5.0 Discussion

Public health issues

Following natural disasters there is often a widespread fear that dead bodies will cause epidemics among survivors. Although it was difficult to gauge public opinion in the tsunami affected areas immediately after the disaster, our perception two months afterwards was that fear of disease was not the main driver regarding the disposal of the dead. This may have been because of considerable publicity about the low risk of diseases from dead bodies following WHO's statement concerning potential fatalities from infectious diseases [4] In Indonesia and Sri Lanka, WHO country offices and field teams were energetic about disseminating this message. Furthermore, that no large outbreaks or epidemics occurred in Aceh [5], even though thousands bodies remained unburied for several weeks, should be taken as further evidence that dead bodies are a negligible public health threat after natural disasters.

Although there are potential risks for individuals handling bodies during the recovery, identification and disposal process, we did not identify any reports of 'occupational' infections during our research. This was supported by an independent assessment of temporary morgues in Thailand by CDC and the Thai Ministry of Public Health [6] Health and safety problems included sharps injuries, burns from dry ice used to cool the bodies as well as heat stress and dehydration due to the overuse of personal protective equipment. However, occupational hazards of working among debris during body recovery presented a possible risk of tetanus, especially in Aceh where tetanus vaccination coverage was low. Recommending tetanus boosters should be considered for this occupational group in the future. Interestingly, the only adverse health event associated with dead bodies documented during this research was from the unnecessary spraying of a chemical disinfectant on forensic specialists in Thailand as part of decontamination measures

In Sri Lanka most of the dead bodies were taken to hospitals. In several locations this threatened to disrupt the provision of medical attention to survivors and in some instances, hospitals were effectively shut down. This is clearly an unsatisfactory situation and should be avoided in the future. Even where it may not be possible to prevent local communities taking bodies to the local hospitals, provision should be made to move the bodies to an alternative site.

Identification of victims following mass casualty natural disasters

Visual identification is likely to be the most practical option in most countries following mass fatality disasters. In a tropical climate without cold storage, the critical period for visual identification of the dead is 24-48 hours, before decomposition becomes too advanced for facial recognition. However, using visual identification as the sole method of identification may have a high error rate· following the Bali Bombing in 2002, a third of victims were incorrectly identified by relatives using visual identification [7] Nevertheless, useful information can still be collected after this period. For example, successful identification was achieved in Sri Lanka and Indonesia using personal effects including clothes, identity papers, jewellery, telephone SIM cards and other distinguishing features or items.

Making suitable arrangements for visual identification where there are mass casualties is extremely difficult. In Indonesia and Sri Lanka, relatives had to search through large numbers of dead bodies. Although the recent publication by PAHO suggest that this should be avoided [2], where there are a large number of bodies, setting up suitable arrangements is logistically very difficult and may require military logistics support.

Photographs are an alternative and simple way to achieve post mortem identification. This was done successfully in Sri Lanka. However, photographs need to be taken soon after death before decomposition becomes too advanced. One photograph of the face and a second of the whole body is probably sufficient; clothes and personal items on the deceased were used in the successful identification of several bodies in Sri Lanka. Clear instructions about the type of photograph are needed as many images that were taken were not suitable for identification purposes (i.e. photographs of groups of bodies). Digital photographs have many advantages over traditional film. But additional equipment needed to download, print and display the pictures needs to be available. Where traditional film is used, developing can be expensive and take time to achieve.

As of 30/04/2005, forensic identification efforts in Thailand successfully identified 40% (1,468/3,684) of the victims [8]. 49% of these were by fingerprints (Thai identity cards include fingerprint information) and 46% was using dental analysis. Only 2% have been identified by DNA analysis and 3% using physical evidence. Although these techniques are becoming increasingly available, few countries have enough trained staff or equipment to collect and analyse this data following a mass fatality event. For example, in Sir Lanka there was initial enthusiasm at a political level to use DNA techniques, but sufficient laboratory facilities or expertise to collect and process DNA samples do not exist in the country. Even with the enormous international forensic response in Thailand, forensic investigation is only useful if ante-mortem data (i.e. medical, dental and fingerprint records) or comparative samples are available. This may not be the case in many countries or rural communities.

