

Picture 1: the DPA01 being prepared for use during a wound dressing

Experience With a Portable Anaesthetic Machine Following the April and May 2015 Earthquakes in Nepal

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Having been introduced to the charity Safe Anaesthesia Worldwide by a meeting with their medical director, Dr Roger Eltringham, I decided that I would like to become involved in the valuable work being undertaken by the charity in some of the most difficult and dangerous situations in the world. Dr Eltringham suggested I visit Kathmandu, Nepal, to see for myself how they had coped during the recent large-scale earthquakes. This report is a brief description of my visit during the late summer 2015.

At the dawn of the day, when the early sunrays find their way over

the top of the hills encapsulating the Kathmandu Valley, the buzzing capital is already awake. Streets quickly fill to their brim with the widest assortment of life; children in their school uniforms, books securely tucked in their colourful backpacks; food markets lining the pavements; energetic taxi drivers trying to identify potential customers; cars, bicycles and buses filled with people on their way to work, zigzagging past a cow blissfully unaware of her precarious resting place.

At first glance there seems little indication that this is the capital of a country that was hit by two

disastrous earthquakes only a few months previously. It is only when looking beyond the bustling city life that one spots the large pile of bricks curiously out of place, the surprising open spaces between the tall buildings, or the tent displaying the logo of an international aid organization. The national disaster is only present in the periphery, like a distant memory that is gradually being absorbed into everyday life.

On April 25th 2015, Nepal was hit by an earthquake measuring 7.8 on the Richter scale. This was followed on May 12th by a second earthquake of 7.3 magnitude [1]. The epicentre of the initial earthquake was approximately 80 Km northwest of Kathmandu, followed by an epicentre located northeast of Kathmandu, close to the border between Dolakha and Sindhupalchok districts [1,2]. Although the city of Kathmandu experienced comparatively little destruction there was an inevitable surge in the number of casualties received by the local hospitals.

Following the second earthquake, the charity Safe Anaesthesia Worldwide was contacted via a common link at Fistula Foundation© with an appeal for urgent help from two partnering hospitals, Kathmandu Model Hospital and Kirtipur Hospital, both located in the Kathmandu Valley. Despite the inevitable disruption in the transport and communication systems caused by the earthquake, the charity was able to deliver a portable Glostavent® anaesthetic machine (DPA 01, manufactured by Diamedica Ltd) to Kirtipur Hospital within a few days.

The hospital's existing electricity generators had been able to compensate for the reduction in the mains electricity supply immediately following the earthquake, enabling surgery to continue. However, the surge in the number of emergency admissions increased the number of in-patients from approximately sixty to over one hundred and thirty, many of whom required emergency surgery. This meant that additional anaesthesia services were required without delay.

The hospital has two main operating rooms, which were unable to accommodate the additional emergency surgery required. However, the arrival of the DPA01 meant that one of the small dressing rooms nearby could be used as an additional operating room (picture 1). As it has no mechanical ventilator, its use was restricted to the shorter procedures, while the more complex operations were undertaken in the main operating rooms where conventional anaesthetic machines were available.

Although no accurate auditing was carried out, it was estimated that the donated Glostavent® was initially used in nearly 20% of operations performed in the immediate aftermath of the earthquake. This percentage gradually decreased over the next four months as the rapidly increased influx of patients subsided.

Initially the increased workload was a direct consequence of the earthquake and included crush injuries and fractures, while subsequent operations reflected the secondary effects of the disaster such as burns and wound debridement. However, despite the huge increase in the workload it is remarkable that the capacity of the hospital was never exceeded during this period.

Interviews with anaesthetists who had used the DPA01 provided very positive views about its ease of use and simplicity. Minor issues encountered during set-up were quickly resolved by the hospital technician. Mild apprehensions were expressed regarding the availability of spare parts should they be required; an additional instruction manual was also requested but in general the staff found it easy to understand and operate. Other members of the staff including nurses, surgeons and Dr Rai, director of Kirtipur Hospital, expressed strong satisfaction with the DPA01.

Many members of staff expressed deep feelings of appreciation

towards Safe Anaesthesia Worldwide for supplying this additional anaesthetic machine and to Fistula Foundation© for initiating the donation. Although it is currently not in constant use now that the workload gradually is reverting back to normal, staff were nevertheless very keen that it remained available in the anaesthetic department to ensure the continuity of service should similar emergencies occur in the future. Additionally, as anaesthetic staff was unfamiliar with using draw-over anaesthesia in their routine practice, the DPA01 constitutes an excellent teaching aid. Kirtipur Hospital is furthermore planning to open four more operating rooms in the near future, and plans are in place for the construction of a new hospital in Itahari in Eastern Nepal; consequently the Glostavent® is anticipated to be required on a full-time basis.

In addition to their involvement in surgery performed in Kirtipur Hospital, the services of the anaesthetic department are regularly required in outreach clinics in rural parts of the country. Some of these are equipped with their own anaesthetic machines while others require the visiting team to bring their own anaesthetic machine with them. For many years a smaller version of a continuous flow machine has been used for this purpose (picture 2). Having now become familiar with the DPA01 the members of the anaesthetic department have requested that it not only remains available for use in Kirtipur hospital but also is taken to outlying hospitals when surgery is required.

