

Learning the hard way: Australian Defence Force health responses to terrorist attacks in Bali, 2002 and 2005

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IN ADDITION TO ITS PRIMARY ROLE in the defence of Australia, the Australian Defence Force has an increasingly important role in responding to disasters in Australia and the Asia-Pacific region, whether the result of terrorist attacks, natural disasters or other humanitarian crises. A key element of this response is providing health care to ADF personnel and the people affected by the disaster. The ADF remains capable of deploying large health treatment facilities in the longer term. However, particularly in the early phases of the response, aeromedical evacuation (AME) to move injured people from the affected areas to a higher level of health care is critically important. In addition to military operations in East Timor, the Solomon Islands and the Middle East, this capability has been used extensively in short-notice humanitarian events such as the

Abstract

- ◆ On 12 October 2002, Defence Health Service personnel responded to a terrorist attack in Bali, evacuating 66 patients to Darwin, and subsequently moving 36 of them to hospitals in other Australian cities.
- ◆ Although the response was regarded as a success, the scale of the operation revealed many shortcomings in the Australian Defence Force aeromedical evacuation system.
- ◆ Since the events of 2002, the Royal Australian Air Force, the lead Service in provision of aeromedical evacuation in the ADF, has undertaken a major upgrade of its operational health capability.
- ◆ These changes were tested in real time following further terrorist attacks on 1 October 2005, when the ADF was again called upon to evacuate casualties from Bali. Lessons learned in 2002 were implemented, resulting in a far more streamlined, better coordinated and resourced mission.
- ◆ This revised operational model and associated new capabilities will allow the ADF to meet future challenges in health support to military operations and in short-notice response to humanitarian disasters.

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Bali terrorist attacks in 2002 and 2005 and the Asian Boxing Day tsunami in 2004.

In recent years, opportunities to exercise this capability have allowed the ADF, and particularly the Royal Australian Air Force (the Service responsible for provision of tactical and strategic AME), to critically examine procedures, equipment and training in an effort to improve capability. In particular, the ADF health response to the first Bali terrorist attack in 2002, although regarded by most as highly successful, provided many lessons which prompted major changes.

In this article, we examine the response to the Bali bombings of 2002, detail the lessons learned, and demonstrate the improved response to a similar scenario when terrorists again struck Bali in October 2005. In particular, we examine four key areas: mission planning; command, control, communication and intelligence (C3/I); equipment; and personnel. In doing so, we demonstrate that lessons learned in responding to these events have better prepared the organisation to respond to a humanitarian disaster, and have better equipped the Defence Health Service to perform its primary role of support to military operations.

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Operation Bali Assist

On 12 October 2002, terrorists detonated two large explosive devices in Kuta, Bali, resulting in the death of 202 people (including 88 Australians), and generating large numbers of injured people, many with severe burns, and blast and shrapnel injuries. The Indonesian health facilities were overwhelmed and the ADF mounted a major AME response to evacuate the large numbers of severely injured people. Initial casualty estimations were relatively low (about 35 people), and the ADF planned to retrieve these people in two missions using C-130 transport aircraft and transport them to Darwin. En route to Bali, mission staff learned that the scale of the incident was much greater than originally anticipated, and the original AME teams were augmented with personnel and equipment from Darwin.

On arrival in Denpasar, the AME teams found a large number of unstable and undertreated critical casualties dispersed between Sanglah Hospital and other peripheral hospitals. To receive these casualties and prepare them for flight, an Aeromedical Staging Facility (ASF) was established at Denpasar airport using the limited personnel and equipment available from the AME teams. The ADF eventually evacuated 66 patients in five C-130 AME missions. Many of the injured had very severe injuries, including major burns, traumatic amputations and severe fractures. Three patients were intubated and ventilated before flight, one patient died at the ASF from a severe head injury, and another died from major burns in flight. On return to Australia, 20 patients required admission to Darwin intensive care unit (ICU) for stabilisation, and many had multiple emergency surgeries. Patients were stabilised in Darwin and subsequently transferred throughout Australia to specialist burns centres by ADF AME flights and civilian air ambulance.¹⁻⁴

Mission planning

Operation Bali Assist was initially planned as a simple AME mission to evacuate a small number of seriously injured but stabilised patients from Denpasar to Darwin. As the severity and number of injuries became known, the mission developed into a full aeromedical evacuation system (AES). This required establishment of the ASF, and multiple C-130 AME missions to evacuate patients to Darwin and beyond. As a result of this mismatch between plan and final requirements, the team was neither equipped nor staffed to treat and manage the actual number of severely injured people for so long a period. No formal intensive care or surgical capability existed, so much improvisation occurred, and hospital retrieval further stretched the resources of the team.

