

# A STUDY OF NEEDLE-STICK INJURIES AMONG HOUSE OFFICERS IN A MAJOR HOSPITAL

H P Chia, D Koh, R Chong, J Jeyaratnam

## ABSTRACT

House officers (HO) undergoing housemanship in the departments of Surgery, Medicine and Orthopaedics in a major hospital were studied with regard to the incidence and causes of needle-stick injuries via a self-administered recall questionnaire. A response rate of 79% (44 out of 56 HOs) was obtained, of which 35 HOs had completed 2 months of housemanship and 9 had completed 8 months. A total of 171 needle-stick injuries (1.2 per HO-month) were reported with 6 HOs never sustaining an injury. The more experienced HOs had less injuries than the less experienced HOs with an incidence rate of 4.65 (95% confidence interval of 4.08-8.87). Resheathing was the commonest reported cause of injury (45% of 113 described cases). Forty-three HOs (90%) reported that they frequently resheathed used needles before disposal. Most HOs (61%) felt that they were at nil to moderate risk of contracting an infectious disease from a needle-stick injury. A system of reporting and policies on management of infected personnel may be needed to monitor this health hazard.

**Keywords:** needle-stick injuries, house officers, venepuncture, infectious diseases

SINGAPORE MED J 1994; Vol 35: 41-43

## INTRODUCTION

More than 20 infectious agents<sup>(1)</sup> including Hepatitis B Virus and the Human Immunodeficiency Virus (HIV) have been documented to be transmitted through injury of the skin by used hypodermic needles and other sharp instruments. Of prime concern would be the danger of Hepatitis B and HIV transmission among our healthcare workers. The occupational hazard of needle-stick injuries have been well-documented among healthcare workers like nurses<sup>(2)</sup>, resident doctors<sup>(3)</sup>, blood collection teams<sup>(4)</sup> and even in medical students<sup>(5-7)</sup>. This study looked at the incidence of needle-stick and sharps injuries among house officers (HO) in a major hospital and the possible causative factors.

## METHODS

The population studied comprised 56 HOs undergoing housemanship in General Surgery, General Medicine, and Orthopaedics. Through a self-administered questionnaire distributed via their respective departments over a one-week period, house officers were asked to recall all their past experiences of needle-stick and sharps injuries and the surrounding circumstances, since the start of their housemanship. Questions pertaining to self-perceived cause of injury, personal protection and self-perception of risk were also asked. The frequencies of venepuncture and other minor ward procedures performed by the house officers in the different postings were not specifically quantified in the questionnaire.

Division of Occupational Medicine  
Department of Community, Occupational and Family Medicine  
National University Hospital  
Lower Kent Ridge Road  
Singapore 0511

H P Chia, MBBS  
Senior Tutor

D Koh, MBBS, MSc (OM), PhD, FAMS  
Senior Lecturer

J Jeyaratnam, MBBS, MBs (OM), PhD, MFCM, FFOM, FAMS  
Associate Professor and Head

Department of Medicine II  
Singapore General Hospital  
Outram Road  
Singapore 0316

R Chong, MBBS, M Med (Int Med), MRCP (UK), MRCPI, FAMS  
Consultant Physician

Correspondence to: Dr H P Chia

Distinction was made between 'needle-stick' injuries and 'sharps' injuries. A needle-stick injury was defined as a puncture wound of the skin, with or without bleeding, caused by a used hypodermic needle, a 'Vacurette', a butterfly needle or a venula. Similarly, a sharps injury was defined as a puncture wound of the skin caused by used blades, suture needles and other sharp surgical instruments.

There were two type of HOs distinguished by length of service: 'Junior' HOs who had served the first 2 months of their first housemanship posting and 'senior' HOs who had served 8 months and were at the end of their 2nd clinical posting or beginning of their 3rd posting.

The reliability of the reported rate of needle-stick injuries is limited by the differential recall ability of the house officers involved. However, it is reasonable to assume a fairly accurate recall since a needle-stick injury is usually a painful experience.

## RESULTS

### Response Rate

A response rate of 79% (44 out of 56 HOs) was obtained, of which 35 HOs (Junior HOs) had served only 2 months of housemanship, while the other 9 (Senior HOs) had served 8 months in 2 postings (Table I).

