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Case Report

Infection prevention and control lessons learned from the management of the first suspected Ebola virus disease case admitted to a New Zealand hospital

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Abstract. This report describes the infection prevention and control involvement in the care of the first suspected Ebola virus disease (EVD) case to be admitted to a New Zealand hospital. Prior planning and detailed preparations enabled a smooth admission process and ongoing patient treatment. Prepared infection prevention and control procedures ensured the public and healthcare workers were not put at risk of acquiring EVD. Further refinement of personal protective equipment is required.

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Introduction

New Zealand has been actively preparing for the potential management of cases of Ebola virus disease (EVD) since the World Health Organization declared EVD a public health emergency of international concern on 8 August 2014.[1] Local healthcare facility preparations have been overseen and guided at a national level by the New Zealand Ministry of Health with the objective of containment of any cases arising in New Zealand.[2] Four main hospital centres were established to prepare for receiving and caring for a suspected or confirmed EVD case; Christchurch Hospital was the designated centre in the South Island.

In March 2015, the first case of suspected EVD in New Zealand was admitted to Christchurch Hospital, a large acute-care 700-bed tertiary referral hospital that is part of the Canterbury District Health Board (CDHB). The New Zealand Coordinated Incident Management System (CIMS)[3] was implemented locally, and under this structure the Infection Prevention and Control Service reported to Operations. The Ministry of Health was kept regularly informed.

Case study

This case report describes the infection prevention and control involvement in the care of a patient with suspected EVD who was admitted to Christchurch Hospital in March 2015. The report focuses on the principal IPC areas of involvement: isolation facilities, personal protective equipment, environmental cleaning, laundry and waste management, and IPC considerations for clinical procedures.

The infection prevention and control (IPC) team were notified of an impending admission of a suspected case of EVD, late on a Friday afternoon. The patient was a middle-aged nurse who had recently returned from frontline work in an Ebola treatment centre in Sierra Leone. She had been self-monitoring at home and had developed signs and symptoms consistent with early onset of EVD. These signs and symptoms, along with her work history and travel time frame, meant that she strongly met the case definition for suspected EVD.

The patient lived over 500 km (6 h by road) from Christchurch so arrangements for transporting her to Christchurch were put into place. The New Zealand emergency services activated their specialised team trained in transporting an EVD case, and arrangements were made to transport the patient by air using an ISOPOD (a transportation device that is used for highly infectious patients).

The transportation arrangements gave the hospital and the IPC team some extra time to prepare for the patient's arrival, which was expected around 8 h after notification.

Isolation facilities

Prior planning had identified a wing in the acute medical admitting unit (AMAU) and this was made ready for the patient's arrival. Existing patients were transferred to other wards and the whole wing was closed off. Access was restricted to essential staff, and security personnel were posted outside the doors to monitor access. All personnel entering the restricted area signed in and out.

The patient was transferred directly from the air ambulance in an ISOPOD on a stretcher into AMAU via external doors, bypassing the Emergency Department as previously arranged. The helicopter landed in a closed-off section of road outside the hospital and the patient was transported across

Implications

- Infection prevention and control professionals should be prepared for the management of an Ebola virus disease case.
- The correct choice of personal protective equipment is critical for staff confidence and safety.
- Prior planning and training will pay off in a real scenario event.

to the hospital in the ISOPOD on a stretcher. The decision to transport the patient from her home to the hospital using the ISOPOD was made by the Emergency Services, based on reported symptoms at the time and the potential contamination risk to the interior of the air ambulance (helicopter). The patient was stable during transportation and she was able to safely transfer out of the ISOPOD within the isolation room. The emergency crew then safely doffed their PPE using a Buddy system in line with their prior training. The ISOPOD was double-bagged in impervious cadaver bags and stowed in a safe waste disposal area, while awaiting test results.

Strict EVD specific isolation procedures were implemented and the patient remained in full EVD isolation precautions for over 60 h until tested negative twice for EVD. Three negative pressure isolation rooms with anterooms and ensuite bathrooms were utilised: one for donning the PPE, one for the patient, and one for staff to take a shower and re-dress after doffing their PPE. Red, orange and green zoning around the patient's room had previously been determined and marked out on the floor with coloured tape. The infectious waste drums were stored in another single room adjacent to an exterior door for ease of delivery and pick-up. Other cubicles and spaces were dedicated to supplies and PPE training.

The disadvantage of this plan was that the closure of 20 beds significantly impacted on our acute medical admission capability.

Personal protective equipment (PPE)

Training in the use of advanced PPE for EVD had already taken place with several senior staff; further training with regular updates was planned. Christchurch hospital had chosen to train with a gown and hood ensemble, with the ability to change to an all-in-one coverall suit ensemble if there was a high body-fluid risk. This choice in PPE had arisen shortly after the commencement of preparation training when the staff themselves identified that they felt safer removing a gown ensemble than a coverall ensemble. Written and pictorial procedures were available. However, all staff involved in the initial care of this case received a refresher training and practice session during the course of Friday evening and ongoing throughout the course of the patient's isolation by the IPC nurse specialist and AMAU nurse educators. This was essential to ensure that staff felt confident in donning, wearing and doffing the PPE and the safety that it afforded. As is recommended, a Buddy system was used by the clinical team, but they quickly realised that the PPE procedures benefited from a third person. The Buddy would check and assist with the donning and doffing, while a third nurse would read out the instructions. The real-life wearing of PPE also resulted in small changes being made to the donning and doffing procedures, although the principle of using a Buddy system remained one of the most important aspects of the use of PPE for the staff involved.

