*For Debate***Preventing needlestick injuries**

D C Anderson, A L Blower, J M V Packer, L A Ganguli

The use of needles is an essential part of providing medical care but is potentially hazardous to staff. Awareness of hazards, use of the correct equipment, and a consistent and careful technique are all of great importance in preventing needlestick injuries.

To date 13 cases of occupationally contracted AIDS caused by needlestick injuries with hollow bore needles have been documented worldwide (N Gill, K Porter, personal communication). Nevertheless the overall risk of contracting HIV infection after a simple needlestick injury with a needle known to be contaminated is estimated to be less than 0.5%,^{1,2} whereas the risk of hepatitis B virus infection has been estimated to be 3-16%.² Although the risk of hepatitis B virus infection can be eliminated by vaccination,⁴ vaccination of all staff at risk is probably unattainable.

The recent Department of Health guidelines state:

Needles that have to be removed from syringes and lines must be dealt with safely. Needle forceps or other suitable aids or devices should be readily available. Up to 40% of self-inoculation accidents have been reported to occur while resheathing needles; therefore this must not be done unless there is a safe means available at the point where the work is conducted.¹

In 1989 the Salford Control of Infection Committee, of which we are members, reviewed the evidence concerning resheathing before updating the code of practice. Despite reviewing the same evidence as the BMA working party⁵ we came to different conclusions. For simplicity we discuss here only disposable needles and associated syringes, which account for the greatest number of hollow bore needle injuries.⁶

Between 22% and 40% of occupational needlestick injuries occur during resheathing.^{2,6,7} The high incidence of such injuries led the United States Centers for Disease Control to opt for a non-sheathing technique but without evidence of its efficacy.⁸ Their guidelines were then adopted with minor modifications by the Department of Health and Social Security^{1,9} and by the BMA working party. These recommendations were based on the assumption that avoiding resheathing should decrease the number of needlestick injuries and consequent problems.

Reasons for resheathing

Jagger *et al* found that 113 of 326 needlestick injuries occurred with needles associated with disposable syringes.⁶ Eighty six injuries occurred after the needle had been used: 52 during or after recapping. In seven cases the injury was attributed to the cap falling off after resheathing, which would be prevented by better fitting sheaths. The cap was pierced in 13 cases; in 11 this was because the sheath was too small, reflecting poor technique or use of Venflon needles, whose

sheaths are shorter than the needles—a correctible design fault. Thirty two injuries were caused by the operator missing the cap while resheathing using a dangerous technique. We believe that the other 34 injuries, some of which involved a third party, could have been prevented if the needle had been resheathed immediately. This study suggests that even with an intrinsically unsafe routine technique resheathing may prevent as many injuries as it causes.

An important consideration is that resheathing prevents injuries to a third party occurring later as properly resheathed needles are almost 100% safe. An uncapped needle could project through the walls of substandard containers (still often used even in Britain) or through the top of an overfilled container, causing an injury to someone who cannot know the nature or degree of the danger. At least if the operator is injured he or she can readily check on the potential risk of contracting hepatitis B virus or HIV.

After venepuncture (which is a particular risk because of the potential for injecting large volumes of blood) the needle must normally be removed before the blood is injected into containers. This is difficult to do safely without first resheathing except when a sharps container with a slot designed for the purpose is used. Such containers are unlikely to be universally available, and the problem still remains when taking a sample for blood culture, when, traditionally, the needle is changed while the syringe nozzle is kept sterile before blood is injected into the culture bottles. Providing staff with Spencer-Wells forceps (cost £13) to hold the needle, as officially recommended,¹ is expensive, impracticable on a large scale, and associated with a risk of "flipping" the needle or blood across the room or, worse, into the eye. The incidence of injuries increased after forceps were introduced for removing needles in New Zealand.^{10,11}

Goldwater *et al* have recently argued strongly against the policy of not resheathing.¹¹ They pointed out that with resheathing the main risk is isolated in time and space and is taken by the operator. With unsheathed needles the risk depends on the reliability of rigid puncture resistant containers. Two studies found that introducing such containers had no effect on the overall needlestick injury rate, although injuries during final disposal fell.^{12,13} In contrast, Goldwater *et al* presented evidence to suggest that an active resheathing policy using a portable resheathing device reduced the rate of needlestick injury fourfold from 1 in 4000 venepunctures to 1 in 16 000. They estimated the costs of each injury to be about \$110, taking account of medical care, time lost at work, laboratory testing, and treatment but excluding hepatitis B vaccine (which increased the cost to \$300) and litigation costs.