Table I – Response rates by current posting

Current posting	Total number of HOs* in unit	No of respondents (% of unit total)
General medicine	27	25 (93%)
General surgery	17	9 (53%)
Orthopaedics	12	10 (83%)
All postings	56	44 (79%)

\*HOs : House Officers

Table II – Comparison of injury rates between junior\* and senior HO<sup>s</sup>\*\* in all postings

Type of HO	No. of HOs	No. of injuries	Rate of injury
Junior	35	140	2.0
Senior	9	31	0.4

Incidence rate ratio = 4.65 (95% CI 3.13 - 7.09)

\* Junior HOs had served 2 months in their current posting

\*\* Senior HOs had served 4 months in their current posting and 4 months in a previous posting.

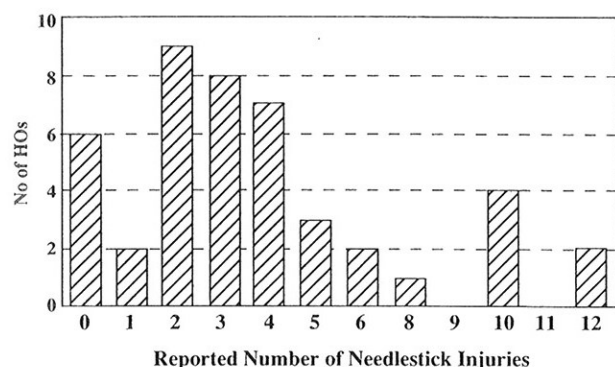
**Table III – Rate of needle-stick injuries by current clinical posting**

Clinical posting	No. of junior HOs	No. of injuries reported by junior HOs (Injury rate per HO-month)	No. of senior HOs	No of injuries reported by senior HOs (Injury rate per HO-month)	Combined injury rate per HO-month of junior and senior HOs
General medicine	18	96 (2.7)	7	2 (0.07)	1.5
General surgery	9	18 (1.0)	0	0 (0.0 )	1.0
Orthopaedics	8	26 (1.6)	2	2 (0.3 )	1.2
All current postings	35	140 (2.0)	9	4 (0.1 )	1.4

**Needle-stick Injuries**

A total of 171 needle-stick injuries was reported by all HOs. The number of multiple injuries sustained by an individual ranged from nil to 12 with a mode of 2 (Fig 1). Only 6 HOs could not recall ever sustaining an injury. Crude and specific incidence rates were expressed as number of injuries per HO-month. Thus, the crude incidence rate of injury sustained by all HOs was 1.2 per HO-month. The length of experience of the HOs significantly influenced the rates of injury. The Incidence Rate Ratio (IRR) of injury rates of junior HOs (2 months of housemanship) to senior HOs (8 months of housemanship) was 4.63, 95% CI 3.13 – 7.09 (Table II).

**Fig 1 – Frequency of needlestick injuries among all house officers**



Total number of reported injuries = 171  
Crude Rate of injury = 1.2 per HO-month

Based on crude rates (Table III), HOs in the current medical posting (1.5 per HO-month) had a higher reported rate of injury compared to HOs currently serving in Orthopaedic (1.2 per HO-month) and Surgical (1.0 per HO-month) postings. The order of magnitude of injury rates remained the same after eliminating senior HOs from the calculations (Medical 2.7 per HO-month, Orthopaedics 1.6 per HO-month, Surgical 1.0 per HO-month).

Of the 171 reported injuries, details of 113 cases were described (Table IV). Resheathing was specifically cited as the cause of injury in 52 cases (46%). Injury during the procedure itself accounted for 20 cases (18%). Correspondingly, the habit of resheathing a used venepuncture needle was frequently practised by 93% (41) of the HOs. None of the injuries were formally reported or recorded.

Gloves were commonly worn only for the procedure of blood cultures (91%) as it was a requirement for sterile procedure (Table V). For the other common procedures like blood taking and arterial blood taking only 2 HOs used gloves as a routine.

The HOs were asked to rate their risk of contracting an infectious disease on a crude scale ranging nil, low, moderate, high or very high (Table VI). The majority of HOs (61%) rated their risk as nil to moderate.

