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Post-traumatic stress disorder in trainee doctors with previous needlestick injuries

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Background	Doctors are at particular risk of occupational needlestick injuries (NSI), and these may result in considerable acute anxiety and fear of disease transmission.
Aims	To measure the prevalence of post-traumatic stress disorder (PTSD) among trainee doctors who had experienced an NSI.
Methods	A questionnaire was distributed to trainee doctors starting work in a large university hospital in the UK. The survey gathered demographic information and experience of previous NSI and included questions designed to assess the presence of PTSD via the Impact of Event Scale (IES), a widely used screening tool for PTSD. The six-item version of this tool (IES-6) was used in this study.
Results	Among the 147 doctors who participated, 80 (54%) had sustained at least one NSI during their training and 77 of these completed the IES-6 survey. Of note, 38% of injuries (30/80) were not reported to the occupational health or emergency departments. Using a cut-off level of 10 in the IES-6, 12% (9/77) of the doctors who suffered NSI during their training showed evidence of PTSD. Since the prevalence of PTSD in the general population is estimated at 3%, the odds ratio of PTSD in doctors who had NSI was 4.28 (95% confidence interval: 2.16–8.47).
Conclusions	NSI injury is common among doctors in training. As 12% of doctors with experience of NSI had post-traumatic stress reactions, special attention should be paid to psychological impacts of NSIs. We would recommend further prospective studies.
Key words	Medical training; needlestick injuries; post-traumatic; stress disorders.

Introduction

Despite awareness of the risk, occupational needlestick injuries (NSI) continue to occur [1]. Doctors are particularly vulnerable to NSIs, and previous data have shown that they have a higher risk of NSI compared with nurses [2,3]. Among doctors, trainees are more likely to have NSI although non-compliance with protocols designed to reduce the risk is reported to be higher among senior staff [4]. It has previously been shown that the risk of blood and body fluid exposure among junior doctors was three times that of senior doctors [5]. A study of surgical residents in the USA reported that virtually all (99% of responders) had sustained an NSI by the final year of training [6]. Worryingly, over half said that their injuries went unreported.

The increased risk of NSI among doctors in training may be due to the fact that they are learning new skills [6] and also use sharp items in many different circumstances in the health care setting. Since trainee doctors are more likely to rotate between medical centres during their training, the need to adapt to new work settings may be a risk factor, partly explaining the higher risk of injury.

NSIs may lead to the transmission of serious blood-borne infections caused by hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). They are associated with a significant financial burden related to follow-up testing, treatment and staff replacement and also human costs in terms of stress and anxiety following the acute event. Sustaining an NSI is stressful, and the higher levels of anxiety in

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these health care workers could put them at higher risk of future NSIs [7]. Distress and anxiety following exposure to blood and body fluids via an NSI may become chronic, and persistent symptoms could meet the diagnostic criteria for post-traumatic stress disorder (PTSD). There are two reported cases of PTSD after NSI from an HIV positive patient [8].

The current prevalence of PTSD in the general population has been estimated to be 3% [9]. To the best of our knowledge, there is no published work examining prevalence of PTSD in doctors who have previously experienced NSI. The aim of this study was to investigate the prevalence of NSIs in doctors in training, the reason for not reporting such injuries and the prevalence of PTSD in doctors who report previous NSI.

Methods

Trainee doctors attending a single induction day at the start of their training placements at Barking, Havering & Redbridge University Hospitals Trust (i.e. public organization providing services on behalf of the National Health Service (NHS) in UK) [10], Essex, UK were recruited as participants. This is an NHS establishment in north-east London covering two main acute hospital sites, with more than 1500 inpatient beds, and a catchment population of over 700 000. At any one time, around 450 trainee doctors are employed within the trust, typically on rotational placements lasting 6–12 months. Those who agreed to participate were asked to complete a questionnaire that was a modified version of that used by Markery *et al.* [6]. This included questions regarding the age and gender of respondent and the grade and year of postgraduate clinical training (in accordance with current UK training programmes). Questions regarding NSIs included the number of NSIs recalled during all of their training, the number in the past year, NSIs involving high-risk patients and more detailed questions about the most recent NSI including the circumstances and causes of injury and whether they felt either themselves or someone else had been primarily to blame. High-risk patients were defined as those with a history of HBV, HCV, HIV or injection-drug use [6]. Participants were asked if the NSI was reported and, if unreported, the reasons for this.

