**Prepared by Dr. Chris Sikora,**
**Community Medicine Resident, University of Alberta**

## Theoretical background work

There is a body of work concerned with the risk associated with the re-use of single-use syringes and needles during the practice of anaesthesia. Initial studies completed by Lessard *et al.* (1998) explored the possibility of bacterial contamination associated with the re-use of syringes during the daily work of anaesthetic delivery. Out of 200 syringes tested for bacterial growth (100 multi-use and 100 single-use controls), there was a 3% growth rate identified in each category. Samples were not tested for viruses in this study. The authors raised the *possibility* of blood reflux. A study completed by Trepanier *et al.* (1990) studied the potential for blood contamination within the delivery of intravenous (IV) fluid. They tested samples from 300 IV tubings that were delivering non-blood product. Blood was identified from 3.3% of the IV circuits, with a lower proportion (0.3%) identified at distal ports. There was not difference associated with the presence of a check valve. An extension of the same study tested the potential for contamination of the syringe when saline is injected into the side port of an IV circuit carrying blood. Of 100 syringes used to inject saline into IV tubing carrying blood, 34% were contaminated with blood (the syringe body, not the needle).

## Environmental beliefs

Beliefs, and likely practices, in the re-use of single-use syringes in the delivery of anaesthesia has been variable. In the US, a study completed by Tait and tuttle (1995) surveyed 1149 anaesthesiologists, comprising approximately 4% of the membership of the American society for Anaesthesiology (ASA). There was a 44% response rate. Of the respondents, 19.2% stated that they frequently reuse syringes with 1% indicating that they always reuse syringes. A study in was completed in Canada by Kantor in 1996. In this study, surveys were delivered to 187 heads of anaesthesia departments. There was a 68% response rate. Approximately 61% of the respondents stated that they reused syringes with residual drug. This was further stratified by teaching vs. non-teaching sites which reported 49% vs. 68.9% use respectively.

Halkes and Snow completed a survey of 393 UK-based anaesthesiologists in 2003. There was a response rate of 66.4%. Only 46% of the respondents indicated that they change all the equipment after every patient suggesting that over half of the respondents in this study (54%) re-use some components of the IV circuit. The most recent study of beliefs and practices of anaesthesiologist practice with respect to the reuse of syringes was completed by Ryan *et al.* in 2006. This study surveyed 450 anaesthesiologists in New Zealand. There was a 61% response rate. Of the respondents, 50% stated that they had read their site-specific infection control guidelines. Only 2.2% stated that they occasionally used the same syringe to administer drugs to more than one patient.

**Association Recommendations**

There have been recommendations from anaesthesiology societies regarding the reuse of materials for anaesthesia. The French society for Anaesthesiology and Intensive Care recommends not sharing any injection materials during anaesthesia. The Recommendations for Infection Control for the Practice of Anaesthesiology of the American Society for Anaesthesia (2002) state that: 'syringes and needles are sterile, single-patient use items' and that 'medications from a syringe must not be administered to multiple patients even if the needle on the syringe is changed' (Appendix B). Corresponding Canadian guidelines could not be found at this time.

**Cases reported**

There have been multiple case reports of infections being transmitted through reuse of needles and syringes (Appendix A). An early report from Chant *et al.* (1993) revealed a cluster of 5 cases of HIV tracked back to a single surgical session in 1989. The procedures completed at this site were skin-related/cosmetic. The surgeon did not report using multi-use vials for local anaesthetic. No defined mechanism for transmission was identified. A clearer cluster of cases was reported in France by Germain *et al.* in 2005. There was a cluster of 4 cases positive for HCV (genotype 1b) identified as having a surgical procedure performed on the same day in the same operating theatre. Of the 5 cases that had procedures during this operating session, there were four that received a dose of fentanyl. These four patients are the individuals identified in the cluster. There

was identified re-use of a syringe and needle. A call-back was initiated with 1201 patients considered in the exposed group. There were 796 that completed screening and 7 further patients were found to be positive for HCV.