**Table IV – Reported causes of needle-stick injuries by occurrences\***

Cause of Injury	No. of occurrences (%)
Resheathing	52 ( 46%)
During venepuncture	20 ( 18%)
Uncapping	21 ( 19%)
During intravenous injections	8 ( 7%)
By hypocount needles	5 ( 4%)
Others	7 ( 6%)
All causes	113 (100%)

\* The causes of 58 injuries were not described.

**Table V – Usage of gloves during 3 common ward procedures**

Type of procedure	No. of Houseman who uses gloves			Total (%)*
	Plastic (%)*	Rubber (%)*	Not specified (%)*	
Routine blood taking	1 (2)	1 ( 2)	0 ( 0)	2 ( 4)
Blood cultures	1 (2)	29 (66)	10 (21)	40 (91)
Arterial blood gas	0 (0)	2 ( 4)	0 ( 0)	2 ( 4)

\* The causes of 58 injuries were not described.

**Table VI – Self-perception of risk of contracting an infectious disease**

Perception of Risk	Number (%)
No risk	2 ( 5%)
Low risk	5 (11%)
Moderate risk	20 (45%)
High risk	12 (27%)
Very high risk	2 ( 5%)
No response	3 ( 7%)

**Sharp Injuries**

Only one HO reported 3 sharps injuries caused by suture needles during the procedure of toilet and suture. Four HOs who reported injuries due to breaking of ampoules were excluded from the study of definition.

**DISCUSSION**

Since specialised phlebotomy teams were not available in the hospital studied, routine blood-taking in the wards were carried out mainly by HOs among their other duties. The hospital adopted the traditional method of using disposal syringes and needles of venepuncture and then squirting the blood into the various tubes for laboratory testing. Puncture-proof containers were provided in the wards for disposal of needles.

A total of 171 needle-stick injuries were reported by 44 HOs. A similar study by Woolley in London and Sheffield<sup>(6)</sup> had 25 out of 78 house officers surveyed admitting to a needle-stick injury in the first 6 months of housemanship. In our study, only 6 out of 44 HOs reported never having had a needle-stick injury.

The length of housemanship served was significantly associated with a lower rate of needle-stick injuries. The senior HOs had a lower rate of injury than their junior counterparts. Experience had probably taught them how to better avoid needle-stick injuries in spite of a heavy work load.

A difference in rates of injury was noted among the different postings. Contrary to a study by Heald and Ransohoff<sup>(3)</sup> which reported a higher rate of injury among surgical residents than non-surgical residents, medical HOs had a higher rate of needle-stick injuries than surgical/orthopaedic HOs. However, the interpretation of these figures was severely limited by the lower response rates (53%) of surgical HOs compared to medical HOs (93%).

It is well-known from journal reports that resheathing of used needles is the most frequent cause of needle-stick injuries. In this study, 45% of the needle-stick injuries was reportedly due to resheathing of used needles. This was comparable to the percentage of resheathing injuries in other studies on various groups of health workers: 15% and 18% of all hospital personnel by McCormick et al<sup>(2,3)</sup> and Jagger et al<sup>(9)</sup> respectively, 51% of physicians by Thurn et al<sup>(10)</sup>, 51% of British medical students by Gompertz<sup>(5)</sup> and 20% of Singaporean medical students by Chia<sup>(7)</sup>. Resheathing of used needles was a very common practice among the house officers (93%) in spite of specific guidelines laid down by the Ministry of Health<sup>(11)</sup>. In fact, the guidelines laid down by the Ministry was quite clear in that used needles should not be recapped but should be immediately disposed of into puncture-proof containers. This means that such containers should also be placed within easy reach of the venepuncturist. A study by Becker<sup>(12)</sup> cited reasons for non-compliance to the no-recapping rule like inadequate knowledge, concerns about personal risk, forgetfulness, 'too busy' and the misconception that recapping protects disposal workers. However, the practice of recapping used needles can be so deeply ingrained that eradicating it would require rather radical methods. An experiment<sup>(13)</sup> was carried out in a hospital in which recapping rates in a group of nurses was secretly measured before and after a series of health education and generous provision of needle disposal systems in the wards. They found no significant decrease in recapping rates before (93.9%) and after (94%) the measures. Another hospital<sup>(14)</sup> had a similar experience of non-improvement after providing needle disposal systems without health education. A third hospital<sup>(15)</sup> however, reported a 53% decrease in recapping injuries after provision of needle disposal units in all patient care areas of convenient locations coupled with intensive health education.

