Universal precaution compliance by orthopaedic trauma team members in a major trauma resuscitation scenario

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ABSTRACT

INTRODUCTION We determined the compliance rates of orthopaedic trauma team members in applying universal precautions in major trauma resuscitation scenarios and the availability of universal precautions in accident and emergency (A&E) departments throughout England.

MATERIALS AND METHODS A national telephone survey was implemented contacting the first on-call orthopaedic surgeon and A&E departments in hospital trusts accepting major trauma throughout England. A questionnaire was employed to ascertain current practice, experience and availability of universal precautions when managing a major trauma patient.

RESULTS Overall, 112 first on-call orthopaedic surgeons and 99 A&E departments responded. There was good compliance for using gloves (99%) and aprons (86%). There was poor compliance in using eye protectors (21%), face masks (18%), shoe covers (4%) and head caps (4%). Trainees applied universal precautions according to the level of risk they subjectively perceived. All A&E departments had gloves and aprons but the availability of the other universal precautions was less. Of trainees, 76 reported that all universal precautions were not readily available in the A&E department.

CONCLUSION Orthopaedic trauma team members are very compliant in using gloves and aprons, but should be more compliant in using eye protectors. It is questionable whether face masks, head caps and shoe covers need to be used in all trauma scenarios. In general, universal precautions should be more available in the A&E departments. There should be better communication between A&E departments and the trauma team regarding the availability of universal precautions.

KEYWORDS

Orthopaedic trainees – Universal precautions – Blood-borne infections – Trauma scenario – ATLS®

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Orthopaedic surgeons are exposed to major trauma as part of their work. It is often the role of an orthopaedic trainee initially to manage a multiply injured trauma patient as part of a hospital trauma team. Managing a multiply injured trauma patient exposes the attending trauma team to risk of exposure to blood-borne infections, such as the human immunodeficiency virus (HIV) and hepatitis B and C, through open fractures, lacerations or wounds. The risk of seroconversion of HIV, hepatitis B and C through a needle-stick injury or mucocutaneous contact are about 1:300, 1:30 and 1:10, respectively, depending on the route of exposure.^{1,2} Though these risks are small, medical staff who become infected through contamination may suffer life- or career-threatening consequences. The UK Department of Health has issued guidelines on their website (<www.doh.gov.uk>) for protection

against blood-borne infections. We are unable to find evidence in the medical literature to show which hospitals have implemented these guidelines.

Orthopaedic trainees are recommended to attend the Advance Trauma Life Support® course (ATLS®). The ATLS® course is an international course and one of the main objective of the course is to resuscitate the multiply injured trauma patient. It would be reasonable to presume that those who have attended the ATLS® course are more proficient and confident in managing the multiply injured trauma patient. The ATLS® course recommends the use of universal precautions by medical and nursing staff who come into contact with the multiply injured trauma patient to prevent transmission of blood-borne infections from patient to health-care worker. The universal precautions recommended by the

ATLS® course are: gloves, fluid impervious aprons, eye protection, shoe covers, face masks and head caps.³ Quite often the advice from the ATLS® course may be the only formal instruction that the orthopaedic trainee receives. In many English hospitals, the hospital trauma team comprises of an anaesthetic trainee, operating theatre assistant, general surgical trainee, orthopaedic trainee, accident and emergency (A&E) doctor and nurse. There appears to be a variation in the compliance rate of universal precautions by different healthcare workers of the trauma team.^{4,5} These studies have been conducted in trauma centres in US and have not included the specific compliance rates of universal precautions by orthopaedic surgeons.

The authors of this paper, both orthopaedic surgeons, have noticed that although the resuscitation of a multiply injured patient is performed well, the use of universal precautions by orthopaedic trainees is patchy. There is no study in the current medical literature regarding the application of universal precautions by orthopaedic trainees or the availability of universal precautions equipment in A&E departments in hospitals throughout England. The aim of this study is to assess the use of universal precautions by orthopaedic members of the trauma team when managing a major trauma resuscitation scenario. It also assesses the availability of universal precautions in the units in which they work.