Edmond *et al* found that despite an official policy to

Departments of Medicine, Surgery, and Medical Microbiology, Hope Hospital, Salford M6 8HD
D C Anderson, MD, *professor of endocrinology*
A L Blower, MD, *senior surgical registrar*
L A Ganguli, PHD, *consultant microbiologist*

Department of Public Health Medicine, Salford Health Authority, Eccles M30 0NJ
J M V Packer, FFPHM, *consultant in communicable disease control*

Correspondence to:
Professor D C Anderson,
Department of Medicine,
Hope Hospital, Salford M6 8HD.

BMJ 1991;302:769-70

the contrary 94% of trained nursing staff resheathed needles⁷; starting bedside disposal systems and an educational programme had no effect on the practice of the 37% who attended. They concluded that whatever people are told most are likely to continue to resheath needles, partly because they intuitively believe that it protects themselves and others. In Salford we found (admittedly before the BMA code of practice and accompanying poster were published) that resheathing was practised by 77 (49%) of 158 nursing sisters and 61 (87%) of 70 doctors who completed the questionnaire. Ninety six nursing sisters and 63 doctors stated that, despite an active local policy not to resheath, they intended to continue to resheath needles.

Resheathing and HIV infection

Of the 13 documented cases of HIV infection after occupational needlestick injuries,^{3 14 25} only three were associated with resheathing: one occurred while resheathing a needle attached to a syringe containing "fresh blood drawn from an arterial line,"¹⁴ and one while resheathing a thoracocentesis needle¹⁵; in the third case the worker had two needlestick injuries within 10 days, one during resheathing and the other not.¹⁶ Some of the remaining 10 cases would have been prevented by resheathing, including one case that led to an out of court settlement of \$1.35m.²⁴

We believe that operators have an obligation to make used needles safe by resheathing them before disposal. Although the risks are much less for intracutaneous or subcutaneous injections, because third parties injured cannot tell the source of the needle the same policy should be introduced for all hollow bore needles. The resheathing process should be as safe as possible for the operators, and methods of teaching safe resheathing to medical students, nurses, and others need to be developed. We agree that resheathing the needle in the horizontal position as shown in the BMA booklet is highly dangerous and should be avoided under all circumstances, but other techniques are much safer—for example, by using a resheathing device, such as the Saf-T-Cap (fig 1)²⁵ or NeedleGuard,¹⁰ or using sharps containers that have a hole to place the sheath in. We have tried two safe manual techniques. In the first (fig

FIG 1—Saf-T-Cap resheathing device

FIG 2—Gravity resheathing method. Sheath is placed over tip of needle and dropped into place. It is then held by base, gently pushed home, and removed with needle inside

FIG 3—Scoop resheathing method. Once up to hilt of sheath, syringe is turned to point upwards with sheath covering needle. Sheath is held at base and pushed home

2) the syringe and needle are held pointing upwards at an angle of about 70° and the sheath by its tip in the other hand; the sheath is brought over the top of the needle and, once the needle tip is covered, is dropped into place under gravity. The cap is then held at its base and driven home by rotation. Until the cap is in place the operator's hand is never in the same horizontal plane as the needle, so there is no risk of self injury. The second technique is the scoop technique (fig 3),²⁶ whereby the sheath is placed on a flat surface, and scooped up with the needle and shaken into place before being driven home as above. We suggest that resheathing devices should be made available wherever venepuncture is performed and that one of these two techniques should be taught as a back up for when such a device is not available. In busy areas, such as accident and emergency departments, where the operator might be knocked, a resheathing device should always be used. It could be argued that the problem could be avoided by using a system such as the Vacutainer; this is debatable, but in some cases a conventional needle and syringe will still be required for venepuncture, such as when taking blood for cultures.

We thank the medical illustration department at Hope Hospital for the figures and the control of infection committee and hospital staff for their help with the questionnaire.