The Impact of Event Scale-revised (IES-R) has been shown to be a reliable and valid self-reported screening tool for PTSD in different populations [11]. The questionnaire comprises 22 questions measuring three clusters of PTSD characteristic symptoms: intrusion/re-experiencing, avoidance and hyperarousal. For field studies such as the one reported here, a shorter version of IES, the abbreviated (six-item) version of IES-R has been developed and validated [11]. A cut-off score of 10 or higher has the best overall efficiency for detecting PTSD in populations. Thus, this six-item version of this tool (IES-6) with cut-off point 10 was used in this study. In order to estimate the prevalence of PTSD related to previous NSI, the IES-6 was completed by the doctors who had previous NSI.

Approval for the study was obtained from the Clinical Governance Department of Barking, Havering and Redbridge University Hospitals. SPSS version 17 for Windows was used for statistical analysis. Descriptive statistics were used to show the overall characteristics of NSIs. Any *P*-value smaller than 0.05 was considered statistically significant. The Wilson score method was used to calculate the confidence interval (CI) for the proportion of needlestick-injured doctors.

Results

Of 179 trainee doctors invited to participate during the induction day, 82% (147) of doctors completed the questionnaire. Of those who participated in the study, 54% (80) reported that they had suffered at least one NSI during their training. The injury most commonly occurred during foundation year 2 (FY2) and specialty trainee year 1 (ST1). The average number of NSIs per doctor during their training was 1.03. A trend for NSIs to be more common among male participants did not reach statistical significance (Table 1).

With regard to the specified location for the most recent NSI, the highest injuries (38%) were reported to have occurred at the patient's bedside followed by the operating room (23%). Suturing (23%), cleaning up (15%) and recapping (14%) were the most common tasks performed at the point of injury. The majority of injuries were from hollow-bore needles (41%). Being 'rushed' was reported by 44% of doctors as a causal factor for the NSI followed by 'the lack of assistance' (22%). Of note, 58% of the injured doctors reported the injury to be 'self-inflicted'.

Of 80 doctors who experienced NSI, 30 cases (38%) did not report their most recent injury to their local occupational health department. Of these 30 cases, 13 provided an explanation for the reasons behind this non-reporting. The most common reasons cited were 'Too busy to report' (39%), 'It takes too much time' (23%) and 'Low risk injury by self risk-assessment' (15%). A previous study found 52% of NSI were not reported by surgeons [12].

NSIs were more likely to be reported if a hollow-bore needle was the instrument causing injury, high-risk patients were involved, the location of injury was at the bedside, the responsible person was someone else and the injury happened out of office hours, but none of these reached statistical significance (Table 2).

Out of 80 doctors with experience of NSI, 77 completed IES-6. Applying the cut-off level 10, which is considered to have the best overall efficiency (sensitivity 0.86, specificity 0.88, positive predictive value 0.71, and overall efficiency 0.87) [11], 12% (9 of 77) were considered to be positive for PTSD (95% confidence interval (CI): 6–21%; Table 3). There were five doctors who

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Table 1. Variables associated with needlestick injury

Variable	Trainee doctors surveyed *n* (%)		Average no. of needlestick injuries per trainee doctor
	No NSI	NSI	
Gender			
Male	27 (40)	35 (44)	1.34
Female	38 (57)	40 (50)	0.78
Unspecified	2 (3)	5 (6)	1.14
Year of training			
Foundation training Year 1	1 (1)	0 (0)	0
Foundation training Year 2	16 (24)	11 (13)	0.89
Specialty training Year 1	24 (36)	18 (23)	0.55
Specialty training Year 2	6 (9)	12 (15)	1.17
Specialty training Year 3	4 (7)	16 (20)	1.65
Specialty training Year 4	3 (4)	7 (8)	1
Specialty training Year 5	4 (7)	3 (4)	1
Specialty training Year 6	3 (4)	2 (3)	0.4
Other	3 (4)	8 (10)	2.55
Unspecified	3 (4)	3 (4)	0.67
Total	67	80	1.03

Table 2. Variables associated with reporting of the most recent needlestick injury