The 2003 edition of MMWR (Vol. 52, No.38) describes four instances of transmission of Hepatitis B and C viruses in out patient settings New York City, Nebraska and Oklahoma. There were two case examples of transmission in New York City in 2001. In the first instance, there were 7 cases of HCV (genotype 2c) identified as being associated with endoscopic procedures in a single private office. The initial lookback encompassed 68 patients, of which 12 were positive for HCV (7 initial and 5 further). A broadened lookback was initiated which 2192 individuals were sent for testing. Of the 1315 respondents, there were 7 further cases of HCV identified. The probable mechanism for infection was contaminated multi-dose anaesthesia medication vials. The second case example in New York City occurred after the identification of two patients with HBV having visited a private physician's office. Preliminary testing identified 19 further HBV patients. Testing was offered to 1042 patients with a further 38 patient identified (57 total). Genetic sequencing of 28 of the patients were homologous. The implicated mechanism was injection of medications (atropine, dexamethasone, vitamin B12) from multiple-dose vials into a single syringe.

In 2002, the Oklahoma department of health was notified of 6 individuals with HCV infection related to a pain remediation clinic. An initial investigation revealed that a single needle and syringe was used to administer midazolam, fentanyl and propofol. Testing was offered to 908 patients and completed on 793. there were 69 further HCV cases identified and 31 further HBV cases. In Nebraska, there were 4 initial HCV cases linked to a haematology/oncology clinic. A preliminary investigation revealed 10 cases of HCV with 100% of the tested strains (n=6) being genotype 3a. The individual responsible for medication infusions would routinely use the same syringe to draw blood from a patients' central venous catheter and to draw catheter-flushing solution from 500-cc saline bags. A total of 613 patients were notified with 486 completing testing. There

were a total of 99 further HCV cases identified. One hundred percent of the tested strains (n=95) were genotype 3a.

The most recent case of transmission of viral illness through the reuse of syringes occurred in Nevada in 2007 and represents an ongoing investigation in the area (MMWR, 2008, 57(19)). There were 6 cases of HCV initially identified from a private endoscopy clinic in Nevada with onset of symptoms between October and November 2007. Five of these individuals had a procedure performed on the same day in September 2007. Of the 5 available blood samples, the identified genotype was HCV 1a, with 4 being genetically related to each other. The reuse of syringes for the delivery of propofol through an intravenous catheter was implicated in these initial 6 cases. Notification of approximately 40,000 patients is underway.

## Appendix A

| Year | Place + Facility | Organism | Presumed mechanism | No. of cases | Called back | Reference |
|---|---|---|---|---|---|---|
| 1989 | Australia – private surgical facility | HIV | unknown | 5 | 9 | Chant *et al.* (1993) |
| 2001 | France – private surgical clinic | HCV (1b) | Multi-dose vial fentanyl (reuse of syringe and needle) | 4 initial<br>7 further | 1201 notified<br>796 tested | Germain *et al.* (2005) |
| 2001 | New York City – Private Office, endoscopy | HCV (2c) | Probable contamination of multi-dose anaesthesia | 7 initial<br>5 further<br>7 further | 2192 notified<br>1315 tested | MMWR 2003 |
| 2001 | New York City – Private Office | HBV | Multi-dose vials, single syringe used | 2 initial<br>57 further | 1042 notified | MMWR 2003 |
| 2002 | Oklahoma – Pain Clinic | HCV<br>HBV | Reuse of syringes + needles for midazolam, fentanyl, propofol | 6 HCV initial<br>69 HCV further<br>31 HBV further | 908 notified<br>793 tested | MMWR 2003 |
| 2002 | Nebraska – haematology & oncology clinic | HCV (6/6 were 3a) | Use of same syringe to drawn blood from central venous catheter and drawn saline to flush catheter | 10 initial<br>99 further (95/95 were 3a) | 613 notified<br>486 tested | MMWR 2003 |
| 2007 | Nevada – private endoscopy | HCV (5/5 were 1a) | Use of same syringe on multiple patients | 6 initial | 40000 notified<br>6000 tested | MMWR 2008 |