- 1 Advisory Committee on Dangerous Pathogens. *HIV—the causative agents of AIDS and related conditions. Second revision of guidelines*. London: HMSO, 1990.
- 2 Kennedy DA. Needlestick injuries: mechanisms and control. *J Hosp Infect* 1988;12:315-22.
- 3 Marcus R. Centers for Disease Control CDC Cooperative Needlestick Surveillance Group. Surveillance of health care workers exposed to blood from patients infected with the human immunodeficiency virus. *N Engl J Med* 1988;319:1117-23.
- 4 Expert Advisory Group on AIDS. *Guidance for clinical health care workers: protection against infection with HIV and hepatitis viruses*. London: HMSO, 1990.
- 5 British Medical Association. *A code of practice for the safe use and disposal of sharps*. London: BMA, 1990.
- 6 Jagger J, Hunt EH, Brand-Elnaggar J, Pearson RD. Rates of needlestick injury caused by various devices in a university hospital. *N Engl J Med* 1988;319:284-8.
- 7 Edmond M, Khakoo R, McTaggart B, Solomon R. Effect of bedside disposal units on needle recapping frequency and needlestick injury. *Infect Control Hosp Epidemiol* 1988;9:114-6.
- 8 Centers for Disease Control. Acquired immune syndrome (AIDS) precautions for health care workers and allied professions. *MMWR* 1983;32:450-1.
- 9 Advisory Committee on Dangerous Pathogens: LAV/HTLV III. *The causative agent of AIDS and related conditions—revised guidelines*. London: Department of Health and Social Security, 1986:6.
- 10 Nixon AD, Law R, Officer JA, Cleland JF, Goldwater PN. Simple device to prevent accidental needle-prick injuries. *Lancet* 1986;ii:888-9.
- 11 Goldwater PN, Law R, Nixon AD, Officer JA, Cleland JF. Impact of recapping device on venepuncture-related needlestick injury. *Infect Control Hosp Epidemiol* 1987;10:21-5.
- 12 Ribner BS, Landry MN, Gholson GL, Linden LA. Impact of rigid puncture-resistant container system upon needlestick injuries. *Infect Control* 1987;8:63-6.
- 13 Krasinski K, La Conture R, Holzman RS. Effect of changing needle disposal systems on needle puncture injuries. *Infect Control* 1987;8:59-62.
- 14 Anonymous. Needlestick transmission of HTLV-III from a patient infected in Africa [Editorial]. *Lancet* 1984;ii:1376-7.
- 15 Oksenhendler E, Harzic M, LeRoux J, Rabian C, Clauvel J-P. HIV infection with seroconversion after a superficial needlestick injury to the finger. *N Engl J Med* 1986;315:582.
- 16 Stricof RL, Morse DL. HTLV-III/LAV seroconversion following a deep intramuscular needlestick injury. *N Engl J Med* 1986;314:1115.
- 17 Neisson-Vernant C, Arfi S, Mathez D, Leibowitch J, Monplaisir N. Needlestick HIV seroconversion in a nurse. *Lancet* 1986;ii:814.
- 18 Centers for Disease Control Update. Human immunodeficiency virus infections in health care workers exposed to blood of infected patients. *MMWR* 1987;36:285-9.
- 19 Centers for Disease Control. Recommendations for prevention of HIV transmission in health-care settings. *MMWR* 1987;36:4-55.
- 20 Gerberding JL, Bryand-LeBlanc CE, Nelson K, et al. Risk of transmitting the human immunodeficiency virus, cytomegalovirus, and hepatitis B virus to health care workers exposed to patients with AIDS and AIDS-related conditions. *J Infect Dis* 1987;156:1-8.
- 21 Gioannini P, Sinicco A, Cariti G, Lucchini A, Paggi G, Giachino O. HIV infection acquired by a nurse. *Eur J Epidemiol* 1988;4:119-20.
- 22 Ramsey KM, Smith EN, Reinartz JA. Prospective evaluation of 44 health care workers exposed to human immunodeficiency virus-1, with one seroconversion [Abstract]. *Clin Res* 1988;36:1A.
- 23 Centers for Disease Control Update. Acquired immunodeficiency syndrome and human immunodeficiency virus among health care workers. *MMWR* 1988;37:229-39.
- 24 New York doctor with AIDS settles out of court. *BMJ* 1990;300:766-7.
- 25 Bessent RG, Donnet R, Shaw A. Device to permit recapping of syringes without risk of infection. *BMJ* 1987;295:307-8.
- 26 Green ST. Avoiding needle pricks. *Lancet* 1986;ii:1096.

(Accepted 25 January 1991)