Variable	Trainee doctors surveyed *n* (%)		Odds ratio (95% CI)
	Did not report injury	Reported injury	
Gender			
Male	14 (47)	21 (42)	0.90 (0.35–2.28)
Female	15 (50)	25 (50)	1.11 (0.44–2.82)
Unspecified	1 (3)	4 (8)	
Responsible person			
Self-inflicted (accidental)	13 (43)	33 (66)	0.63 (0.15–2.62)
Someone else	3 (10)	12 (24)	1.58 (0.38–6.51)
Unspecified	14 (47)	5 (10)	
Involvement of a high-risk patient			
True	1 (3)	7 (14)	3.17 (0.36–27.6)
False	19 (63)	42 (84)	0.32 (0.04–2.75)
Unspecified	10 (33)	1 (2)	—
Location of injury			
At the bedside	8 (27)	22 (44)	2.16 (0.81–5.78)
In the operating room	6 (20)	12 (24)	1.26 (0.42–3.81)
Other	16 (53)	16 (32)	0.41 (0.16–1.05)
Time of the injury			
Office hours (8:30–17:00)	13 (43)	25 (50)	0.67 (0.23–1.91)
Out of office hours	8 (27)	23 (46)	1.50 (0.52–4.26)
Unspecified	9 (30)	2 (4)	—
Instrument type			
Solid-bore needle	6 (20)	13 (26)	1.41 (0.47–4.20)
Hollow-bore needle	7 (23)	26 (52)	3.56 (1.29–9.79)
Other	17 (57)	11 (22)	0.22 (0.08–0.58)
Task performed during injury			
Suturing	5 (17)	13 (26)	1.59 (0.50–4.98)
Recapping needle	4 (13)	7 (14)	0.97 (0.26–3.62)
Cleaning up	5 (17)	7 (14)	0.74 (0.21–2.59)
Passing needle	2 (7)	7 (14)	2.09 (0.40–10.8)
Loading needle	1 (3)	0 (0)	—
Other	13 (43)	16 (32)	0.62 (0.24–1.57)
Total	30	50	—

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Table 3. Variables associated with PTSD after needlestick injury

Variable	Trainee doctors surveyed n (%)		Odds ratio (95% CI)
	PTSD −	PTSD +	
Gender			
Male	29 (43)	4 (44)	1.24 (0.29–5.40)
Female	36 (53)	4 (44)	0.81 (0.19–3.50)
Unspecified	3 (4)	1 (12)	—
Responsible person			
Self-inflicted (accidental)	43 (63)	2 (22)	0.12 (0.02–0.73)
Someone else	10 (15)	4 (44)	8.6 (1.38–53.7)
Unspecified	15 (22)	3 (33)	—
Involvement of a high-risk patient			
True	60 (88)	8 (89)	0.93 (0.10–8.61)
False	7 (10)	1 (11)	1.07 (0.12–9.88)
Unspecified	1 (2)	0 (0)	—
Location of injury			
At the bedside	28 (41)	2 (22)	0.41 (0.08–2.11)
In the operating room	15 (22)	1 (11)	0.44 (0.05–3.82)
Other	25 (37)	6 (67)	3.44 (0.79–14.98)
Time of the injury			
Office hours (8:30–17:00)	33 (48)	2 (22)	0.41 (0.07–2.41)
Out of office hours	27 (40)	4 (45)	2.44 (0.42–14. 38)
Unspecified	8 (12)	3 (33)	—
Instrument type			
Solid-bore needle	17 (25)	1 (11)	0.38 (0.04–3.22)
Hollow-bore needle	31 (46)	2 (22)	0.34 (0.07–1.76)
Other	20 (29)	6 (67)	4.8 (1.09–21.10)
Task performed during injury			
Suturing	15 (22)	1 (11)	0.44 (0.05–3.82)
Recapping needle	10 (15)	1 (11)	0.73 (0.08–6.44)
Cleaning up	10 (15)	1 (11)	0.73 (0.08–6.44)
Passing needle	8 (12)	1 (11)	0.94 (0.10–8.51)
Loading needle	1 (1)	0 (0)	—
Other	24 (35)	5 (56)	2.29 (0.56–9.35)
NSI reported			
True	43 (63)	6 (67)	1.16 (0.27–5.06)
False	25 (37)	3 (33)	0.86 (0.20–3.74)
Total	68	9	—

had their most recent NSI in the past 4 weeks, and all of those had a PTSD score under 10 ruling out the misdiagnosis of acute stress reaction for PTSD in accordance with DSM-IV criteria [13]. Considering that the prevalence of PTSD in the general population is 3% [9], the odds ratio of PTSD in doctors who had NSI was 4.28 (95% CI: 2.16–8.47).

Two-thirds of positive cases (IES-6 ≥10) had reported their injury to the occupational health department. NSI caused by 'Someone else' was associated with higher risk of PTSD (IES-6 ≥10) compared with 'Self-inflicted' injuries (odds ratio: 8.6, 95% CI: 1.38–53.7). The difference between these two groups was statistically significant ($P < 0.05$).

The risk of PTSD was not significantly associated with gender, involvement of a high-risk patient, location or time of injury. In addition, neither type of instrument used nor the procedure made a significant difference in PTSD.

Discussion

Our study found that 12% of doctors who had experienced at least one NSI during their training reported symptoms consistent with PTSD. Considering that the prevalence of PTSD in the general population is 3% [9], doctors who had NSI were 4.28 times more likely to report PTSD than those in the general population. We also found that more than half (54%) of doctors in training had received an NSI. NSIs caused by 'someone else' were associated with the highest risk of PTSD (odds ratio 8.6) compared with 'self-inflicted' injuries. This difference needs further exploration in future studies perhaps by structured interviews.

