

Management of Ebola virus disease: is environmental decontamination effective?

Short title: Clinical decontamination of Ebola virus

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To the Editor -

The West African Ebola virus disease (EVD) outbreak was the most extensive and devastating EVD outbreak in history. Effective case management is a key component of EVD control, involving the care of infectious patients in an environment that limits ongoing transmission. We read with interest the recent article by Poliquin *et al.* "Environmental contamination and persistence of Ebola virus RNA in an Ebola Treatment Centre, in Freetown, Sierra Leone"[1], which adds to a small body of literature on Ebola viral contamination of clinical settings where EVD patients were managed. The authors cite a prior study by Bausch *et al.*, conducted in Uganda [2], as the only previous study in this area. However, we are aware of three other studies examining environmental contamination of EVD clinical facilities [3-5]. Given how important this issue is for the safety of health workers and patients, we would like to highlight this other relevant evidence.

We performed an audit of environmental decontamination practice at Connaught Hospital Ebola Holding Unit (EHU), also in Freetown, Sierra Leone, conducted in January 2015 (Youkee *et al.*) [3]. We sampled extensively in a clinical area (EVD Holding Unit Ward-EHU) where EVD patients were managed, collecting 173 swabs for evidence of Ebola virus RNA by RT-PCR analysis, using Σ -Virocult[®] swabs. Sample collection was temporally related to EHU decontamination, following an EVD-positive patient being transferred out to the EVD Treatment Centre (ETU) before admitting a new suspected EVD case. We sampled the clinical environment immediately after the departure of EVD patients from the bedside prior to cleaning, and then at 30 and 60 minutes after routine decontamination with 0.5% chlorine solution according to our protocols, to assess the efficacy of decontamination procedures and the effect of time on Ebola Virus RNA persistence. We repeated the process after a period of refresher training for hygiene staff.

Our results showed Ebola virus RNA contamination of the immediate patient bedside area and of

visibly soiled sites and equipment, prior to decontamination. There was no evidence of contamination of environmental surfaces outside the patient's direct contact area in the ward. We demonstrated that routine decontamination procedures reduced evidence of Ebola virus RNA contamination at 30 minutes and 60 mins post decontamination, in all but a few locations. The patients' bedframe and floor near the bed were areas where routine decontamination did not consistently remove Ebola virus RNA. Similarly, Poliquin *et al.* reported that bedrails, which were not visibly soiled, and concrete floors were areas of Ebola virus RNA persistence [1].

In a further report from Italy, by Puro *et al.*, swabs from the floor under an EVD patient's bed and table were positive for Ebola virus RNA on RT-PCR, following routine cleaning [4]. This was an area that had been heavily contaminated with body fluids. Repeat sampling after more extensive cleaning was negative, and Vero cell culture of the PCR positive sample was negative. A study at Jui-SL China Friendship Hospital, in Sierra Leone, found no evidence of Ebola virus RNA by RT-PCR in swabs taken from the clinical area around a convalescent EVD patient [5].

Together, these data inform the important debate on the potential risk to patients of admission to EVD clinical areas. In many EVD clinical care facilities, patients who had suspected EVD (not confirmed) were managed alongside other suspected and confirmed EVD patients [6]. This was largely unavoidable during the West African EVD outbreak, due to the large number of suspected cases, delayed diagnostic confirmation, and a shortage of ETU beds, but this raised significant concern of nosocomial transmission - that suspected EVD patients who were actually not EVD-infected could be exposed to Ebola virus during their admission [6, 7]. Our EHU, like others, was divided into high and low risk areas, with individual bed spaces. Staff movement was unidirectional from low to high risk areas, with decontamination between individual patient contact episodes. Regular and vigilant personal and environmental decontamination, together with patient supervision to avoid patients physically interacting with each other, were employed to minimise the risk of

nosocomial transmission [6].

Our audit results reassured us that there was a low risk of EVD transmission to patients within that environment from fomites or from contact with clinical staff. We conclude that the floor area and bedrails in the immediate vicinity of a patient's bed require extra attention during cleaning. We await the results of epidemiological studies looking at nosocomial transmission inside Ebola Holding Units, which are also critical to this debate.

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