**Appendix B**

American Society of Anaesthesiologists. Recommendations for Infection Control for the Practice of Anaesthesiology (Second Edition)

II. Preventing Contamination of Medications
Section (B): Use or syringes

Recommendations

- Syringes and needles are sterile, single-patient use items
- Medications from a syringe must not be administered to multiple patients even if the needle on the syringe is changed
- After entry into or connection with a patient's intravenous (IV) infusion, the syringe and needle should be considered contaminated and used only for that patient
- After use or at the latest, at the end of each patient's anaesthetic, all used syringes and needles should be discarded immediately in an appropriate puncture-resistant container
- Unused syringes, needles and related items should be stored in a clean area to avoid contamination by contaminated syringes and equipment

Rationale

- All current literature advises against administering medications to multiple patients from the same syringe, even if the needle is changed. Removing the needle from a syringe creates a siphoning effect that aspirates the needle contents into the syringe. A needle containing viruses or bacteria will contaminate the syringe even if the needle is flushed prior to removing it from the syringe. Disposable syringes are labelled for "single-use only" by the manufacturer.
- Syringes may become contaminated with bloodborne pathogens when used for IV, intramuscular or subcutaneous administration of medications. IV administration tubing can become contaminated with blood if backflow occurs during blood sample aspiration or from a blood transfusion. Infectious bloodborne pathogens may be present even if blood is not visible in the tubing.
- The syringe, plunger and contents can also be contaminated by direct contact or airborne transmission. Fluidborne contaminants on the open back end of the syringe and plunger will readily contaminate the syringe contents after several cycles of withdrawal and injection of the plunger. Multiple injections increase the chances of syringe contamination.
- Reusing syringes or needles places subsequent patients at risk of cross-infection and places HCWs at risk of infection if a needlestick injury were to occur.
- Some practitioners choose to mix more than one medication in a syringe for simultaneous administration. If this is done, the procedure should be performed in an aseptic fashion, and the solutions must be chemically and physically compatible. Although this may be acceptable practice in some situations, the additional maneuvers in this procedure may increase the likelihood of contamination.

**References**

Acute Hepatitis C Virus Infections Attributed to Unsafe Infection Practices at an Endoscopy Clinic --- Nevada, 2007. (2008) MMWR. 57(19):513-517

Carbonne A *et al.* (2006) Evaluation of practices involving a cross infection risk in anaesthesia. Annales

Francaises d'Anesthesie et de Reanimation 25:1158-1164

Chant K *et al.* (1993) Patient-to-patient transmission of HIB in private surgical consulting rooms. Lancet 342:1548-9

Germain JM *et al.* (2005) Patient-to-patient transmission of Hepatitis C Virus through the use of multidose vials during general anaesthesia. Infection Control and Hospital Epidemiology 26:789-792

Halkes MJ and Snow D (2003) Re-use of equipment between patients receiving total intravenous anaesthesia: a postal survey of current practice. Anaesthesia 58:571-596

Kantor G and Chung F (1996) Anaesthesia drug cost, control and utilization in Canada. Can J Anaesth 43(9-16)

Lessard MR *et al.* (1990) A microbiological study of the contamination of the syringes used in anaesthesia practice. Can J Anaesth 35:567-9

Recommendations for Infection Control for the Practice of Anaesthesiology (Second Edition). American Society of Anaesthesiologists

Ryan AJ *et al.* (2006) A national survey of infection control practice by New Zealand anaesthetists. Anaesth Intensive Care 34:68-74

Tait AR and Tuttle DB (1995) Preventing Perioperative Transmission of Infection: A Survey of Anaesthesiology Practice. Anesth Analg 80:764-9

Transmission of Hepatitis B and C Viruses in Outpatient Settings – New York, Oklahoma, and Nebraska, 2000-2002. (2003) MMWR. 52(38):901-906

Trepanier CA and Lessard MR (2003) Propofol and the risk of transmission of infection. Can J Anaesth 50:533-537

Trepanier CA *et al.* (1990) Risk of cross-infection related to the multiple use of disposable syringes. Can J Anaesth 37:156-9