“For me, it was an incredible, unforgettable experience that changed my outlook on health care provision”

Louise Collingwood, UK
An Elective in Expedition Medicine

Why Expedition Medicine?
I have had a keen interest in expedition medicine since the start of my time at The University of Edinburgh after becoming a member of the University Wilderness Medicine Society. After taking part in an altitude physiology expedition in 2014, I decided this was a specialty I wanted to further my experience in. I saw this elective module as the perfect opportunity to explore whether this is something I would like to pursue as a potential career. I wanted to challenge myself in a different way to the remote mountain environment of the altitude physiology expedition and so I applied to take part in a dive expedition with Blue Ventures in a remote island in Belize. I saw this as an opportunity to learn about medicine in a tropical environment, which poses many different challenges to medicine within the western world. The role of expedition medic includes providing health care to all staff and volunteers as well as emergency medical treatment and overseeing Medivac if the need arises, as well as maintenance of medical supplies, introductory lectures and briefings for our expedition team and the enforcement of on-site health and safety measures. As the elective student on expedition, I was expected to see members of the expedition team should they have any concerns, but also to be prepared for any emergency scenarios.

‘Expedition medicine is concerned with maintaining physical and psychological health under the stress and challenges of expeditions. Its aim is to encourage adventure but to attempt to minimise the risk of trauma and disease by proper planning, preventative measures such as vaccinations, sensible behaviour, and acquisition of relevant medical skills. Responsible attitudes towards the environment and the welfare of indigenous people in the area are also of great importance.’ (1)

Aims
- Take part in and learn about expedition medicine from the perspective of a dive expedition in a remote tropical environment.
- Witness the challenges of providing healthcare in a remote, resource-poor setting.
Pre-departure Preparations
Adequate preparation is the fundamental aspect of ensuring a successful and safe expedition. All volunteers including myself were required to complete fitness to dive medical and PADI (Professional Association of Diving Instructors) forms which were to be reviewed and counter signed by our GPs before departure. Being in a remote location obviously has its own complications with logistical difficulties getting to and from site should mine or others personal health be compromised. However, San Pedro is a 60-minute boat journey away with a recompression chamber in case of decompression sickness or other medical emergencies. A MEDIVAC plan is in place from both Sarteneja and Bacalar Chico, with Helicopter evacuation to Belize City or Chetumal, Mexico, through the Belize Emergency Response Team (BERT) available to be organised at short notice should it be needed. My vaccinations up to date and the risk of malaria in Belize is low so prophylaxis is not needed, I was just advised to prevent mosquito bites. English is the official language of Belize so there were no anticipated problems with language barriers, however, I learnt basic Spanish in preparation as the local finishing village, Sarteneja, communicates mostly in Spanish. I completed the medical training for volunteer medics (see Appendix 1) which included diagnosis and management of common medical problems on site including ear problems, gastroenteritis, cholera, anaphylaxis, malaria, wound management and escalation criteria – when management is above what I can provide, above my competency, a could patient deteriorate, or further investigations are needed.

Dive Medicine
There are two important medical complications of diving to be particularly aware of; decompression sickness and barotrauma. Decompression sickness (DCS) is caused by bubbles of nitrogen in tissues; they can form anywhere and can cause a wide variety of symptoms including rash, pain, numbness, weakness or general malaise. Immediate management is with ABC approach, oxygen and fluids. There is a recompression chamber in San Pedro, a 60 minute boat journey away should emergency recompression be needed. Prevention of DCS is through safe dive profiles and safety stops on ascent to prevent nitrogen from dispersing from the tissues as a result of decreasing pressure of air. It is also important to stay hydrated, avoid alcohol before diving and strenuous exercise after
dives, all of which we stressed in our introductory lectures at the start of the expedition.

Barotrauma is the expansion or compression of body parts as a result of pressure differences between some body cavity and the surrounding pressure. On decent this could be middle/inner ear or mask squeeze and on ascent this could be reverse squeeze or pulmonary barotrauma, with the risk being greatest between 0 and 5m. Pulmonary barotrauma is due to expanding air on ascent unable to escape due to breath holding which can cause rupture of the lung tissue and risk of arterial gas embolism. The lectures highlighted the importance of never holding your breath, slow controlled ascents and not to dive if you’re having trouble equalising. Barotrauma may present with ear pain. On otoscopy tympanic membrane will appear red and inflamed or blood may be visible behind it. The drum may rupture in severe cases. Initially, management is supportive with analgesia and decongestants. However, if rupture occurs antibiotics are required. If the patient experiences vertigo, hearing loss or tinnitus there is a possibility of inner ear trauma. This calls for an emergency evacuation procedure and ENT surgical review as soon as possible.