Materials and Methods

We contacted all 164 hospital trusts that accept major trauma patients in England as listed on the UK Department of Health website (<www.doh.gov.uk>) by telephone between January and May 2003. The first on-call orthopaedic surgeon at each hospital was contacted and an explanation was provided of the study and an invitation to participate. The trainee was asked a series of questions regarding current practice and use of universal precautions in a major trauma resuscitation scenario and problems encountered with universal precautions in the A&E department resuscitation room (Appendix 1). A major trauma resuscitation scenario was defined as when the orthopaedic trainee was called to attend a multiply injured patient in the A&E department as part of a hospital trauma team. The practical experience of the on-call orthopaedic trainee and their exposure to universal precautions guidelines varies widely between hospitals. To allow uniformity of the results we set strict exclusion criteria. We excluded from this study all on-call orthopaedic trainees who: (i) had not attended an ATLS® course; (ii) were locum doctors; and (iii) had worked in orthopaedics less than 6 months.

The same hospital A&E department from which the orthopaedic trainee responded was contacted within 48 h. The A&E sister or charge nurse who had good knowledge of

Table 1 The percentage of first on-call orthopaedic surgeons routinely using universal precautions in a major trauma scenario

Universal precaution	Percentage
Gloves	99
Aprons	86
Shoe covers	4
Eye protectors	21
Face masks	18
Head caps	4

the universal precautions in the A&E department was informed of the study and invited to participate. A series of questions were asked regarding the availability of universal precautions equipment in the A&E department to all members of the hospital trauma team (Appendix 1). A maximum of two attempts were made to contact trainees and A&E staff.

Results

Out of the 164 hospital trusts in England, 112 first on-call orthopaedic surgeons were available to participate in this study. Of these, 101 trainees were senior house officers (SHOs), 8 were trust-grade doctors and 3 were specialist registrars in orthopaedic surgery. There were 104 male and 8 female doctors. The level of postgraduate surgical experience at SHO level and above, was 1–9 years (mean, 2.87 years). All respondents had attended an ATLS® course. Of the trainees, 92% were part of the hospital trauma team; the other 8% were expected to assess the multiply injured patient in the emergency resuscitation room if required.

Only 35% of trainees had been formally taught or advised, whilst in their current training post, on the use of

Table 2 Why orthopaedic trainees did not use all the universal precautions in a major trauma scenario?

Reason	Percentage
Not available	76
Not necessary	15
No time	26
Nobody uses	5
Not told	2
Others	2

Table 3 The percentage of orthopaedic trainees would take extra universal precautions if the major trauma patient was known to have HIV, hepatitis B or hepatitis C

Extra universal precautions	Percentage
Gloves	1
Aprons	9
Shoe covers	3
Eye protectors	42
Face masks	31
Head caps	4
Double glove	30

universal precautions whilst attending a major trauma scenario. Of all the trainees, 55% stated that they had a high concern regarding the transmission of blood-borne infection during the management of a major trauma patient, 19% had moderate concern and 26% had low concern. Only 44% of those surveyed had knowledge of the seroconversion rates when exposed to either HIV or hepatitis B and C by needle-stick or mucocutaneous exposure. Of trainees, 74% said that the ATLS® course was useful in emphasising universal precautions' application in a trauma scenario.

Table 1 shows the percentage of trainees that routinely used each of the universal precautions in a major trauma scenario in their respective A&E department. Table 2 shows the reasons why universal precautions were not used when attending a major trauma scenario in their A&E department. Trainees were allowed to give more than one reason. Table 3 shows the percentage of trainees that would take extra precautions if they knew the injured patient had a blood-borne disease such as HIV, hepatitis B or hepatitis C. Table 4 shows the availability of universal precautions

Table 4 Percentage of A&E departments with each of the universal precautions equipment available to all trauma team members

Universal precaution	Percentage
Gloves	100
Aprons	100
Shoe covers	23
Eye protectors	94
Face masks	81
Head caps	27

equipment in the A&E department to all members of the hospital trauma team in a major trauma scenario. The sister or charge nurse in 99 out of the 112 A&E departments contacted were available to participate in the study.