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Because of difficulties with communication and inadequate liaison with Indonesian health authorities, accurate information about the situation on the ground was either not available



Dr Steven Cook on arrival in Darwin on the first C130 from Bali with a severely injured burns patient.

or was not passed to responding health personnel. As a result, the health team was split almost immediately upon arrival, with one medical officer required to visit various local hospitals to assess casualty numbers and condition. Some patients arrived at the ASF unannounced, requesting transport to Australia. Communication on the ground was also limited, both within country and back to Australia. Health team members resorted to using personal mobile phones to maintain links. Although an Officer in Charge (OIC) was nominated, no formal command structure was established between team members and health authorities back in Australia, and an Aeromedical Evacuation Operations Officer (AEEO) was not deployed.

Equipment

The ASF was largely improvised from AME equipment such as Thomas Transport Packs and Oxy Vivas, and an extra disaster pack which had been loaded on the AME aircraft at the last minute. As well as the lack of formal surgical or ICU capacity, there was no pathology capability and a general shortage of equipment required to treat the large number of people with severe injuries such as burns and penetrating trauma. The number of casualties and intensity of treatment consumed large amounts of oxygen, fluids, antibiotics and resuscitation drugs, and stocks were quickly depleted. In the short response time available, additional oxygen, drugs, fluids and resuscitation equipment and drugs were sourced from ADF facilities in Sydney and Darwin, and local hospitals in Sydney, Darwin and Adelaide. Each C-130 arriving in Bali brought more supplies, until the surplus allowed excess medical supplies to be sent to Sanglah Hospital. Only four units of blood were available during the initial retrieval. Initial AME equipment included only four Propac monitors, and these had to be used sparingly because of battery life restrictions and a lack of an Australian compatible power source at the airfield. Some equipment had not been cleared for use in C-130J aircraft and a waiver was required for its use.

Personnel

The initial AME team which deployed from Sydney consisted of two medical officers, three nursing officers with critical care experience, and three medical assistants. As the mission escalated and the multitude and severity of casualties became obvious, this team was augmented with extra personnel in Darwin, including a surgeon, an anaesthetist (both Reservists from the Royal Darwin Hospital [RDH]), an ADF medical officer, and two extra nursing staff. The surgeon and anaesthetist were important additions as, in addition to providing invaluable clinical expertise in triage and stabilisation, both were able to directly liaise with the RDH on casualty estimates. The Permanent RAAF personnel had a wealth of operational medicine and recent trauma experience through deployments to East Timor. The second C-130 departed Sydney with extra supplies, nursing staff and Specialist Reserve medical staff. The small numbers of personnel initially deployed meant that many local Indonesian and expatriate health care workers and volunteers were used to augment the teams. These individuals provided some nursing care and acted as stretcher bearers.

The initial flights to and from Bali were on a very tight schedule because of aircrew duty limits. However, fatigue levels of the health staff were not considered, and this had the potential to compromise patient safety. Because of the inadequate staffing level, health personnel worked for unbroken periods of 24–48 hours, and many experienced extreme fatigue and stress to complete the mission.

The outcome

Operation Bali Assist was appropriately regarded as successful. This can be attributed to the training, flexibility and resourcefulness of the ADF health personnel involved. However, the complexity and scale of the mission exposed many areas that required improvement. Since then, RAAF Health Services Wing has collaborated with various agencies to overcome these shortfalls.

Operation Bali Assist 2

On the evening of 1 October 2005, three suicide bombers attacked separate locations in Kuta and Jimbaran Bay in Bali. The death toll was 26 (including four Australians), and about 130 people were injured, 19 of them Australians.