Supplies of PPE were well managed and made easily available via the Logistics Officer under the CIMS. AMAU had three large packs of supplies ready to go in their storeroom, calculated to last ~24 h. The CDHB supply department had further stocks of EVD-specific PPE on a pallet in their warehouse and supplies were replenished over the course of the weekend from this stock. One of the lessons learned was that the multiple PPE training sessions, immediately before and after arrival of the patient, quickly depleted the AMAU stocks.

Wearing the PPE for a real case identified weaknesses in some of the items of PPE previously sourced and tested. The hoods turned out to be too small to be comfortable for larger heads, which became apparent when donned by a tall male doctor. The hood was cut with scissors at the back to enlarge it slightly for the one occasion that this was required. An alternative choice of PPE for this situation would have been the one-in-all coverall which has an integral hood. There were also issues with some of the disposable gowns. It had taken a long time to source a disposable gown that was long enough and prior training had been undertaken using another model. When the longer disposable gowns were introduced at the time of this admission, both for training and real use, they infrequently ripped under the arms during donning. On these occasions the gown was replaced before entry into the isolation room. There were no instances of the gown tearing while in use in the patient's room, but if this had become a major risk, there was an alternative sterile individually-wrapped surgical gown available or an all-in-one coverall. The full-length face visors fogged up quickly, which made clinical practice challenging. As a result, the medical staff who put in the peripheral intravenous catheter and took the blood samples reported that they learnt to do tasks requiring good visibility when they first entered the room. This visor was the only one available to the New Zealand market that was long enough, so further work is required to solve this problem, which will include evaluating the best mask to use under the visor or trialing the use of a defogging mist spray.

At no stage did the staff report feeling unsafe, as the patient did not pose an increased risk of exposure to blood or body fluids to staff during her stay. If the patient had deteriorated so that body-fluid exposure was a risk, staff would have worn a coverall ensemble. Sourcing of appropriate PPE had been one of the most difficult and drawn-out processes during our preparations, as many preferred items are not available for the New Zealand market. Similar PPE procurement issues were

reported by other New Zealand hospitals during their preparations.

Waste, laundry and cleaning

After the patient was admitted, some of her symptoms improved which resulted in minimal blood and body-fluid contamination of the environment. This made waste and environmental cleaning easier to manage.

EVD waste must meet international requirements for disposal, which are more stringent than New Zealand standards for infectious waste. Procedures had already been written for disposing of waste from the patient's room as well as the PPE removed outside. Waste was double-bagged and then taken to the waste disposal room and placed into the hard shell drums with a third packaging liner. The drums are a standard size and not really suitable to cater for large volumes of waste. Fortunately, in this incident the patient did not require healthcare workers to enter the room often, which limited the amount of PPE waste generated. The used ISOPOD would not fit into the medical waste drum so was initially placed in a large impervious cadaver bag and stored in a secure area. The waste supplier was able to provide drums as required over the weekend.

Disposable bed linen was used. Scrubs used by the staff under their PPE were laundered as infectious linen through the usual laundry processes. Any other linen was discarded.

All environmental cleaning was undertaken by the clinical staff. Touch points and horizontal surfaces were wiped down daily with a sodium hypochlorite solution of 1000 ppm and the floor outside the room where the PPE removal took place was mopped with disposable cloths using the same solution. There was a poster in the patient bathroom advising the patient or nurse of a cleaning procedure when the toilet was used.

Clinical procedures

Where possible, previously sourced disposable equipment was used in the patient's room. The patient was a nurse so she was able to undertake some of her own routine observations and report back to the nursing staff using a dedicated phone line. The senior medical officers who examined her, took blood samples and inserted a peripheral intravenous catheter. One of the doctors reported poor dexterity with the double gloves supplied so changed to using sterile surgical gloves as their outer gloves on subsequent examinations. Other dexterity issues arising from the visors fogging up have been noted previously in the PPE section of this report. The doctors had also been trained to use the portable point-of-use laboratory testing device, which was in the patient's room. The laboratory had also trained in their procedures and used these to test for malaria and send off samples for EVD testing to the Victorian Infectious Diseases Reference Laboratory in Melbourne. During the course of her stay the patient received intravenous fluids and was on telemetry.

Staff support

The IPC nurse specialists are not routinely on-call. However they made themselves available by phone 24 h a day during this period. In addition they went in during the weekend and spent several hours in the EVD area to provide on-hand support. In general the staff undertook their duties calmly and with confidence and there were relatively few IPC matters to discuss as most of our pre-planning worked well.

Conclusion

This admission was an excellent test of the EVD preparedness at Christchurch Hospital and in the wider New Zealand public health system. The IPC procedures and processes that had been previously prepared worked well and only required a few small changes during this incident. The patient helped the situation through her expert knowledge of EVD and was able to assist with her own care. She also kindly provided some feedback about the EVD procedures.

Some of the lessons we learnt was that further staff training in advanced PPE, along with regular updates are required to ensure that adequate numbers of staff are available to manage a case for a prolonged period of time. Some items of PPE will need to be reviewed, with alternatives sourced if possible.

It is recommended that healthcare facilities plan for an EVD admission with clear IPC procedures and processes developed. Staff training in advanced PPE should be undertaken in those hospitals likely to admit an EVD case.

Conflicts of interest

No conflicts of interest declared.

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