Discussion

The incidence of HIV and hepatitis B has been shown to be higher in patients admitted with major trauma.⁶⁻⁸ The true incidence of needle-stick, percutaneous or mucocutaneous contact exposure to body fluids during a major trauma scenario is not known. This is due to an under-reporting of such injuries and exposure.^{9,10} Surgeons in various surgical specialties have reported direct blood contact during operative procedures and is shown to be between 17–48%.¹¹ Although there is no evidence to show that universal precautions reduces the seroconversion rate when exposed to blood-borne infections, universal precautions do reduce direct contact to body fluids.^{12,15} The principles of using universal precautions in a major trauma scenario are to reduce the amount of body fluids to which healthcare workers are exposed. The risks of acquiring a blood-borne infection are determined by several factors, such as the type of body fluid, route of exposure, amount of fluid exposed to, length of exposure and treatment following exposure.¹ Healthcare workers have acquired blood-borne infections through needle-stick, mucocutaneous and direct epidermal exposure particularly when there has been a disruption in the epithelium, though the latter two routes are extremely rare.^{1,14,15}

It is clear that there is variable compliance amongst orthopaedic trainees in applying universal precautions, despite 74% having moderate-to-high concern regarding the transmission of blood-borne infections from patients to themselves. Trainees overall had very good compliance in using gloves and aprons. This is most likely because the hands and torso are parts of the body which are most exposed to body fluids; but there was less compliance in using the other universal precautions. There appears to be several reasons why other universal precautions were not used. Of the trainees, 76 reported that universal precautions equipment (apart from gloves and aprons) were not readily available. There may be poor communication between A&E departments and members of the trauma team. Our study shows that all A&E departments had gloves and aprons and more than 80% had eye protectors and face masks available for all members of the attending trauma team. This theory is supported by the fact that only 35% of orthopaedic trainees have received formal training regarding universal precautions in their current post, excluding that from the ATLS® course. Twenty-six trainees reported that they had no time to apply universal precautions prior to managing the trauma patient. This may not be a valid reason as

Madan *et al.*⁵ have shown that despite adequate time to wear universal precautions, compliance rate was still poor. Fifteen trainees tried to justify that universal precautions were not needed. Five trainees actually reported that 'nobody else uses universal precautions'; these reasons were not investigated further. We recommend that there should be better communication regarding the availability of universal precautions equipment to the attending trauma team. It is unclear how best to achieve this. Several methods have been reported including video-taping trauma management scenarios, which have been shown to increase universal precautions compliance rates significantly.^{4,16} The best method seems to be the setting of rigid protocols.⁵

Universal precautions' compliance to prevent the transmission of blood-borne infection through mucocutaneous contact such as the eyes and mouth was poor. Only 21% of trainees wore eye protectors and 18% wore face masks when attending a major trauma scenario. The transmission of blood-borne infection through the mucocutaneous surface of the eyes has been reported, though it is rare.¹⁷ Of trainees, 17% did not wear eye protectors as they wore prescription glasses, although none of these trainees said that prescription glasses were a suitable alternative to formal eye protection. Of orthopaedic trainees in this study, 42% would use eye protectors, 31% would use face masks and 30% trainees would double glove if it was known that the trauma patient was a carrier of HIV, hepatitis B or hepatitis C. These results suggest that trainees assess the risk of exposure to blood-borne infections and use universal precautions according to the level of risk they perceive with a particular patient. The presence of visible blood in trauma resuscitation has been shown to increase the compliance of universal precautions.^{4,5} Less than 33% of trauma patients infected with HIV had been correctly identified during a trauma resuscitation; hence, trainees' own attempts at identifying high-risk patients are unreliable.¹⁸ Trainees, in general, are exposing themselves to blood-borne infections by inadequate protection of their mucocutaneous surfaces especially their eyes. Near eye splashes in a trauma or surgical environment are not that uncommon, particularly when there is a considerable amount of blood around.^{19,20} It is debatable whether face-masks are absolutely necessary as a Medline search revealed that infection by contact through the mucocutaneous surface of the mouth is extremely rare.¹⁵

