

Deployment of a dental treatment facility during Operation Gritrock – lessons for future maritime contingency operations

B. Mair¹

Following the largest outbreak of Ebola in history, Royal Fleet Auxiliary Argus deployed to Sierra Leone in October 2014 as part of the UK Armed Forces response to the Ebola crisis. Integral to the Primary Casualty Receiving Facility deployment was a dental capability, which was one of the busiest departments on board during the deployment. This paper describes the deployment and unique challenges of conducting dental treatment in an environment where there is an infectious disease epidemic.

INTRODUCTION

Royal Fleet Auxiliary (RFA) Argus was deployed on Operation Gritrock in October 2014 as part of the UK response to combat the Ebola virus disease (EVD) outbreak in West Africa, with particular focus on Sierra Leone. The principal role of Argus is to serve as a Primary Casualty Receiving Facility (PCRF). She has a fully equipped 100-bed medical complex on board, which can be uniquely tailored to deliver cutting-edge treatment afloat.¹ This deployment included a lighter PCRF platform with reduced personnel,² giving a basic secondary care facility built around primary resuscitation and surgery. The PCRF was tasked with providing care in the management of Disease Non Battle Injury (DNBI) patients. However, training and operating procedures were designed to protect and manage any patients or personnel who contracted EVD.

Historically, dental morbidity accounts for a significant element of DNBI casualty rates.³ A dental team is required in the joint operating area (JOA) as their presence is not just to restore those with dental problems back to dental fitness, but also to maintain and improve the dental standard of the deployed personnel thereby reducing future dental problems. A dental team can

also educate and inform those deployed on how to improve their oral hygiene and to help reduce their dental risk. Despite this, the dental component of DNBI continues to impact on Operations through time lost as patients travel to seek dental care. The decision to provide dental support depends on:

- The availability of pre-existing dental support in the JOA (no existing dental facility. Personnel would require evacuation to the UK for treatment)
- The casualty evacuation capability (initially unreliable air-bridge – not in place until mid-November)
- The operational situation (almost all local healthcare facilities were converted to deal with EVD, and there were only two dentists working in the public sector⁴ in Sierra Leone)
- The duration and size of the deployment (minimum six-month deployment, with upwards of 1,700 entitled personnel)
- Surge capacity (during the Roulment in Place (RIP) period possibility of surging to 2,000 personnel)
- Security and environment
- Productivity of dental deployment.

One dental officer should be able to care for 1,300 patients.⁵ In the case of Operation Gritrock, while the number of eligible patients was significantly higher than this, 1,300 patients were not co-located with the dental team. Therefore, only emergency care was provided to these personnel. Emergency care was also only provided due to the requirement to reduce the risk to the embarked personnel of EVD from category two and three

IN BRIEF

- Describes the deployment of the Royal Fleet Auxiliary Argus to Sierra Leone in October 2014 as part of the UK Armed Forces response to the Ebola crisis.
- Discusses the dental capability of the primary casualty receiving facility on board.
- Describes the challenges of carrying out dental treatment in an infectious diseases epidemic environment.

patients. The dental team consisted of two members; a dentist and dental nurse. The team was based within the PCRF complex in the 'Minor Ops Room'. While there is a fixed dental chair (A-Dec) and wall mounted light, a portable dental unit and compressor were used alongside a portable X-ray machine.

The aim of this study was to collect and analyse dental morbidity for a contingent, short notice operation, concentrating on the dental morbidity of those deployed on board RFA Argus. It also includes information of those personnel who presented for emergency treatment from ashore.

CLASSIFICATION OF PERSONNEL FOR EVD

In January 2015 the EVD risk categories were:

- Category one: individual who had visited an EVD affected area, but had no direct contact with an Ebola case (or body fluids) in the last 21 days
- Category two: individual who had direct (close) contact with EVD cases (or body fluids) in the last 21 days but did not provide direct physical contact as part of clinical care. Individual wore appropriate protective equipment/clothing (PPE), and had no known breaches in PPE
- Category three: individual who had direct (close) contact with EVD cases (or body fluids) in the last 21 days and provided direct physical contact as part of clinical care. Individual wore appropriate PPE.

While transiting to the JOA the dental team constructed a standard operating procedure (SOP) specific to the risk assessment for EVD.

