Operational

Op GRITROCK: the Royal Navy supports defence efforts to tackle Ebola

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Introduction
In response to what the World Health Organisation has declared “a public health emergency of international concern” (1), UK Defence has deployed around 800 personnel to support the Department for International Development (DFID) in the battle against Ebola virus disease (EVD) in Sierra Leone. As part of this strategy, a twelve-bed EVD Treatment Unit (EVDTU) has been built and established on the Freetown peninsula, to provide reassurance to international and UK healthcare workers deploying to Sierra Leone. Alongside the EVDTU is an 80-bed Ebola treatment unit, run by Save The Children International, which provides medical care to Ebola victims from the community.

The team
Working in support of DFID, 22 Field Hospital provides operational command, support, stores, nursing and laboratory personnel, as well as a deployed medical director within the EVDTU. Specialist Ebola diagnostics are provided by Public Health England. As a truly ‘Joint’ operation, the physician cadre of the EVDTU - all individual augmentees - comprises a bespoke team of two consultants in intensive care medicine (one of whom is a Royal Naval (RN) Medical Officer); one consultant in interventional cardiology & pre-hospital emergency care (another RN Medical Officer); and a consultant in gastroenterology, infectious diseases and tropical medicine (1). Two specialist trainees in infectious diseases are also attached, one of whom has recent experience of working in Ebola units as part of a Ministry of Defence (MOD) Wellcome Trust Fellowship.

Pre-deployment training
The Army Medical Service Training Centre (AMSTC) at Strensall, having previously been a mock-up of the Role 3 Hospital at Camp Bastion, has been rebuilt to include a full-scale replica of the deployed EVDTU. Pre-deployment training mostly revolved around use of the extensive personal protective equipment (PPE). This has been developed by a partnership between the MOD, PHE and the Health and Safety Executive. Full-body, fluid-impermeable coverage is provided by a body suit, endoscopy apron, visor, dual-layer extra-length gloves, a particulate filter face mask and protective boots. Recent healthcare worker infections have highlighted the absolute importance of proper decontamination procedures, and these were extensively rehearsed, using a scripted, supervised, step-wise process. A two-week package of PPE training, clinical education and a full mission rehearsal was combined with operational updates from Permanent Joint Headquarters and DFID. Cultural awareness training was provided by a Sierra Leone national, with extensive classes in Krio, the language spoken by 97% of the Sierra Leone population.

Deployment
Deployment was by chartered aircraft to Lungi airport, followed by a five-hour ground move into sweltering beachside accommodation on the southern tip of the Freetown peninsula. Here ‘real life support’ fell under the umbrella of the Vanguard Enabling Group Headquarters. Medical support was provided by a Defence Role 2(-) facility (1-1-1-6 configuration, indicating that it consisted of: one operating table; one intensive care bed; one high dependency bed; and six general beds) held within barracks at Freetown, subsequently augmented by the Primary Casualty Receiving Facility of RFA Argus. Once established in theatre, the huge task of tracking and moving all the required items of stock started. Prior to deployment, the whole kit and drugs list was created de novo, as a bespoke package for this operation. Clinician
engagement with the quartermaster’s staff in this process was key to ensure the smooth running of the operation, so that critical capabilities were made available within the EVDTU on the start date. One example of this was in the procurement of intravenous malaria therapy, usually only held within specialist infectious disease centres in the UK. Working closely together with DITD colleagues and other stakeholders, the difficulties were overcome, and the equipment and pharmaceuticals were moved into the EVDTU. In addition to ongoing clinical updates, we visited the Sierra Leone Armed Forces Hospital Facility, 34 Field Hospital, where in recent weeks their staff had set up a temporary Ebola holding unit (Figure 1).

![UK Ebola treatment facility](image)

**Figure 1 UK Ebola treatment facility.**

Thermal acclimatisation, essential given that ambient temperatures were usually around 34 degrees Celsius, with over 80% humidity, continued throughout. Medical force protection measures, essential in this area of West Africa, revolved mainly around the avoidance of malaria - an Achilles’ heel on previous deployments to Sierra Leone, which has one of the highest bite-to-infectivity ratios in the world.

**Ebola Virus Disease – the challenge**

Ebola virus disease is highly transmissible, with each patient estimated to infect 1.8 close contacts. The threat of transmission to healthcare workers is large, with an estimated 10% of all local healthcare workers infected in Sierra Leone.

Patients with Ebola have a mortality ranging from 50-90% in endemic settings. The only specific treatments are experimental, and no vaccine exists at this time (2). Death is usually due to multiple organ failure due to prolonged hypovolaemic shock, volume loss having been caused by severe diarrhoea, and in some cases huge gastrointestinal haemorrhage. Neurological failure, with seizures due to encephalopathy, is described, as is sudden death believed to be due to arrhythmia subsequent to severe electrolyte derangement. The key tenets of Ebola management are early recognition, case isolation, use of PPE, aggressive supportive care including oral rehydration, and intravenous volume restoration, to avoid end-organ injury.

Providing meaningful care, within the limits of what is possible in the environment, whilst avoiding becoming inadvertently infected, represents a huge challenge to Ebola medical teams.

**Providing care within the EVDTU**

A full shift comprises eight nursing staff: a mix of registered nurses, healthcare assistants and combat medical technicians. In the daytime, three physicians are present, with a clinical lead nominated working a fourteen-hour day. At night, one physician remains on-site, with specialty backup available by phone, or a fifteen-minute drive away if needed. A buddy system is employed, mandating that two clinical workers supervise every aspect of care delivery. The daily running is unlike any other military medical unit. A huge amount of planning is required to undertake even the most basic of clinical or nursing tasks. Even administering drugs is very time-consuming. After every patient contact, to avoid cross-infection, outer glove and apron are carefully removed and replaced, washing under-
gloves in 0.5% chlorine solution in between. Movement through the ‘Red Zone’ is carefully controlled, with flow permitted from ‘suspect’ to ‘confirmed’ areas only (see Figure 1), never in the reverse direction. Time in the unit is limited due to the constraints of the PPE and ambient temperatures. On leaving, gloves and boots are full of sweat and condensation. A rehearsed procedure exists for the emergency extrication of staff members who have succumbed to the heat.

**Ebola care bundle**

In order to provide the optimum standard of care to patients in the EVDTU, the clinical team developed an Ebola care ‘bundle’, to ensure that meaningful supportive care was provided at all times, no matter what the clinical skill-mix on the EVDTU.

The key elevations in care which we hope to provide are:

- Aggressive intravenous volume replacement, using central access early if needed.
- Early management of co-infection, providing antimalarial and antibiotic therapy early where indicated.
- Scrupulous electrolyte management, with daily measurement and early replacement of potassium, magnesium and phosphate.
- Use of ultrasound to guide volume replacement, using inferior vena caval measurements.
- Availability of pressors such as noradrenaline to combat shock once volume status has been optimised.
- Management of coagulopathy and haemorrhage, using vitamin K and blood products.
- Early seizure control.
- Optimal pain relief and end-of-life care, where indicated.

**As I write**

As of 0830 yesterday, 5 November 2014, following ministerial approval, the EVDTU is now officially open and ready for business – Save The Children, on the same site, have had 5 admissions, including a very sick child, with another 4 outside the gate this morning, one with haematemesis. The EVDTU Duty Physician is waiting for the phone to ring, and we know that there are healthcare workers in nearby facilities awaiting admission....

**References**


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