

# Facial Protection in Renal Dialysis Units: A Literature Review

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## Abstract

**Aim** The aim of this paper is to raise awareness and critically evaluate the need for greater facial barrier protection, in order to reduce the frequency of mucocutaneous exposure for health care workers in renal dialysis units (RDU).

**Method** A literature review of published literature related to the use and application of standard precautions was conducted, focusing on facial barrier protection for health care workers (HCW) in various health care settings.

**Findings** Despite renal dialysis nurses having considerable risk of permucosal (splash) contamination the overwhelming literature discusses this exposure in a variety of other health care settings. HCW level of compliance to standard precautions, particularly the use of personal protective equipment (PPE) requires significant improvement. There is an urgent need for PPE to be more suitable and easily accessible to the HCW in order to prevent interference with patient procedures, and promote compliance of standard precautions.

**Conclusion** The literature confirms that HCW in RDU are at risk of exposure to blood borne infections. HCW rarely fully implement and comply with standard precautions in regards to application of PPE in various health care settings however further research is required to determine compliance in renal dialysis units. Facial barrier protection requires significant and urgent redesign in suitability, safety and accessibility in order for HCW to fully embrace its use.

## Introduction

Transmission of communicable diseases such as Hepatitis B Virus, Hepatitis C Virus and Human Immunodeficiency Virus (HIV) is a major occupational health and safety concern for health care workers (HCW). While the need to decrease percutaneous exposure has been of significant importance, there is a risk of transmitting blood borne diseases through permucosal (splash) exposure (Gilmore, 2001). Exposure may occur from a direct source such as blood management in

renal dialysis units. Similarly exposure occurs in cases where HCW have not utilised adequate facial protection in order to decrease their risk of occupational exposure (Gilmore, 2001).

## Methods

A database search of Blackwell, Cinahl, and Medline was conducted using renal, dialysis, occupational exposure, mucocutaneous, permucosal and personal protective clothing as keywords. Relevance to the issues related to

## Key Words

renal, dialysis, occupational exposure, mucocutaneous, permucosal, personal protective equipment

personal protective equipment and HCW exposure was considered when including the articles. This included non renal dialysis literature that was considered applicable to the renal dialysis setting. All articles in full text and English language were reviewed. Articles were accepted from 1990 through to 2005.

## Discussion

### Risk

Gilmore (2001) proposes that as the frequency of percutaneous injuries decreases the percentage of employee permucosal exposure may increase. Cutter and Jordan (2003) cite the 1998 United Kingdom Health Department who reported the risk of contracting HIV following percutaneous exposure is approximately 0.3%. Mucocutaneous exposure has a much lower risk of approximately 0.03%, however as this type of exposure is more common than percutaneous, the cumulative effect could result in a higher risk. The Center for Disease Control (CDC, 2001) reported 49 HCW having seroconverted to HIV after occupational exposure, of which 6 were non-percutaneous (Wong, Jones, and Lange, 1998). While the literature describes the occurrence and risks of permucosal exposure in various

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health care settings, there has been very little research and investigation in haemodialysis. Gilmore (2001) describes permucosal exposure occurring from a direct source such as blood management in renal dialysis.

Braethen et. al., cited by Wong, Jones and Lange (1998) raised the issue of effective barrier systems by suggesting that Langerhan's cells are present in intact skin and that it is no longer valid to assume that HIV infections occur exclusively through percutaneous or mucous membranes. Marasco and Woods (1998) studied the risk of eye splash injuries due to concern about the transmission of infectious diseases through eye splash injuries during surgery. The study reported that of the 160 face shields used in surgery, 44% tested positive for blood, with the surgeon being aware of contamination in only 8% of cases. The first assistant's shield was splashed in 41% of cases and the second assistant's shield in 19%. Shield splashes were identified in minor surgery such as inguinal hernia repairs and minor breast surgery, as well as laproscopy and laparotomy surgery.

Ippolito, et. al. (1998) reported on a HCW working in a laboratory who sustained a conjunctival blood splash of approximately 0.5mls, without blood contact with the HCW mouth or any skin lesions. The HCW had no known risk factors for HIV or Hepatitis. Despite instigating immediate and post exposure strategies, the HCW developed HIV and Hepatitis C infections.

### Rates of Contamination

Kouri and Ernest (1993) determined the rate of contamination of obstetricians' face shields during vaginal delivery at 32% and caesarian section deliveries at 50%. Furthermore, 50% of contaminations were undetected by the obstetrician at the time of vaginal delivery and 92% at the time of caesarian section (Kouri and Ernest, 1993).