¹Royal Navy, Defence Dental Services, The Wardroom, HMS Seahawk, Helston, Cornwall, TR12 7RH
Correspondence to: Barbara Mair
Email: b.mair@ymail.com

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The embarked specialist infection prevention and control nurse (IPCN) assisted in the creation of the bespoke SOP to cover all eventualities. During the deployment Public Health England (PHE) and the British Dental Association (BDA) issued guidance relevant to dentistry and dental treatment – however, this guidance used old EVD risk categorisation. One of the elements of Operation Gritrock was force protection, including minimising the risk to military personnel. The dental team was deployed to force regenerate but if only category one patients were seen then there would be limited reason for having a dental team deployed as only those on board Argus and minimal personnel ashore would be eligible for treatment. Therefore, under the guidance of the IPCN the decision was made to continue offering emergency care to category two and three patients, as long as they remained apyrexial.

DENTISTRY IN AN EVD AREA

EVD is spread by contact with bodily fluids, including saliva.⁶ Specific challenges for the dental team were therefore to conduct a risk assessment of all patients before and once they had presented for dental treatment.

Dental support is historically difficult to plan⁷ – the involvement of personnel from the UK Government, NHS and PHE alongside multinational forces increased this difficulty.

If the patient was from ashore, then the medical team ashore would assess their temperature using an infrared contactless thermometer. If at presentation the patients' temperature was over 37.5 °C then they were immediately sent to the medical officer for assessment. If they were at risk of EVD exposure then SOPs for EVD exposure were followed. If the temperature was under 37.5 °C, the patient would be transferred to Argus as long as they had had no history of breaches in PPE. Category three patients with suspected breaches in PPE were not seen for any dental care until 21 days had passed post-exposure.

Every person arriving on board Argus had their temperature monitored on arrival; this was completed by the Royal Marines Band Service Temperature Monitoring Team. An EVD risk assessment form (Appendix 1) was also completed. If apyrexial, the patient would be escorted to the dental department. At this point a verbal check of the EVD risk assessment form was carried out and their temperature was checked again. The patient was also questioned regarding EVD specific symptoms – headache, chills, muscle pain or general malaise. If the patient remained low risk then they progressed to treatment. If there were no symptoms, then it was decided that category one patients would be treated

as normal. Category two and three patients would be assessed and if appropriate managed with pain relief and antibiotics and seen 21 days after the last exposure to EVD. If operative intervention was required then normal infection control procedures would be followed. No extra PPE was worn, but as far as was practicable rubber dam was used to reduce unnecessary aerosol.^{8–10} Prior to treatment patients also used a chlorhexidine digluconate 0.2% mouthwash as this has been shown to reduce bacterial¹¹ and virucidal¹² load during conservative procedures.

METHODS

This was a service evaluation using routinely collected anonymised data from the dental records of patients seen on board Argus between 17 October 2014 and 07 April 2015. All dental records were reviewed on return to the UK. Any unscheduled dental visit where the patient had left their duty station to seek care was considered an emergency. All details about emergencies were recorded.

RESULTS

During Operation Gritrock, a total of 382 cases were seen. These were made up of 113 pain cases, 159 routine checks, 132 hygiene appointments and 75 restorative visits. Two hundred and thirty-two were personnel from Argus while 28 were from units ashore. Breakdowns of nationalities of patients eligible for treatment under the Medical Rules of Eligibility are detailed in Table 1. While deployed, the dental team treated patients from the Royal Navy, Royal Marines, Army, Royal Air Force, Reserves from all three services, RFA, the Canadian Military, Norwegian laboratory workers, Danish healthcare workers, members of the UN, PHE and the WHO.

Figure 1 demonstrates that in the first three weeks there was an expected peak of acute infections. This could be attributed to the short notice nature of the deployment – many patients had had treatment started but not completed, whilst others had had extractions days before deployment. It was also evident that several personnel who were phobic of dental treatment became aware that they could not delay treatment any further. During the RIP period of weeks 10/11/12 there was another small peak in acute infections that could be attributed to the new personnel from Tranche 2 arriving in theatre.

There is a wide range of estimates for the number of dental emergencies in deployed soldiers that should be expected on operations, ranging from 102–285/1,000 personnel/year.^{13,14} This equates to 51–143/1000 personnel/six-months or

Table 1 Entitled patients

| Nationality/organisation | Number |
|--------------------------|--------|
| UK – Military | 828 |
| UK – Government/NHS/PHE | 305 |
| Netherlands | 250 |
| UN | 152 |
| US | 70 |
| Norwegian | 50 |
| Canada | 40 |
| Korea | 11 |
| Total | 1706* |

*Data true for December 2015

Table 2 Emergency presentations

| Presenting problem | Number | % of total |
|-------------------------|--------|------------|
| Defective restoration | 27 | 20.93 |
| 8's | 19 | 14.73 |
| Periodontal abscess | 11 | 8.53 |
| Caries (restorable) | 10 | 7.75 |
| Sensitivity | 10 | 7.75 |
| Surgical complication | 9 | 6.98 |
| Tooth fracture (minor) | 8 | 6.20 |
| Orthodontics | 7 | 5.43 |
| Periapical pathology | 5 | 3.88 |
| Endodontic complication | 4 | 3.10 |

25–72/500 personnel/six-months. During Operation Gritrock 113 pain cases were seen; 84 from Argus and 28 from ashore. One patient required return to the UK for further emergency treatment. Taking into account the fact that the majority of patients were not co-located with the dental team, and a population of around 547 rotated through Argus this seems to fall comfortably in the upper estimates of expected dental morbidity rates.