The ADF again mounted a response to evacuate casualties from Bali to Darwin. Twenty-one patients, including three patients with severe injuries who required intubation and ventilation, were transported in two C-130J aircraft from Bali to RDH. After stabilisation in RDH, a further strategic AME from Darwin to Newcastle was conducted for nine patients, including two ICU patients. The other patients were transported from Darwin using civilian air ambulances.⁵

Mission planning

From the moment ADF health assets were activated, Operation Bali Assist 2 differed significantly from the 2002 mission. As part of a whole-of-government response, an advance health team, the Medical Assessment Element (MAE), was deployed by civilian air to assess the situation and coordinate the evacuation before the other health personnel arrived. The 2005 mission was concurrently planned not as a series of AME missions, but as the deployment of a complete AES, including a lightweight Expeditionary Health Facility (EHF), to Denpasar airport. This provided the equipment and personnel necessary to retrieve patients from surrounding hospitals, stabilise these patients, including performing basic surgery if necessary, and then evacuate them to the RDH.

The health facility which deployed to Denpasar airport to manage the evacuation of casualties consisted of a small EHF Level 2 (EHF2), which has replaced the ASF, and a Fly Away Surgical Team (FAST). Together, these two elements constitute the RAAF's smallest deployable Level 3 health facility (EHF3 Basic). The EHF3 Basic was augmented by additional personnel from the health reserve elements of all three Services, who were either incorporated into the FAST or enhanced the AME teams with critical care skills. To coordinate AME, an AEOO deployed to Darwin, where additional health personnel, both Reserve and Permanent forces, were positioned to assist. The mission plan proved robust and provided the necessary operational capability and the flexibility required if the disaster had been of a larger scale.

The revised RAAF expeditionary health capability, developed following the ADF response to the Boxing Day tsunami in 2004, is based upon a modular system that allows for deployment of the appropriate level and size of health capability to meet operational demand. Various capability “bricks” can be used to tailor the facility to meet the requirements of the mission, from the EHF1, which provides primary health care, environmental health services and support to aerospace operations, up to a full hospital, the



The triage area at the Denpasar airport before evacuation to Australia.

EHF3. The system is similar in concept to the United States Air Force (USAF) Expeditionary Medical Support (EMEDS) and Small Portable Expeditionary Aeromedical Rapid Response Team (SPEAR) used successfully in several theatres of operations, including Iraq and Afghanistan, and the floods in Houston.⁶⁻¹⁰

The EHF deployed on this mission included the equipment and personnel necessary for triaging, stabilising and holding patients for up to 18 hours before evacuation, and for performing basic life-saving surgery.

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Although early reports were again somewhat imprecise, health intelligence was much improved in Operation Bali Assist 2 because of more formalised liaison with other government agencies and improved and streamlined military communication. Rapid deployment of the MAE was crucial in gathering and disseminating this information. The MAE's functions included reassessing casualty estimates and communicating this information to higher headquarters, locating patients, liaising with Australian government and Indonesian health authorities, and preparing a site at Denpasar airport for the EHF. Significantly, the MAE members were able to respectfully and sensitively gain access to Sanglah Hospital, receive handovers from treating physicians, and transfer patients to the airfield for evacuation. The Indonesian health staff provided valuable medical input and were heavily involved in patient management. This liaison was far superior to that during the original operation, probably because of a sense of familiarity and improved trust of both nationalities with each other's procedures.

Most importantly, the MAE provided command on the ground to manage and coordinate the activity of all health personnel. This function was aided by deployment of an AEOO, who ensured good communication was maintained and provided further command guidance to teams on the ground. Personal mobile phones were once again the primary form of communication.

Equipment

In Operation Bali Assist 2, equipment for stabilisation of patients before flight and their management in flight was provided — a major improvement over earlier experience. This was a direct result of improved planning. Surgical equipment (FAST) was available, and two new Enhanced AME kits provided critical care monitoring capability, including continuous invasive arterial monitoring and capnography. There was also an adequate supply of essentials such as oxygen, fluids and antibiotics. Another major improvement was the availability of 240 V DC power, both on the ground from generators at the airfield and in the air via new aircraft power units. This allowed monitoring and ventilation of patients without relying on the limited battery life of equipment.

Personnel

Deployment of an EHF instead of an AME team allowed for an adequate number of appropriately trained personnel, both Permanent and Reserve, to provide stabilisation and transport of the wounded. Early pre-positioning of extra AME teams and specialist medical and nursing staff at Darwin provided the flexibility to adapt to the evolving situation and allowed for improved management of health staff duty times.