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In this study, almost 40% of NSIs were not reported to an occupational health department with 'Too busy to report', 'Taking too much time to report' and 'Low risk injury on self-risk assessment' as common reasons for not reporting. Non-reporting of injuries is a concern and previous studies have also shown significant underreporting in physicians to levels as high as 80–97% [5]. Strategies to encourage reporting of NSI should be developed, both to enhance opportunities for post-exposure prophylaxis and to identify those at risk of developing PTSD. Standardizing the management of NSIs between occupational health and emergency department (when out of hours) could improve satisfaction, which may lead to more reporting. For those who feel too busy to report or do not perceive a risk, based on self-risk assessment, continued education to emphasize on health risks and importance of early reporting should be considered [14]. Findings of this study in highlighting the psychological impact of NSIs may be used to reinforce the educational message.

Not all participants replied to all the questions. The questions that were most often not answered were 'Which person was responsible for your NSI?' (23%), 'How long did you take to report the injury?' and 'Did the NSI involve a high-risk patient?' (14%). Analysis revealed no statistically significant differences in the prevalence of PTSD between participants who answered these questions and those who left them blank. In some cases, it may be that participants were unsure who has been responsible for the NSI or may have felt it difficult to apportion 'blame'. Similarly, they may have left the question regarding 'high-risk patient' blank either because they did not recall the level of risk or because they took the view that all patients were potentially at high risk.

This study has a number of limitations. Categorizing those having PTSD was based on questionnaire responses, whereas a structured interview is required to confirm the diagnosis of PTSD in individual cases. However, for screening purposes, the IES-R 22-item questionnaire [15], and its abbreviated six-item version have been developed and validated [11]. In addition, the study is based on responses from trainee doctors in a single, large, NHS trust in North East London. It may be that trainees in London or coming to work in this trust are more susceptible to PTSD or NSI, perhaps because of the inherent stresses of working and living in a large city. It would therefore be useful to replicate the study in other environments.

There was a lack of IES-6 responses from the group of trainee doctors who had no history of NSI. As a result, we have not been able to compare other causes of PTSD experienced by doctors (e.g. being a victim of aggressive and abusive behaviour and violence, traumatic life event, etc).

The number of trainees in some groups was small (e.g. only one FY1 trainee participated) because the study was performed during a single induction day in the trust. Future studies could ensure a greater mix of trainees, perhaps by recruiting through postgraduate deaneries or training schools.

This was a retrospective study and relied on the recollection of trainees regarding previous NSIs. It could be argued that doctors with PTSD, anxiety or depression might be more or less likely to recall NSIs and other adverse-life events than those in more robust mental health. Almost all (77/80) doctors who reported at least one NSI completed the IES-6 survey, and there did not appear to be any significant differences between those who did complete and the three doctors who declined.

PTSD represents a significant burden to the individual and society as a whole [16]; however, it remains largely unreported, and sufferers often do not seek help. The condition is fluctuating with recovery in the majority of cases. However, in a small fraction of cases, the condition may become chronic with the possibility of enduring personality change [17]. The cognitive processes used by individuals to interpret traumatic events are important maintaining factors for PTSD among sufferers [18]. The extent to which trainee doctors are particularly susceptible to such mechanisms following NSI require further study. If our current findings are confirmed, ideally with prospective studies using structured interviewing, there may be a case for offering specific psychological support and follow-up of those sustaining a NSI.

Early reporting of NSIs provides the opportunity for post-exposure prophylaxis e.g. for HIV and early diagnosis and treatment. This could also reduce the feeling of threat from infectious diseases such as HIV, which could be a maintaining factor for PTSD as described earlier. Evidence suggests that the risk of sharp injuries could be significantly reduced by using safety-engineered devices [19,20]. Another effective strategy to reduce NSIs is that sharp disposal containers should be available when the sharp items are used, for example, patient bedside [21].

In summary, trainee doctors should be made aware of the need for early reporting of NSIs, the culture of blame for such injuries should be removed from the workplace, and procedures should be in place to screen and support trainees who develop PTSD as a result of such injuries.

Key points

- More than half (54%) of the doctors in training had needlestick injury and almost 40% of injuries were not reported.
- Twelve percent of doctors with experience of needlestick injury had post-traumatic stress reactions that is four times the expected level of post-traumatic stress disorder in the general population.
- Needlestick injuries caused by 'someone else' were associated with almost nine times the risk of post-traumatic stress reactions compared with 'self-inflicted' injuries.

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Conflicts of interest

None declared.

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