The average number of pain cases was 5.6 per week. The dip seen in Figure 2 during weeks 15/16/17 is due to the dental team being back in the UK for Rest and Recuperation (R&R) for 2 weeks. This then explains the peak in week 18 as those personnel ashore who had problems in the previous 2 weeks were able to present. The last peak in week 20 is due to beginning of the second RIP period ashore, with Tranche 3 of personnel arriving in theatre.

The nature of presentations was similar to that previously described by Moss: 'a non-symptomatic chipped tooth was counted equally as an abscess. In either case, the sailor was a loss to his normal work...had no dental care been available, the vast majority of these 'emergencies' would never have presented.

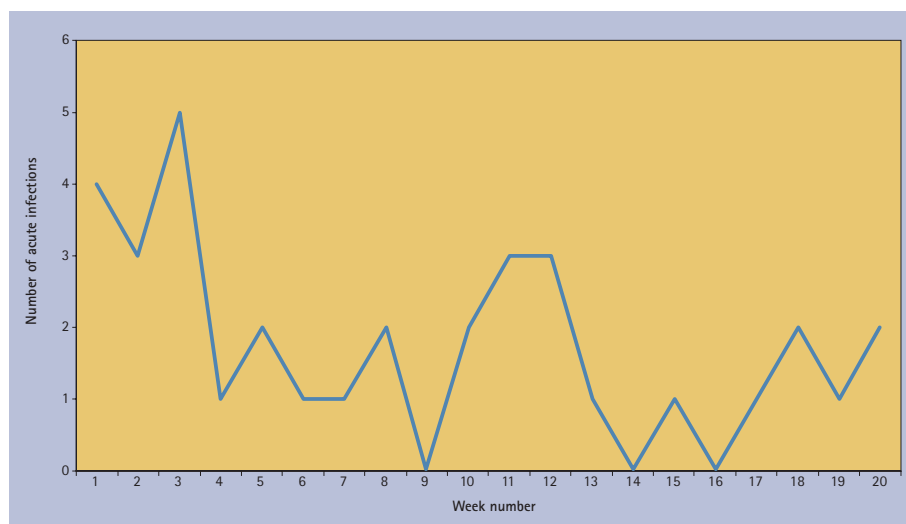


Fig. 1 Number of acute infections per week

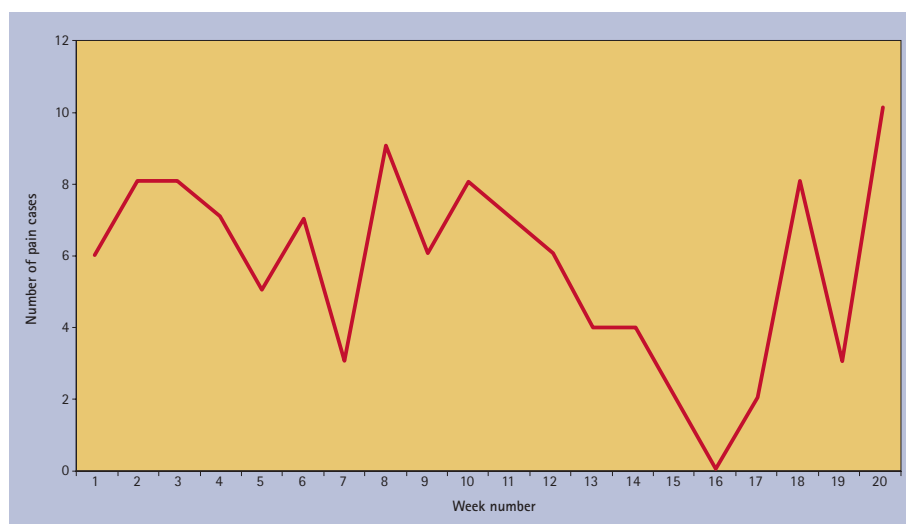


Fig. 2 Number of pain cases per week

The few 'true' emergencies (extreme pain due to infection, irreversible pulpitis or trauma)... would have required evacuation out of theatre without on-site dental care.¹⁵ The 'true' dental emergencies equated to 25 personnel making 22.5%. A summary of the top ten presenting emergencies is shown in Table 2.