Various ADF Reserve specialists deployed on the operation, including critical care specialists, anaesthetists and surgeons. They were highly effective and integrated with the Permanent RAAF personnel who constituted the core of the teams. Once again, the deployment of senior specialist Reserve personnel from RDH was important to mission success, as it streamlined the ADF–RDH communications.

The availability of an emergency physician was invaluable, as many patients had complex blast and shrapnel injuries and hidden injuries that required highly skilled trauma management. Many of the ADF staff had recent experience in Iraq and were sadly familiar with these combat-like trauma injuries. Unlike the first Bali bombings, where most injuries were burns, there was a higher proportion of penetrating trauma from ball bearings used in the explosive devices.

In addition to health personnel, security and logistics staff deployed to provide airfield security, deal with the media, and assist with power and airfield safety issues. C-130 missions were planned so that crew duty limits would not impinge on the operational requirements of the AME mission.

Outcome

Operation Bali Assist 2 was conducted in a very professional and well coordinated manner. Experience from the first Operation Bali Assist was used to increase the efficiency of the mission, and demonstrated a very effective deployment of a light, rapidly deployable health facility and aeromedical evacuation to Australia.

Conclusions

The ADF learned many lessons from experiences gained on Operation Bali Assist and was able to implement changes to improve its ability to respond at short notice to a similar scenario 3 years later. The ADF has responded to the challenges provided and the suggestions and input from many health professionals involved in the first operation. Consequently, it has significantly improved its capability to deal with offshore military, terrorist, and humanitarian disasters. Changes include the acquisition of new equipment and development of new ways of deploying personnel. The new RAAF expeditionary health capability, which was tested in an operational setting for the first time, proved robust and effective and ensured that adequate personnel and equipment were available to maximise flexibility.



Dr David Read (Major, ARA) at Royal Darwin Hospital inspecting a chest x-ray of a victim of the Bali Bombing in 2005 with shrapnel wounds.

Although the number and severity of injuries of the patients in Operation Bali Assist 2 were much less than in Operation Bali Assist, the response and capacity provided by the ADF was appropriate for the mission, and could have managed a much higher casualty load if required. Importantly, the ADF staff involved in this mission felt supported, well resourced and justly proud of their contributions to a well executed mission.

Overall, the ADF provided a professional and well-coordinated response to yet another civil disaster in Australia's region. Indeed, this felt very much like "business as usual" as this type of operation becomes increasingly core business rather than an exercise of the ADF's spare capacity.

Future directions

This mission demonstrated the importance of specialised health support, including AME and critical care medicine, in the ADF. The ADF has a unique capability in response to disaster management in Australia and the region. With its aeromedical evacuation and deployable health capabilities, the ADF can rapidly convey equipment, supplies and skilled personnel to a disaster area and rapidly evacuate injured people to appropriate facilities away from hazards, helping to prevent local facilities being overwhelmed. This is an important concept in disaster management, and also relevant in mainland Australia, where intensive care facilities are often stretched, and the ability of the Australian health system to deal with a major disaster or terrorist strike is being closely examined.^{11,12}

The ADF needs to continue to focus on military and trauma medicine to meet the demands of combat, humanitarian, and terrorist responses. ADF health personnel should continue to maintain and improve their critical care and trauma skills by placements in civilian trauma hospital departments as part of their duties, to be able to meet operational requirements. This capability should also be exercised regularly in a military context to continue to improve the ADF's systems and capabilities.

Further enhancements to capability are being developed in the RAAF, including the Military Critcare AME Team (MCAT) concept, which is similar to the USAF Critical Care Aeromedical Transport Teams (CCATT).^{13,14} The RAAF has also developed a dedicated ICU module — the Deployable Aeromedical Retrieval and Transport System (DARTS) — for installation on the C-130 aircraft. This will improve the ADF's AME capability. The expeditionary health concept is being further refined and upgraded to increase its flexibility and ease of deployment.

This will be assisted by a new structure for RAAF Specialist Reserve personnel, who will now be posted into full-time health units to provide specialist support as required. New equipment purchases are also underway, including additional FASTs. The introduction of the C-17 aircraft will further enhance RAAF AME capabilities by providing significantly larger range, speed and payload capabilities. Through these initiatives, the ADF will ensure that it remains a leader in short notice, rapid responses to medical emergencies in Australia's region.

Competing interests

None identified.

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