I feel very privileged to have been able to visit the anaesthesia department in a busy hospital in a developing country and discover how they responded to a disaster of this magnitude. In the event, it seems that they were able to cope remarkably well as the epicentres were some distance away and the hospital itself not badly affected.

I was pleased to discover that the DPA01 arrived intact and ready to use without delay, and that

the efforts of Safe Anaesthesia Worldwide and Diamedica Ltd were greatly appreciated by the local staff. The DPA01 strongly impacted on the hospital's ability to respond to and cope with both the emergency response as well as the long-term recovery from the April and May 2015 earthquakes.

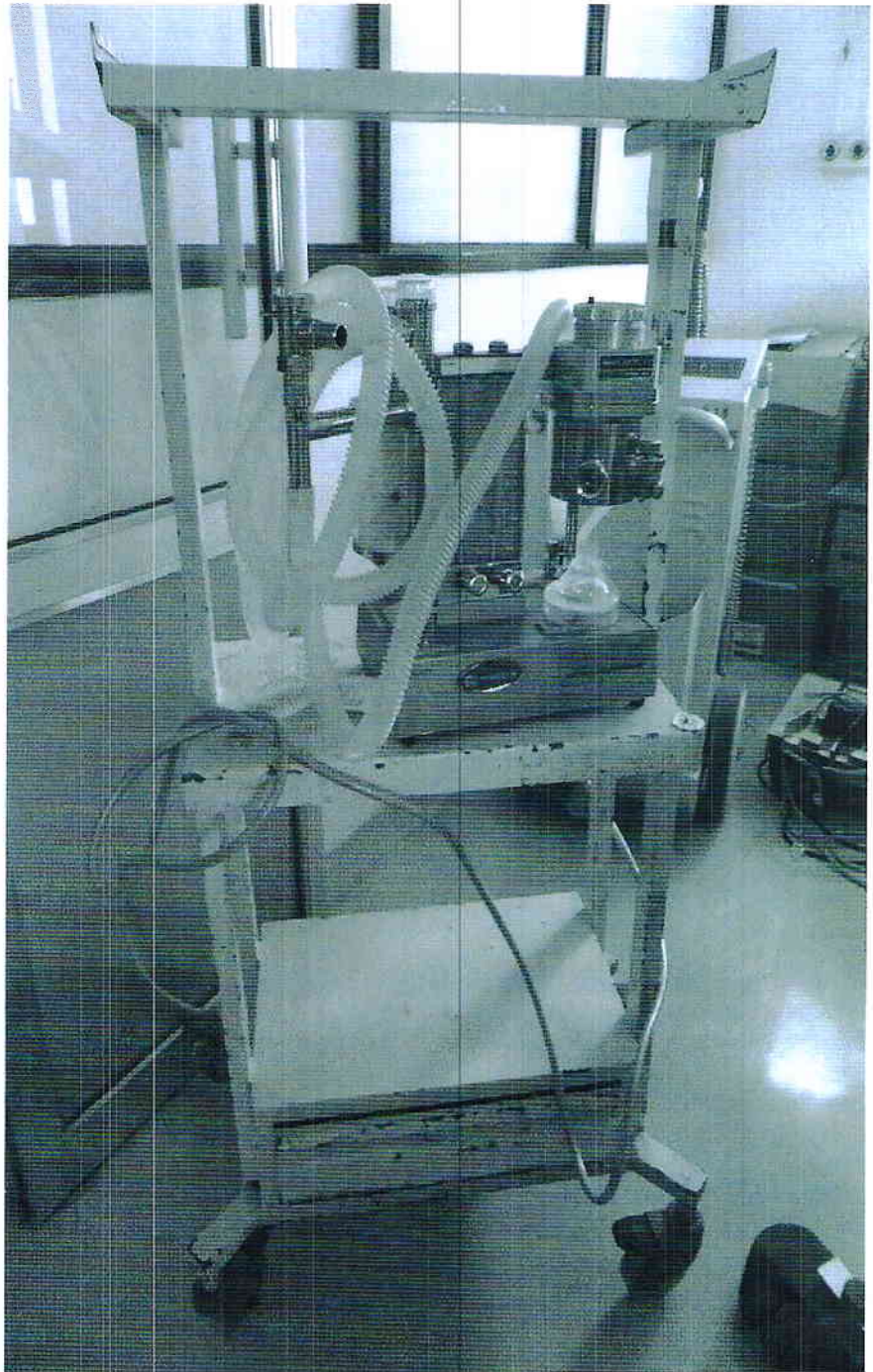
Perhaps the greatest long-term benefit of this donation however was that it encouraged interest in draw-over anaesthesia. As standard continuous flow anaesthetic machines have become more sophisticated, complex and expensive it is easy to forget that they are still dependent on uninterrupted supplies of oxygen, electricity and regular servicing by skilled engineers. Isolated hospitals in poor countries are particularly vulnerable, and hopefully these recent events will act as a reminder that this tried and tested form of anaesthesia is not abandoned.

Acknowledgements:

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References

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2. World Health Organization. Health Cluster Response to the Nepal Earthquake. WHO, 2015. Available from: http://www.who.int/hac/global_health_cluster/countries/nepal_earthquake/en/ [Accessed: 25 November, 2015].



Picture 2: Anaesthetic machine previously used on outreaches