The most common presentation at an emergency appointment, accounting for 20.9% of the presentations, was a defective restoration. This was closely followed by pain from eights. This includes peri-coronitis and trauma from over-erupted upper-eights. The relatively young patient population on board can explain the high number of wisdom tooth and orthodontic issues. Periodontal abscesses made up the third most common presentation. Simechek stated 'authors of previous studies have not agreed on which dental emergencies were nonpreventable'.¹⁶ In this operation 40 personnel were seen from the RFA or civilian organisations that do not have the same stringent pre-deployment requirements as the Royal Navy – therefore, none of these cases could

be prevented. The majority of defective restorations had no history of being defective and therefore these cases could not be prevented. Of those presenting with problems from wisdom teeth – 14 out of 19 had a history of symptoms from these wisdom teeth. Four of these were due to have extractions under general anaesthetic back in the UK, but were unable to attend the appointments due to the Operation. Five developed new issues while deployed. It is hard to come to a conclusion from such a small patient base however a more aggressive management of wisdom teeth may be appropriate to prevent such issues while deployed.

DISCUSSION

Predicting during a periodic dental inspection what conditions will result in presentation as a dental emergency within the next 12 months is extremely difficult. Presentation for a dental emergency can be dependent on a patient's individual pain threshold and perception of a problem rather than the progression of an infection. It also

depends on the accessibility and availability of a dental service. Those patients presenting from ashore were not co-located with the dental team and had to present with significant dental concerns to justify transit via offshore raiding craft or helicopter transfer to be seen. Those with perceived lesser dental concerns from ashore either waited until they returned to the UK or were fitted into the transit matrix – a process which could be a few days following initial presentation.

Of the 25 true dental emergencies, RFA personnel accounted for 11 of these. This is a significant number bearing in mind they made up fewer than 10% of deployed personnel but almost 50% of true emergencies that could have required evacuation out of the operational theatre. While the RFA require a dental check-up before embarkation by their civilian general dental practitioner, this is not stringently enforced or checked. Following this operation, more strict checks should be considered of RFA personnel before deployment.

During the course of Operation Gritrock no patient from ashore was turned away. The risk of EVD did not prevent any patient receiving full and comprehensive dental care. The strict safety procedures in place protected not only the dental team, but all personnel on board Argus.

CONCLUSION

Operation Gritrock and the risk of EVD posed unique challenges for the dental team, but with advice and research these risks were mitigated and overcome. Deployment of a dental capability as part of Operation Gritrock was a key force enabler, allowing personnel who would otherwise have had to return to the UK for treatment to remain in theatre and improving the dental fitness of all those embarked on RFA Argus. The presence of a UK run medical facility, free of EVD, off the coast of Sierra Leone was reassuring to all those personnel ashore. This allowed them to focus on fighting EVD, safe in the knowledge that should they need medical or dental treatment, it was only a short boat or helicopter ride away. The dental team was honoured to support those personnel on Operation Gritrock.

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Appendix 1 Operation Gritrock – RFA Argus screening form for personnel embarking ship

Identity of embarking person

| | | |
|-----------|------|--------------------------|
| Rank/Rate | Name | Surname |
| DoB | Unit | Role (eg Marine/Aircrew) |

Contact with potential Ebola Virus Disease

Potential EVD (or suspected EVD) contact checklist:

| | | |
|---|------------------------------|-----------------------------|
| 1 – Slept in same building as local national or EVD patient within last 21 days | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2 – Had direct physical contact with local national or EVD patient | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3 – Touched/contact with body fluids of a local national or EVD patient | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 4 – Had sexual relations with local national or EVD patient | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 5 – Handled clothes or other personal objects of EVD patient | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 6 – Contact with Body of likely EVD victim | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 7 – Contact with Mattress, clothing or coffin of body of likely EVD victim | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Has the person had any physical contact with non-human primates (gorillas/chimpanzees/monkeys), bats or any other animal
 Yes No

Are there any other circumstances where contact with Ebola Virus Disease may have been possible
 Yes No

Details of Contact

Record Temperature here (°C)

For any potential EVD contact identified above, record temperature and refer to Embarked Forces Primary Care Facility (For patients with temperature above 38°C contact Emergency Department to prepare for arrival immediately)

Temperature monitoring to be recorded twice daily for 21 days for all personnel returning from Ebola risk areas

Person filling form

| | |
|--------|-----------|
| Signed | Date/Time |
|--------|-----------|