Collecting and documenting information about victims produces a large amount of information. Managing this presents additional challenges. Using this data to enable

relatives to identify victims is especially difficult. In Indonesia where there were several body recovery teams, each had their own system to collect identity cards and other personal affects. Relatives had to visit each of the teams to find out if they had information about their family members. In Thailand, the Government has purchased special computer software to aid the management of ante-mortem and post-mortem data. Nevertheless there were several innovative approaches to identification including using mobile telephone SIM cards in Indonesia. In one hospital in Sri Lanka, a 'slide show' on a computer was set up to display digital photographs of victims.

Disposal of the dead

In a tropical climate it is not practical to store bodies without refrigeration beyond 72 hours In Indonesia, Sri Lanka and Thailand, bodies were buried in communal mass graves. Finding a suitable site for the graves was an issue, especially in Indonesia, where several communities now want to move existing communal graves. The mass graves in Sri Lanka tended to be better located, often within the grounds of existing cemeteries, and better documented with regard to location and the number of bodies However, in both cases the bodies were placed haphazardly in the graves one on top of another. This proved a serious problem for international forensic teams in Sri Lanka, who had to exhume bodies from some graves. In contrast to this situation, the orderly and well documented burial of victims in Thailand allowed relatively easy exhumation. Although burial in communal graves should be discouraged, where it is necessary, the Thai experienced should be used as an example of good practice. Burial in well organised trench graves should also be considered as a suitable method of storage for bodies Once buried, the cooler temperature under ground reduces the rate of decomposition quite considerably [9].

Management and Coordination

In the countries studied there was no single person or organisation with a clear mandate to coordinate the whole process of collecting, identifying and disposal of the dead. This resulted in a disjointed process. Body recovery was done by the affected community, voluntary organisations, the police and the military. Doctors, medical staff and forensic specialists were involved in death certification and collecting post mortem data. Disposal of the bodies was done by the military or police, who also had legal responsibility for victim identification. The lack of clear co-ordination caused tensions in Thailand between the police and the Justice Ministry. In Sri Lanka, the forensic medical community has been quite vocal in its criticism of the government about not involving them in devising plans to handle the dead after the tsunami.

Disaster Preparedness and Response

Countries like Thailand and Sri Lanka, which had established systems of death certification and forensic investigation, were quick to realise the importance of proper identification and burial of the victims However, no agency or organization currently provides technical support to governments and local responsible authorities regarding the management of the dead following natural disasters. INTERPOL is able to provide support for disaster victim identification, but this is usually following transport accidents or as part of international criminal investigations. Kenyon International (www.kenyoninternational.com) is a private company providing response services following mass fatality disasters. Like INTERPOL they have recently been involved in victim identification activities in Thailand. However, their primary area of response is following aviation disasters.

In all the countries visited, management of the dead was politically charged. Local authorities and national governments were put under considerable pressure from

both the affected communities and media. Many of the demands made on the responsible authorities were contradictory, such as the need for rapid disposal of the dead, while at the same time conducting proper identification of the victims. Lack of technical support is likely to have added to the pressure in many areas.

None of the affected countries had mass fatality management plans. However, good disaster preparedness in Thailand enabled them to mobilize very quickly. Nevertheless, considering the short time available for visual identification, there is not enough time to develop fatality management plans after a disaster. Considering that emergency assistance usually takes 24-72 hours to arrive in affected areas, even from within the same country, management of the dead will usually be done at the local level, as in Indonesia and Sri Lanka It is therefore important that future disaster preparedness activities do not limit the focus to national response, but also considers how to support local responders. Because maintaining a high level of preparedness at the local level may not be practical or cost effective in the longer term, a combination of strategies is probably needed. This could include developing a simple field manual about the management of the dead, awareness raising among key responding organizations such as the military and police and capacity development for NGOs like the Red Cross and Red Crescent organisations.

Limitations of this research

This was the first attempt to conduct fieldwork to systematically document the management of the dead after a natural disaster. The scope and timeframe of the work was ambitious, with field visits to three countries in three weeks. Consequently several aspects could not be addressed, such as the role of communications and the media and the viewpoint of affected communities. While every attempt was made to

speak to all key informants, the fluid nature of the emergency situation meant that it was not always possible to interview them.

Due to the highly sensitive nature of this work, prior agreement with national governments is advisable Affiliation with a recognised organisation, such as WHO, is also important as it provides the investigator with credibility, and confidence that the findings of the work will be used responsibly. Nevertheless, we found that in most circumstances, key informants were aware of the importance of the research and were happy to contribute.

