Screening for sub-clinical stress cardiomyopathy and disaster ultrasound provision in the Kaikoura earthquake

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On 14 November 2016, a magnitude 7.8 earthquake struck the township of Kaikoura. All road access was cut, isolating the 3,500 residents of the district and approximately 1,000 tourists. The earthquake was also felt strongly 184 kilometres away in Christchurch, population 366,000. In the next 36 hours, seven cases of earthquake-induced stress cardiomyopathy presented to Christchurch Hospital. Christchurch Hospital had previously seen case clusters of stress cardiomyopathy, following earthquakes of both September 2010 and February 2011. When it became clear that we were seeing a third case cluster of stress cardiomyopathy in Christchurch we hypothesised that there might be sub-clinical cases closer to the epicentre in Kaikoura. The hospital in Kaikoura is ordinarily staffed by four family physicians. Telephone contact was made on 15 November and we arranged to fly in a cardiac sonographer and portable echo machine the next day. Utility connections to the hospital were not functioning but there was an emergency electricity generator to provide wall outlet power for the plug-in portable ultrasound machine that we had available. In our previous case clusters of earthquake stress cardiomyopathy, all of the cases had been women aged over 50 years. We therefore sought to perform a five loop very limited LV function study on asymptomatic Kaikoura women over that age. Point of care and focused assessment with sonography for trauma (FAST) scans can have a very important role in emergency care, particularly in disaster situations. The scan that was performed was in some ways similar to a point of care or focused ultrasound scan as routinely performed in many emergency departments, but it is important to note how it differed. Our scan was a limited comprehensive scan for left ventricular function, rather than an emergency department scan protocol designed to exclude a wide range of cardiac pathologies. Our images were digitally archived to DVD and then reported by an experienced echocardiologist in Christchurch.

Prior to sending the sonographer, we approached the local university and hospital research offices and found that there are no local pathways for emergency ethical approval. We have subsequently obtained retrospective approval from the Health and Disabilities Ethics Committee as an observational study.

The sonographer drove with his portable machine from Nelson to Christchurch airport in order to fly in on a small fixed wing aircraft. There was only one seat available so we could not send in an administrator or additional person to organise subjects for the sonographer. The sonographer was met at Kaikoura airstrip and transported to the medical centre. The medical centre was operating under extreme conditions. During the day a major evacuation of tourists to a navy ship that would transport them to Christchurch was undertaken. The medical centre provided a room for the sonographer. All women aged over 50 who presenting to the medical centre for other reasons were scanned as well as all female staff who were of that age. Having worked through those two patient groups the sonographer visited the marae.
that was operating as an emergency centre, but there was no suitable scanning environment at that site.

During the day a total of 26 women without cardiac symptoms were screened for left ventricular wall motion abnormalities. All gave verbal consent. No cases of takotsubo cardiomyopathy or incidental abnormalities were found. The average age for the women scanned was 61 years with a range of 45 to 86 years. Although not currently credentialed for it, our sonographer was also trained in general ultrasound. During the course of the day, medical centre staff, who were aware of this, had the sonographer scan a possible ruptured tendo-achilles, veins for a DVT, a leg for a possible foreign body, a possible PE case and also an acute coronary syndrome case. With the navy evacuation underway the number of people in town dramatically decreased during the day. By 15:30 it was felt there would be low yield in the sonographer continuing in Kaikoura and the opportunity of a seat on a plane out had arisen. He therefore returned to Christchurch.

By nature, echocardiography research in disaster settings has to be opportunistic. We learnt a number of things from our experience. Subclinical takotsubo or stress cardiomyopathy was not found in 26 women screened. The clinical case rate in Christchurch following the Canterbury earthquakes was low, of the order of 1:2,500 older women, but disasters dramatically alter patterns of presentation to emergency departments and relatively little is known about stress cardiomyopathy. It was of interest to look for a sub-clinical form with echocardiography. A team of two people may have been able to operate more efficiently for recruitment for research purposes than the single sonographer. Having a second person whose role was specifically to organise subjects in a timely manner may have increased efficiency and the number of people able to be screened.

Perhaps the major finding from our experience is that it was very helpful that the cardiac sonographer sent also had general ultrasound skills as in the disaster setting there was a clinical requirement for point of care general sonography. When future natural disasters occur in New Zealand in places such as Kaikoura, the emergency medical response should consider the inclusion of point of care ultrasound. Staff availability, equipment compatibility and internet connection if required for remote reporting will mean that provision would need to be on a situation specific basis. In our case the service was provided by a Nelson-based sonographer with coordination and support from a Christchurch-based Cardiologist. A quality disaster medical response should include consideration of ultrasound availability.

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