Managing Patients with Dangerous Infectious Disease: Challenges for Non-Specialist Units Exemplified by the Recent Ebola Viral Haemorrhagic Fever Outbreak

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INTRODUCTION
There is an ever present threat of new or re-emerging transmissible infectious diseases, many of which are lethal or disabling and without suitable medical countermeasures. In recent years there has been the emergence of Severe Acute Respiratory Syndrome (SARS), Middle Eastern Respiratory Syndrome (MERS), and latterly the largest outbreak of Ebola Virus Disease (EVD) and Zika Virus. All can potentially overwhelm established public and national health systems and require specialist units for the management of individual cases. During the EVD outbreak there was a perceived risk to the Trust that it would encounter an infected individual. A number of individuals from the Trust’s catchment area deployed to West Africa to support the diagnostic service in-country, plus two of the UK’s high micro-biological containment facilities, where clinical samples (and the actual virus) are handled are close by. The Infection Prevention & Control team (IP&CT) established a plan for the management and potential evacuation of suspect cases.

INITIAL CHALLENGES
• The outbreak of EVD in West Africa was unprecedented, and a variety of agencies provided support to each of the nations involved.
• There were concerns that the virus could escape from the initial regional focus and spread internationally.
• Clinical knowledge of EVD was limited and myth and misinformation about the virus abounded, giving it a supernatural persona that was difficult to counter.
• While it was recognised that EVD is a severe and serious disease, the virus itself is not anything unusual compared to other viruses handled in the laboratory.
• Staff perceptions, however, remained a factor, in planning and what staff were prepared and more importantly, what they were not prepared to do.
• Staff are aware of personal protective equipment (PPE) for dealing with isolated patients with infectious diarrhoea or antibiotic resistant isolates. The approach to PPE with EVD was far more complex.
• There was concern that the transmission of EVD in West Africa to some Healthcare workers was by an undetermined route, but potentially through incorrect removal of PPE.
• Our own trials with a UV tracer showed the extent of contamination that a clinical worker could pick up from an infected patient, plus potential spread of contamination (Figure 1).
• Our approach to managing potential EVD patients was to isolate and adopt dressing and undressing procedures and contamination control based on military Chemical, Biological, Radiological and Nuclear (CBRN) drills.
• These are complex procedures to the untrained, but are designed to remove heavily contaminated PPE from an individual in a safe manner and limiting the spread of contaminated material.

MANAGING A PATIENT
• Minimum 4 people to deal with patient in isolation
  • “Clinical team” – (clinician + nurse/Healthcare Assistant (HCA)) to directly manage the patient. Both in PPE in dirty (“red”) zone
  • “Undresser” – suitably trained individual in PPE to undress clinical team. In “amber” zone
  • Supervisor – suitably trained individual in clean (”green zone”) to ensure safety and drills correctly conducted. No PPE worn
  • Trust has no dedicated negative pressure siderooms. Isolation was managed in the Emergency Department (ED), Short Stay Emergency Unit (SSEU), using the layout to demarcate contamination zones and “clean”/”dirty” times (Figure 2).
• This meant that patients did not need to be transferred through the main body of the hospital and minimised any decontamination/cleaning required in the aftermath of an event.

DRESSING AND UNDRESSING PROCEDURES
• PPE was difficult to procure as there was high demand.
• PPE was not the best available, but confidence that the ensemble and the procedures would fully protect staff.
• All items in the ensemble were disposable – no chance of errors with re-use, cleaning or disposal.
• Dressing and undressing procedures outlined in Figures 3 and 4.
• Training challenging. Decided early on that only volunteers that were prepared to work in the proposed PPE and with a potentially infectious patient would be trained. To the credit of the Trust, there was no shortage of volunteers.
• No dedicated training time. Staff fitted in training during their routine shifts/workload. Very little opportunity for repetitive training.
• Extensive training provided by the IP&CT on top of their usual day-to-day demands.
• PPE became uncomfortable after 60-90 minutes, so staff rotation every 60-90 minutes or sooner.
  • Required a large number of staff for a response
  • Procurement of adequate stocks of PPE
• The “undresser” would have to undress themselves, but a lower level and extent of contamination was expected.

Figure 3: Dressing Procedure

Figure 4: Undressing Procedure

Figure 2: Patient isolation and Contamination Zones

SHORT STAY EMERGENCY UNIT

UNDRESSING AREA

DRESSING AREA

SIDE ROOM 1

SIDE ROOM 2

SIDE ROOM 3

SIDE ROOM 4

SIDE ROOM 5

SIDE ROOM 6

WC & SHOWER

WC & SHOWER

WC & SHOWER

WC & SHOWER

WC & SHOWER

Figure 1: Contamination Studies

Main zones of contamination

Other spots were found

Contamination easily spread on the floor

INCIDENTS
• 5 suspect cases were managed.
• Patients were isolated for 10-24 hours, waiting for test results.
• Demanding on staff especially in the ED, with 60-90 minute change-overs plus other staff required as logisticians, runners, and laboratory support.
• Disruptive to the ED and Acute Medical Unit (AMU) as needed to clear SSEU.
• Staff response was excellent with high degree of confidence and competence.

CONCLUSIONS
• Confident in equipment and procedures.
• PPE ensemble flexible and adaptable to variety of hazards posed by different pathogens.
• Only voluntary participation.
• Select isolation facility that does not require transfer into main body of hospital.
• Must allocate time for training and training should continue to prevent skill fade, which is evident.