6.0 Conclusions

Public health implications

- The public health risk from dead bodies after the tsunami was low
- The situation in Aceh, where several thousand bodies remained unburied for several weeks, should be taken as further evidence that dead bodies present a low risk of disease for the general public
- Body recovery teams reported no infections caused by handling dead bodies However, these workers did report strain injuries such as back pain.
- Body recovery teams were potentially at risk from injury while working among debris; the need for tetanus boosters or primary immunisation and treatment of tetanus-prone wounds should also be considered
- Several examples in Indonesia and Sri Lanka show that despite a large number of fatalities and limited resources, victims of natural disasters can be identified.

Procedures, systems and guidelines for managing the dead

- None of the countries included in this study had mass fatality management plans, although disaster preparedness did help countries organise their response
- With the exception of international forensic specialists in Thailand, no agency or organisation was able to provide technical guidance, nationally or locally, about the management of dead bodies. However, INTERPOL and forensic teams from individual countries did support body recovery and victim identification for foreign nationals in Sri Lanka.
- Coordination of body recovery, identification and disposal tended to be disjointed, with no single authority or agency providing an overview. This led to different approaches and confusion for families and local/national authorities.
- Despite some success with using advanced forensic identification methods in Thailand, the best approach to victim identification for most countries is probably early visual identification, supported by a simple system of taking photographs and collecting personal affects such as identification papers.
- It is usually not possible to arrange enough cold storage soon enough to keep a large number of dead bodies before significant decomposition takes place. Organised burial is likely to be the most practical way of temporarily storing the bodies until refrigeration can be arranged, positive identification made or more advanced forensic facilities become available.

Resources required for managing the dead

- In each country, management of the dead after the tsunami was an issue of national importance. However the responsibility for implementation was at the local level, where sufficient knowledge and resources to manage large numbers of dead bodies was often lacking.
- Basic equipment for body recovery (gloves, boots, transport etc) was locally available immediately after the disaster. However no country had sufficient stocks

of specialist equipment such as body bags. Additional logistical support for digging mass graves and transporting bodies was mostly provided by the military

- No country had sufficient forensic capacity or technical resources to apply advanced identification methods (e g. DNA or dental records) to deal with large number of bodies The enormous forensic effort required in Thailand to identify around 5,000 victims suggests that this is not a sustainable approach for identifying large numbers of victims. Additionally, there may not be a political will to mount such a response where foreign (Western) nationals are not involved Moreover, in many countries there may be an absence of reliable antemortum data and the resources needed to collect it; this would make more advance techniques impractical.
- Photographic equipment was widely available, and many people used their own personal digital cameras to take pictures of the deceased. However there was insufficient equipment to store/print digital photographs. Developing large amounts of 'traditional' 35mm film was costly and took a long time to achieve
- Although countries such as Sri Lanka took many photographs of bodies, many images were not adequate for victim identification. Simple instruction is needed about how to take photographs for post mortem identification.
- Managing the large amount of information collected from many bodies is difficult. Local areas developed ad hoc systems such as notice boards displaying photographs and "slide shows" of digital photographs on computers. However, no technical support or systems were available for data management for victim identification.

7.0 Recommendations

1 Simple plans for mass fatality management should be considered as part of national and local disaster preparedness activities. Disaster preparedness for mass fatality incidents should not be limited to the healthcare sector, but must include the military and police, as well as non-governmental organisations such as the Red Cross.

2 A named person/organisation should have an agreed mandate to coordinate the management of dead bodies at the national and local level This role should include the recovery, burial, collection of identification data (photographs, personal effects, etc), management of victim identification data and public relations regarding the management of the dead

3. Simple, practical field guidelines for the management of dead bodies are needed at the national and local level. This should include guidance on body recovery, temporary mortuary facilities, simple identification techniques, burial and data management for victim identification

4. The Pan American Health Organization/ World Health Organization should continue to develop technical capacity in the area of managing dead bodies It should also establish mechanisms to provide technical assistance to governments and local authorities after a disaster, such as a network of suitably trained and experienced professionals who could mobilise at short notice

5 For large fatality incidents, basic methods of identification should be a minimum requirement. The simplest approach is likely to be visual identification, supplemented by photographs. More advanced techniques can then be used to support identification efforts, when and if resources become available.

6 Where refrigerated storage is unavailable, bodies should be photographed, documented and temporarily buried in a manner that allows for future exhumation.

7. Further field research should continue to systematically document and learn about the management of the dead after natural disaster.

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