Knight and Bodsworth (1998) investigated the perceptions and practice of standard precautions by registered nurses at a major Sydney teaching hospital. Their study population did not involve dialysis nurses but included registered nurses in the high dependency unit (HDU), medical and surgical wards, outpatients, operating theatres, and cardiothoracic wards. Of these nurses, mucocutaneous exposures were significantly more common (1756 per 100 nurse years) than percutaneous (65 per 100 nurse years) ( $p < 0.1$ ). Mucocutaneous exposure were most frequent in nurses in operating theatres (95%) and HDU's (77%), indicating that work areas which have a high frequency of blood and body fluid exposure provide the highest risk for occupational exposure for nurses.

A study by Brearley and Buist cited by Marasco and Woods (1998) looked at blood splashes to spectacles and demonstrated splashes on the inside of glasses. They suggested that spectacles do not provide adequate protection for eye splashes. Furthermore, splashes of blood to the face increase the risk of transmission of blood borne diseases especially if there are open sores on the face.

### Compliance to Standard Precautions

Standard precautions require all HCW to treat blood and body fluid as potentially infectious. The CDC describes precautions as appropriate barrier protection such as gloves, aprons, eye protection, and masks (CDC, 2001). The author considers the use of PPE an important safety precaution in all renal dialysis units. According to the CDC, application of standard precautions require that "a mask and eye protection should be worn during procedures that may generate splash or splatter" (West and Cohen, 1997 p. ).

Lymer, Richt and Isaksson (2003) have conducted a number of studies investigating blood exposure incidents

of HCW in Sweden. One qualitative study investigated HCW action strategies in situations involving a risk of blood exposure. The sample included nurses and nursing assistants working in emergency, medical outpatients clinics, medical and surgical wards, orthopaedics and gynaecology. Again renal dialysis nurses were not represented. This study investigated why formal recommendations and protective measures were not followed. In spite of education, compliance with recommendations was shown to be poor. One conclusion was that the majority of HCW do not respect the risks (Lymer, Richt and Isaksson, 2003). It is the author's view that splash exposure occurs in haemodialysis units, as standard precautions are not embraced.

A study by Madan, et.al. (2002) looked at compliance rates and reasons for noncompliance in trauma rooms. Within this study group 93% of HCW reported at least one exposure to blood or body fluids. The usage rate of eyewear (no side protectors) was 47%, eyewear with side protectors 16% and masks only 4%. The study identified the main reasons for not wearing facial protection were "masks fog up glasses, don't need a mask because keep mouth shut, time factors, too cumbersome, and claustrophobic" (Madan et. al., 2002). Indeed fogging and claustrophobia were reasons given recently by nurses working with the author, as justification for not wanting to wear face shields.

An audit by Jimenez, Sanchaz-Paya, Gonzales, Rivera, and Antolin (1999) investigated the degree of compliance of standard precautions by HCW in one haemodialysis unit. The study was limited to investigating the use of gloves and handwashing. They concluded that the staff did not adhere to standard precautions in real life, with gloves being used in only 67% of patient care situations, demonstrating a high degree of non-compliance.

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This literature review has identified a lack of research in the renal dialysis arena related to mucocutaneous exposure, despite direct source exposure likely to occur during patient procedures.

### Personal Protective Equipment

The use of appropriate protective equipment is a major component of standard precautions and is an important safety precaution. Many barrier devices currently available are inadequate. Gilmore (2001) advises optimal protection with form fitting face shields. Osterman (1995) suggests that there is an urgent need for facial protection that doesn't fog up or interfere with the HCW ability to perform their procedures. Availability of PPE is of significant importance for adherence to standard precautions. Availability not only includes the amount of accessible equipment but also the placing of that equipment (Lymer, Richt, and Isaksson, 2004).

It is the author's experience that within Queensland, most dialysis nurses use protective eyewear when performing patient related procedures however the level of compliance in the use of face masks is poor. Eyewear alone does not fully and effectively protect dialysis nurses from mucocutaneous exposure. Similarly the author reports that the rate of application of face shields in renal dialysis units in Queensland varies from unit to unit and depends on nurses' preference, but overall the level of use is poor.

In our current practice we recognize that nurses routinely, ritually, and without objection put on aprons to cover their clothing but frequently neglect to provide adequate barrier protection for face, nose and mouth. The author proposes that the face of a dialysis nurse is usually in closer proximity to the procedure they are performing especially cannulation, and therefore should be of greatest priority for barrier protection.

### Cost of Personal Protective Equipment

Kouri and Ernest (1993) describe the total annual cost for compliance to protection provisions recommended by the Occupational Safety and Health Administration in the USA in 1991 amounted to \$813 million. PPE accounted for \$327 million, training \$134 million, and disposal of equipment \$102 million. No Australian comparisons could be found in the literature. They argue that if we critically evaluate this, it may be more appropriate to use these monies towards the development of a vaccine against HIV. Gilmore (2001) argues that the costs of managing percutaneous injuries amount to up to \$1,000 per episode with additional costs if HIV or Hepatitis is transmitted. While PPE is costly upfront it improves safety, decreases potential for disease transmission and limits liability (Gilmore, 2001).