**Bacalar Chico Dive Camp**

The first job for me on arrival in Belize was to help deliver lectures on potential dive problems and general looking after our health while on expedition, always emphasising that prevention is better than cure in remote settings such as dive camp. The first lecture was about staying healthy on a blue ventures expedition. The relative remoteness of the expedition requires us to take greater than usual care of our health. Staying healthy means we can achieve the expedition aims and makes the expedition on the whole, more enjoyable. The tropics and expedition environment puts a greater strain on our minds and bodies than we are used to. It can be more difficult to cope with any illness due to the lack of support networks which are available to us at home. For this reason, good communication is vital. As well as the lack of support networks, the stresses of the expedition environment can lead to conflict. It is important to acknowledge each other’s tiredness, stress and anxiety and work as a team to keep everyone’s spirits up and to protect our mental wellbeing while on expedition. There was a supply run to the local town in the first few days to stock up on medications before departing for dive camp. We were able to purchase adrenaline,
gentamicin, hydrocortisone, loperamide, plasters, ibuprofen and lidocaine to add to the medical kit.

We ran a MEDIVAC scenario (appendix 2) at the start of camp without warning to ensure everyone was aware of the correct procedures regarding potential head or spinal trauma and the protocol should any member of the team need to be evacuated. I put my resuscitation skills into practice using the ABC approach and completing a primary survey. With the c-spine immobilised, our simulated patient was log-rolled onto a board found on the boat using bed sheets, with tape to secure the patient to the board for purposes of boat travel. This was the first test of using what I could find in a limited-resource environment to aid myself and help the patient. We had a debrief with the group following the scenario to see how everyone felt it went and what could be improved. The general consensus was very positive with people feeling much more prepared should a MEDIVAC situation present itself at camp. For me, it was an important scenario to run and a very useful experience.

Ear problems are common on dive expeditions due to pressure changes and prolonged exposure to salt water. One case I had was of a painful loss of hearing in the right ear, an inability to equalise whilst diving, with coryzal symptoms but no headache. On otoscopy the ear was red and inflamed. Due to the high risk of infection and associated complications in this environment, I advised the patient to avoid diving for 48 hours and to treat symptoms with analgesia and decongestants. With the likely diagnosis of otitis externa, gentamicin ear drops were prescribed. I reviewed the patient after 24 hours and with the symptoms resolving advised it was safe to return to diving the following day with a slow descent and shallow dive profile.

During some of the free time while on expedition, I prepared and delivered some teaching to the volunteers on basic life support, using a simple DRABCDE approach. In the context of diving related illness I emphasised the importance of early oxygen, demonstrating how to set up the equipment if needed on the boat or at base. I also talked through the technique of CPR which the rescue diver trainees found particularly useful as this is an important part of their qualification in the care of the non-responsive, non-breathing diver.

Another common problem encountered on expedition due to living on a beach was minor corneal abrasions due to the sand. In such cases, I profusely irrigated the eye, tested visual acuity and examined the eye using a torch to look for any foreign body. Chloramphenicol eye ointment was prescribed due to the risk of infection as well as
to soothe the irritated cornea, with systemic analgesia advised for pain. It was difficult to fully visualise the eye due to lack of fluorescein dye and blue ophthalmoscope light, but was treated conservatively as a corneal abrasion. Other common medical problems encountered at camp included cuts and grazes due to lack of footwear and reactions to sand fly bites for which antihistamines were commonly taken to avoid secondary infection from scratching.

**Conclusions**

I used a lot of my spare time to learn about expedition medicine using books and materials provided at camp in the general medical box to further my learning and enhance my experience on my medical elective. I found this whole experience hugely rewarding but also uniquely challenging. I have never before been in an environment with such few people for such a prolonged period of time. The inability to contact the outside world from camp really added another dimension to the atmosphere between the volunteers. It was very different to deliver healthcare in comparison to in the western world where a lot of the time, technology and communication is used to aid decision making and management. It was also very different due to the fact that my patients on elective were also my friends. It was a challenge to make sure I found the balance between being a good friend whilst also remaining professional. Overall, I found my experience of expedition medicine at Bacalar Chico Dive Camp extremely worthwhile and have decided that this is definitely a specialty of medicine which I wish to pursue alongside my career in the future.

**Reference**

Appendix 2 – Photographs