Investigation of eye splash and needlestick incidents from an HIV-positive donor on an intensive care unit using root cause analysis

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Background Two doctors working on a busy intensive care unit sustained injuries whilst removing a chest drain from an HIV-positive patient. One doctor had a needlestick injury into his finger whilst the other sustained an eyesplash when the chest drain was pulled out.

Methods Following Department of Health format ‘Doing less harm’, a root cause and human factor analysis of the incident was carried out. The aim was to explore the underlying issues.

Results and conclusions Training, cultural and organizational issues were exposed, and are now being addressed. This approach has led to a far more effective dialogue with the National Health Trust concerned than was previously experienced, and there is early evidence of progress on important aspects of health and safety management at organizational level. Lack of health and safety training of doctors at undergraduate and postgraduate level needs to be addressed.

Key words Accident investigation; eye splash; HIV; human factors; intensive care; needlestick; occupational injury; root cause analysis.

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standing as possible of the underlying causes of the incident. It has long been understood that workplace safety behaviour is the result of different influences within an organization [3], and so the context of the work, the doctors' training arrangements and working practices, and the culture in that workplace were specifically examined.

**Investigation approach**

Appropriate policies regarding health and safety as well as protection against blood-borne viruses were present at the Trust level. Written guidance on safety procedures was also available. The initial report indicated that there was discretionary use of eyewear. It was accepted that constant use of eyewear for clinicians in intensive care is neither practicable nor necessary. Protection against exposure to blood-borne viruses therefore relies on the use of eyewear in specific circumstances. The decision whether or not to wear eyewear is delegated to the individual doctor. This decision would be reliant on the risk perception of the individual doctor, which in turn would be affected by a
number of factors. These factors could include any training the doctors received, together with workplace reinforcement by colleagues and supervisors of safe systems of work. Two perspectives were applied to this decision-making process by the doctor [4].

First, human factors analysis divides failures into two groups: (i) error and (ii) deliberate action of the individual (Figure 1). In this case, it was clear that there was a deliberate decision not to use personal protective equipment (PPE) in the form of eye protection. On further interview, it became clear that the use of eyewear was routinely ignored, based on the belief that no significant risk factor applied. The second method of analysis was to work back to the underlying causes by laying out diagrammatically a chain of causes leading to the event. The HSE has identified that the general safety behaviour of colleagues and supervisors can be a significant underlying cause of incidents [5]. The aim of causal chain analysis (Figure 2) was to identify immediate causes and underlying causes. The underlying causes can then be subdivided into general and management causes of failure to use eye protection.

Analysis of immediate causes

The doctors were interviewed about their health and safety training. At undergraduate level, they felt that any advice about splash protection and personal safety training was obscure and not emphasized. They recalled being given warnings and advice regarding prevention of needlesticks and eye splashes by a senior doctor when they were inducted into the employing Trust. The personal presentation was recalled, though they did not refer to written materials that were also provided.

Within a crowded corporate induction programme, there is reliance upon some safety information delivered locally. Both doctors had 'a guided tour' of the clinical area, but by a non-clinical staff member, so personal safety precautions were not discussed. This briefing also omitted information about local availability of written or computer-based policies and procedures, such as infection control. In contrast, nursing colleagues working in the same area received a longer briefing from their nurse manager and completed a mandatory induction checklist. These checklists confirmed that information on management responsibilities, location of safety equipment, and other important clinical and safety information was given. Interview highlighted that where a medical speciality team has patients on different wards, there may be no local unit briefing for those doctors. The doctors referred to 'on-the-job training' as an important method of learning. They observe procedures before practising. The doctor who showed them how to remove chest drains had not worn eye protection. They were asked whether they had heard of any similar incidents and confirmed that they had not. Direct local learning from reported safety incidents of any kind appeared to be uncommon. Sharing incidents informally was not encouraged and doctors perceived stigmatization if they did.