The use of head caps and shoe covers were given low priority. Less than 27% of A&E departments have them both and none of the trainees used them. The 4% who used shoe covers and head caps explained that they were theatre clothing which they wore on duty and were not obtained from the A&E department. Head caps and shoe covers may be perceived as unnecessary or time consuming to wear. This may be justifiable as we were unable to find any

reports where, following a thorough Medline search, medical personnel have been infected with a blood-borne disease through direct contact via the scalp or the feet. Traditionally, head caps and shoe covers have been used in a surgical environment, as good surgical practice, to keep medical personnel clean, rather than to prevent the transmission of infection. The transmission of blood-borne infections through skin around the feet and scalp may not appear a likely route by trainees or A&E departments. Although this route of transmission may be extremely rare, it has been reported that healthcare workers have been infected by epidermal contact of body fluids alone.^{14,15} This risk is significantly increased if there has been a disruption in the epithelium of the skin.^{1,15} Therefore, head caps and shoe covers may be strongly advisable to trainees whose scalps are significantly exposed or to ladies whose feet are exposed. This is particularly important for those with an underlying skin condition of the scalp or feet where the epithelium is disrupted, for instance in psoriasis or eczema.

One limitation of this study is that there are no available data listing all orthopaedic trainees who have undertaken the ATLS® course or who have had at least 6 months of orthopaedic experience in English hospitals. We used a telephone questionnaire to obtain a random sample of orthopaedic trainees. Telephone questionnaires are a recognised method for surveying a target group with a good response rate.²¹ Of orthopaedic trainees from 164 hospitals in England, 68% responded to this survey and 88% of the 112 A&E departments responded. The majority of trainees in this survey are SHOs in posts of 6-months' duration and are likely to rotate into another orthopaedic post or some other surgical specialty as part of their basic surgical training. We suspect that similar results from this study would be obtained if this study was applied to another trauma team specialty. This study relied on the current practices of present orthopaedic trainees. Evidence exists that trainees may overestimate their practices of applying universal precautions in a major trauma scenario.¹⁸ In this study, we had excluded locum doctors, doctors who had not done an ATLS® course and doctors who have worked in orthopaedics for less than 6 months. This was to determine how well trainees, who have received some formal knowledge of universal precautions, were actually compliant. The doctors in the excluded groups are probably at most risk in not using universal precautions. If we had not excluded any trainees at all from this study, then the results may show less compliance in the use of gloves, aprons, eye protectors and face masks.

All categories of hospitals were surveyed from district general to university teaching hospitals. English hospitals vary on the number of major trauma patients they receive. This study did not attempt to differentiate between the different types of hospitals because the principles of universal precautions should apply to all patients irrespective of hospital size.

Conclusions

Of orthopaedic trainees, 74% have a high or moderate concern regarding the transmission of blood-borne infections during a trauma scenario. The use of gloves and aprons in major trauma resuscitation scenarios is excellent, though the use of eye protectors and face masks to prevent the transmission of blood-borne infection through a mucocutaneous route is poor. Orthopaedic trainees need instructions regarding universal precautions especially for eye protectors and the availability in the A&E departments should be known. All trainees should be encouraged to use universal precautions particularly gloves, aprons and eye protection when attending trauma scenarios so that risk of exposure to blood borne infections is decreased. The use of face masks, head caps and shoe covers in all trauma scenarios is questionable as there is little evidence that they significantly reduce the contact of body fluids to these parts of the body.

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Appendix 1

QUESTIONNAIRE

1. Grade ----- 2. Sex ----- 3. Years at SHO level or above -----
4. Are you part of the hospital trauma team? Y/N
5. Have you been formally taught or been advised in your current post regarding using universal precautions in a major trauma scenario? Y/N
6. How concerned are you regarding the transmission of blood borne diseases from patient to yourself when managing a major trauma patient? High Moderate Low
7. Do you know what the seroconversion rate of blood-borne diseases such as HIV, Hepatitis B or C
1:300 1:30 1:10
8. Which of the following universal precautions do you routinely use during a major trauma resuscitation scenario?
Gloves Aprons Shoe covers Eye protectors Face masks Head caps
9. Of the universal precautions that you do not use, why do you not use them? -----

10. If the trauma patient was known to be infected with HIV, hepatitis B or C, what additional precautions would you take?
Gloves Aprons Shoe covers Eye protectors Face masks Head caps
Others -----
11. Has the ATLS® course been useful regarding applying universal precautions in a major trauma resuscitation scenario? Y/N

Questions to A&E sister/charge nurse in charge at the same hospital

12. Which of the following universal precautions are routinely available to ALL members of the hospital trauma team in a major trauma resuscitation scenario?
Gloves Aprons Shoe covers Eye protectors Face masks Head caps