Non of the housemen reported their needle-stick injuries to the relevant hospital authorities because they were afraid of

losing their jobs if found infected or they were not bothered as they generally perceived themselves as having nil to moderate risk of contracting an infectious disease (61%). A regular questionnaire survey of hospital personnel adopted by one particular hospital in the Eastern United States<sup>(14)</sup> may be more effective than an institutionalised voluntary reporting system in gauging effectiveness of new measures implemented. Specific guidelines and policies on management of infected medical personnel with regard to their job security may help to increase the reporting rate.

## CONCLUSION

Needle-stick injuries occur commonly among house officers and pose the threat of contracting infectious diseases. In particular, new HOs are at higher risk than their more experienced counterparts. Laying down guidelines alone are not sufficient in reducing needle-stick injuries. Although the evidence from published data appeared conflicting, many people believe that early intensive education and generous provision of needle disposal systems are required to reduce recapping injuries and needle-stick injuries as a whole. Adequate regular hospital-wide surveys, in addition to voluntary reporting systems, are also required to gauge effectiveness of new measures. Specific guidelines and policies on management of infected medical personnel with regard to their job security may be needed to allay their fear of reporting.

## REFERENCES

1. Collins CH, Kennedy DA. Microbiological hazards of needle-stick. *J Appl Bacteriol* 1987; 62: 385-402.
2. McCormick RD, Maki DG. Epidemiology of needle stick injuries in hospital personnel. *Am J Med* 1981; 70: 928-31.
3. Heald AE, Ransohoff DF. Needle-stick injuries among resident physicians. *J Gen Int Med* 1990; 5: 389-93.
4. McGuff J, Popovsky MA. Needle-stick injuries in blood collection staff. A retrospective analysis. *Transfusion* 1989; 29: 693-5.
5. Gompertz S. Needlestick injuries in medical students. *J Soc Occup Med* 1990; 40: 19-20.
6. Jones DB. Percutaneous exposure of medical students to HIV. *JAMA* 1990; 264: 1188-90.
7. Chia HP, Koh D, Jeyaratnam J. A study of needlestick injuries among medical undergraduates. *Ann Acad Med Singapore* 1993; 22: 338-41.
8. Woolley PD, Palfreeman AJ, Patel R, Talbot MD, Samarasinghe PL. Blood-taking practices and needle-stick injuries in house officers. *Int J STD AIDS* 1991; 2: 46-8.
9. Jagger J, Hunt EH, Brand-Elnaggar J, Pearson RD. Rates of needle-stick injury caused by various devices in a university hospital. *N Engl J Med* 1988; 319: 284-8.
10. Thurn J, Willenbring K, Crossley K. Needlestick injuries and needle disposal in Minnesota physicians' office. *Am J Med* 1989; 86: 575-9.
11. Singapore, Ministry of Health. Handbook on prevention of HIV transmission in the health care setting. Singapore: Ministry of Health. 1991
12. Becker MH, Janz NK, Band J, Bartley J, Synder MB, Gaynes RP. Non-compliance with Universal Precautions Policy: Why do physicians and nurses recap needles? *Am J Infect Control* 1990; 18: 232-9.
13. Edmond M, Khakoo R, McTaggart B, Solomon R. Effect of bedside needle disposal units on needle recapping frequency and needlestick injury. *Infect Control Hosp Epidemiol* 1988; 9: 114-6.
14. Smith DA, Eisenstein HC, Esrig C, Godbold J. Constant incidence rates of needle-stick injuries paradoxically suggest modest preventive effect of sharps disposal system. *J Occup Med* 1992; 34: 546-51.
15. Haiduven DJ, Demaio TM, Stevens DA. A five-year study of needlestick injuries: significant reduction associated with communication, education and convenient placement of sharps container. *Infect Control Hosp Epidemiol* 1992; 13: 265-71.