### Recommendations

The CDC recommendations for preventing transmission of infections among chronic haemodialysis patients propose that staff should "wear gowns, face shields, eye wear or masks to protect themselves and prevent soiling of clothing when performing procedures during which spurting or splattering of blood might occur" (CDC, 2001). Recommendations by hospitals in Australia are in line with the CDC advising eye protection and a mask be worn during procedures that may generate splash or splatter. Tang and Lai (2005) propose the use of face shields when exposure is anticipated.

The American Nephrology Nurses Association Core Curriculum for Nephrology Nursing recommendations require staff to wear protective eyewear and a mask if there is a possibility of splashes, spray, splatter, or aerosolisation of blood into the eyes, mouth or any mucous membrane (Lancaster, 2001). The Competency Standards for the Australian Advanced Practice Nephrology Nurse (Renal Society

of Australasia, 1999) performance criteria for Standard 17.1 identifies risks to staff safety in regards to needle stick injury, however mucocutaneous exposure is ignored despite evidence showing that percutaneous exposure is more frequent. Evaluation of these recommendations reveals that they are not specific and are open to individual interpretation. Staff are able to select facial protection, which varies in level from eye protection only to full facial shielding. Furthermore, how do we determine what procedures predispose dialysis nurses to splash or splatter? The CDC (2001) suggests procedures include initiation and termination of dialysis, cleaning of dialysers and centrifugation of blood, but does not mention cannulation. It is the author's view that all patient procedures related to cannulation or management of the dialysis machine within a haemodialysis unit places the staff at risk of blood exposure, therefore appropriate PPE should be utilised on all occasions, not merely when exposure is anticipated.

### Recommendations for Practice

It is the author's opinion that to continue current practice is to perpetuate risk. However, changing behaviour is complex. Human beings have a tendency to develop ingrained habits that are difficult to change (Osterman, 1995). A change in focus from merely using eyewear will require a change from routine to achieve the desired outcome of using full facial barrier protection. The author proposes that in order to facilitate change, guidelines for facial protection must be more specific. HCW in renal dialysis and infection control need to evaluate the recommendations for barrier protection and remove any ambiguity related to facial protection. Safer work practices must be encouraged. This requires support for the application of face shields and must be embraced and encouraged globally by senior renal nurses and managers in order to decrease the frequency of HCW mucocutaneous exposure.

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Further innovative strategies to improve design and accommodate easy access to facial shields needs to be identified and implemented in order to make practicality and accessibility more appealing, thus enticing nurses to use them and improve compliance of standard precautions.

Further and ongoing education of HCW in regards to occupational exposure and standard precautions is required to improve and maintain their knowledge. Diekema, Albanese, Schuldt, and Doebbling, (1996) studied medical students and found that those with the best knowledge of standard precautions had less frequency of blood exposure. Their discussion proposed that improved knowledge through training reduced mucous membrane exposure.

### Recommendations for Further Research

There is no guarantee that inferences or findings drawn from other health care areas can be applied or transferred to the renal dialysis setting. Therefore, there is an important need for research into the risk of splash exposure of HCW in renal dialysis units. Identification of compliance of standard precautions in the renal dialysis arena needs to be determined and associated factors that impact on renal dialysis nurses' willingness or ability to comply with standard precautions also requires investigation.

Furthermore there is an obvious and urgent need for innovative research into the application of face shields as a suitable and successful safety strategy in the renal dialysis setting.

### Conclusion

Despite renal dialysis nurses having considerable risk of permucosal contamination, overwhelming the literature discusses this exposure in a variety of other health care settings. HCW rarely fully implement and comply with standard precautions in regards to application of PPE in various health care settings however further research

is required to determine compliance in renal dialysis units. Facial barrier protection requires significant and urgent redesign in suitability, safety and accessibility in order for HCW to fully embrace its use.

Infection control recommendations for haemodialysis units were revised and published as recently as 2001 by the CDC. Recommendations for renal nurses endorse standard precautions, with the use of eye protection and mask (CDC, 2001). It is the author's experience that renal nurses very rarely wear masks. Furthermore face masks are inferior to face shields when considering splash exposure. The author proposes that this CDC recommendation requires amendment, to include face shields in order for renal HCW to have full facial protection during normal working conditions.

Senior renal HCW and infection control staff must also encourage change, and implement and support the use of more effective facial barrier protection in order to reduce the frequency of splash exposure of HCW in this health care specialty. In doing so the dialysis community will move away from risky occupational exposure to becoming important health care leaders of infection control precautions.

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