion that sterility has been compromised. Never leave a needle, cannula or spike device (even if it has a one-way valve) inserted into a medication vial rubber stopper because it leaves the vial vulnerable to contamination.

Infusions, administration sets or items in contact with the vascular system or other sterile body compartments[9,18,20]

- Infusions, administration sets or items that are in contact with the vascular system or other sterile body compartments are for single-patient use. They should be discarded after use.
- Bags or bottles containing intravenous (IV) solution should never be used as a common source of supply for more than one patient, e.g. phenylephrine solutions and saline bags for flushing.
- Never use cannulae or spiking devices, even with a non-return valve, to remove fluid from infusion bottles or bags for multiple uses or patients.
- Use single-dose, single-use containers for flush solutions.
- Aseptic techniques should be used when preparing infusions and breaks or taps in the lines kept to a minimum.
- Always clean IV injection ports with alcohol and allow to dry before use. Cover with a sterile cap after use.
- IV cannula caps or bungs are not to be collected for reuse on other patients. These are single-patient, single-use items.
- Both the syringe and the needle or cannula must be sterile when any medication vial or solution is accessed.
- Propofol should be discarded after six hours of ampoule opening. For continuous IV infusions in the ICU, both the tubing and any unused propofol must be discarded after 12 hours.

Non-injectable items[9]

- Examples include topical drugs, ointments and lubricating gels.
- Ideally, these items should be single-patient, single-use.
- If single-use practice is not possible, utmost care should be taken to avoid self-contamination of these items.
- If contamination is suspected or confirmed, the item should immediately be discarded.

Rationale

The silent and insidious, yet devastating, epidemic of unsafe injection and drug administration practice is plaguing healthcare systems worldwide.[22]

In general, evidence has underestimated reality. A possible explanation is that the pathogens are invisible on the equipment. Also, as HIV, hepatitis B and hepatitis C infections may be clinically silent for a period, an iatrogenic causal association is difficult to establish. Using comparative risk assessment and mathematical modelling, in 2000, the Global Burden of Disease Study estimated that contaminated injections accounted for approximately one in three new hepatitis B virus infections, 40% of new hepatitis C infections and 5% of new HIV infections.[23] Approximately 260 000 HIV/acquired immune deficiency syndrome (AIDS) cases, two million hepatitis C infections and 21 million hepatitis B infections per annum are estimated to occur as a result of the reuse of syringes and needles.[23] In 2010, the Association for Professionals in Infection Control and Epidemiology noted that in the previous decade in the USA alone, unsafe injection, infusion and vial practices resulted in more than 35 outbreaks of viral hepatitis. During this period, more than 100 000 patients were exposed to infectious hepatitis. Anaesthetists were implicated in most of these outbreaks.

Recent observations in South African hospitals and clinics revealed routine failures in injection practice.[24] At least one medical injection in five was noted to be administered with a used syringe or needle. The authors concluded that using financial constraints to justify unsafe injection practices was

"ethically indefensible". Moreover, a recent study published in the *Southern African Journal of Anaesthesiology and Analgesia* showed an unacceptably high prevalence of the reuse of single-patient syringes and spinal fentanyl ampoules by anaesthetists at regional, tertiary and central hospitals in KwaZulu-Natal.[5]

Injection safety is every provider's responsibility. It is especially important to remember that when injecting medication into sterile sites, such as neuraxial techniques, there is no margin for error.

Changing a needle (or cannula) and reusing the syringe is extremely dangerous. Negative pressure is generated when a needle is removed from a syringe, producing a siphoning effect that aspirates the needle contents into the syringe.[19]

IV administration tubing becomes contaminated with blood when backflow occurs during blood sample aspiration, or by accidental gravitation or from a blood transfusion. IV tubing and valves are not sufficient to prevent the backflow and contamination of injection devices. Blood has a higher specific gravity than IV solutions, so passive backflow against forward flowing fluid is possible. Infectious blood-borne organisms may be present, even if blood is not visible in the tubing. Injection at the most distal port from the IV cannula does not prevent contamination of the syringe.[19]

Single-use fentanyl ampoules should not be used on multiple patients undergoing neuraxial anaesthesia. Infectious complications of neuraxial anaesthesia include, but are not limited to, meningitis, encephalitis, and spinal and epidural abscesses.[25] Potential pathogens, such as bacteria from airborne contaminants, nonsterile glass fragments, or failure to use an aseptic technique, may contaminate open, partially used ampoules.[26]

Cases of nosocomial bacterial and viral infections, including fatal hepatitis B infection and fatal bacterial meningitis, have been linked to the use of contaminated multi-dose vials.[27,28] Viable viruses were found to survive for at least 24 hours in one study, while bacteria and endotoxins were also found in contaminated multi-dose vials.[28]

Injection ports are a route of entry for microorganisms into the vascular system or other sterile body compartments.[29]

Sharing saline bags as flushing or medication solutions, e.g. phenylephrine, is not recommended. Case reports include the iatrogenic spread of hepatitis C to at least 99 patients at an outpatient clinic as a result of disposable syringe reuse and the contamination of shared saline bags.[30]

Bacterial and fungal infections in postsurgical patients have been linked to contaminated infusions used on multiple patients. Propofol carries a high risk of contamination and cases of postsurgical sepsis and deaths from contaminated infusions have been reported.[25] Propofol is manufactured in a nutrient-rich emulsion, containing glycerine, soybean oil and egg phospholipids, and bacterial growth has been documented at six hours, despite the use of preservative.[31] Therefore, manufacturers have recommended that propofol be discarded six hours after ampoule opening, and for continuous IV infusions, the tubing, container and any unused propofol after 12 hours.[32,33]