The next area of attention was the nature of the supervision. The junior doctor’s line of supervision for safety purposes appeared confusing. It was unclear to all where the doctors were based with regard to the health and safety management structure, and whether the doctors involved in the incident were counted in the ICU safety management returns. The doctor’s appraisals were carried out by the consultant but concentrated on academic assessment. Supervision lacked a personal safety orientation. The investigators reviewed knowledge of and access to the written safety procedures. It was accepted that, by the nature of ICU doctors’ work, few daily tasks involved even momentary referral to written procedures, even though these were available. The doctors appeared unaware of the infection control policies and the module that was available throughout the Trust intranet system. There was information available on the use of gloves and eye protection within the ICU. The ICU also provided written posters, guidance policies on the unit and access to eye protection. It was specifically noted that ICU safety arrangements were generally clearly written in terms of both policy and protocol. There was a blood-borne virus checklist, which was reviewed regularly by unit managers. The checklist had sections on risk assessment, information to staff, provision of equipment and facilities, periodic recorded checks on staff practice, and follow-up of each incident. Any negative answer to that management checklist developed an action plan. The provision and maintenance of PPE were specifically allocated to an ICU technician as a lead responsibility, and as a result a wide range of protective equipment was readily available and properly maintained.

Analysis of underlying causes

The investigators went on to consider underlying causes. General causes were considered first. The investigators found very little consideration of personal safety by the doctors. This appeared to reflect a wider medical culture in which health and safety has a low priority in training [6], with the patient’s safety coming first. The doctors reported that not only did they not routinely wear eye protection, but neither did their medical colleagues. This was noted to be in direct contrast to the nurses, who were trained and inducted as a separate professional group and who did wear eye protection in similar circumstances. The investigators noted that role-model doctors were apparently not using health and safety equipment when teaching. This would potentially reinforce non-compliance and weaken attempts to persuade more junior medical staff to adopt good safety practice.
The investigators then moved into examining possible management causes using the National Patient Safety Agency hierarchy of cause categories [7]. Institutional influences were considered first. The investigators noted that, in some organizations, senior managers have safety objectives as part of their appraisal process. It was noted that the NHS consultant’s appraisal handbook that was implemented in that Trust made little or no reference to personal safety and related health and safety issues. It was noted that doctors’ training is managed separately from that of other staff, and frequently involves rotation through different work areas. Doctors in training were unclear as to who their line manager was, as opposed to the consultant as academic supervisor. Therefore, the individual roles and responsibilities for the health and safety of medical staff were also unclear in practice. As a result, in contrast to the hierarchical nursing structure, direction to health and safety compliance and appropriate training was absent or reduced.

Although infection control policies identifying the range of risks and precautions necessary for safe practice were present, the lack of examples of specific at-risk clinical procedures requiring goggles was considered an underlying factor in this case. The doctors were unclear when they had to wear goggles, but the clear perception was that their department compared no less favourably than other departments in the hospital, or other hospitals they had worked in. Supervision and learning by example were also identified as possible underlying causes, as discussed earlier. It was interesting to note that although eye protection was not used, protective gloves and aprons were used when they removed the chest drain ‘because they knew the patient was HIV positive’. This reasoning is contrary to infection control policy, as well as Department of Health guidelines, in that precautions should be used universally [8].

Discussion

The Trust in question has an annual incidence of 1000 needlestick injuries and eye splash incidents per annum reported on its staff survey. Approximately 200 of these report to the occupational health department per year. The background rate of HIV infection in the population that the hospital serves is unknown, but is likely to be higher in London than in many other parts of the UK. Of more concern is the unknown background prevalence of more infective agents, such as hepatitis viruses. Using this approach has enabled the occupational health and safety department to progress preventative strategies within the Trust in a way that the initial factual report did not facilitate. In particular, the local consultants identified that there were opportunities for improved safety training and they were developing these as a result of this investigation.

The investigators believe that there are wider implications relating to the safety culture of doctors and that its basis in undergraduate and postgraduate teaching warrants further attention. The investigators understand that various bodies, including the Health Services Advisory Committee to the Health and Safety Commission [9], have attempted to encourage the further training and engagement of doctors in health and safety. Training modules for students have been developed to persuade trainee doctors to think and act more proactively in considering their own and others’ safety [10], but these appear not to be widely implemented yet. The General Medical Council has a role to play, and this is being developed with ‘tomorrow’s doctors’, though they may be in a position to do more [11]. The investigators would be keen to hear from other occupational health and safety departments that have performed similar analysis to see whether their incident findings were similar, and to see whether other Trusts have found this approach as useful.

References