

# The 2004 Tsunami Disaster in Asia

Home Transport and Emergency Care  
in Sweden

KAMEDO-report 91

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Kamedo (the Swedish Disaster Medicine Study Organisation) has existed since 1964. The committee started its activities under the auspices of the Swedish Research Delegation for Defence Medicine. In 1974 Kamedo was transferred to FOA (the Swedish Defence Research Establishment), now called FOI (the Swedish Defence Research Agency). Kamedo has been affiliated with the National Board of Health and Welfare since 1988.

The main commission of Kamedo is to send expert observers to places in the world affected by large-scale accidents or disasters. The observers are sent to disaster areas at short notice and collect relevant information by contacting doctors and other colleagues. The information they obtain may only be used for scientific purposes. There are four main areas which are studied first and foremost: the medical, psychological, organisational and social aspects of disasters.

Results from the studies are published in Kamedo reports. Since 1979 (report 34) they have a summary in English, which is only presented on the Kamedo website ([www.socialstyrelsen.se/Amnesord/krisberedskap/specnavigation/Sakomraden/KAMEDO/Kamedo\\_rapporter.htm](http://www.socialstyrelsen.se/Amnesord/krisberedskap/specnavigation/Sakomraden/KAMEDO/Kamedo_rapporter.htm)).

The general guidelines for Kamedo activities were determined by the committee, which met two to three times a year. Work in progress was mainly carried out by the two scientific secretaries, who were affiliated to Kamedo on a consultancy basis until 2007.

The chairman of Kamedo until 2006 was Professor Bertil Hamberger, Karolinska Institutet, Stockholm, and the two secretaries were Louis Riddez, reader and senior consultant at the Department of Surgery at Karolinska Hospital in Stockholm, and Helge Brändström, senior consultant at the Department of Anaesthesiology and Intensive Care at the Norrland University Hospital in Umeå. Other members came from the National Board of Health and Welfare, Stockholm Fire Department, Headquarters of the Defence Forces, the Swedish National Defence College (Crismart), the Prehospital and Disaster Medicine Centre in Västra Götaland region, Uppsala University Hospital and Stockholm County Council Health Authorities.

On 1 January 2007, Kamedo became more closely affiliated to the National Board of Health and Welfare after it underwent reorganisation. The two scientific secretaries were replaced by an expert at the National Board of Health and Welfare. The committee was replaced by an internal steering group at the National Board of Health and Welfare and a reference group with representatives from some of the National Board of Health and Welfare centres for research and development within the area of emergency preparedness, the joint authority needs assessment group for international actions, Crisis Management Research and Training (Crismart), the Swedish Emergency Management Agency (SEMA), the Red Cross and one of the previous scientific secretaries.

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# Preface

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The tsunami disaster on 26 December 2004 caused widespread death and destruction in large coastal areas around the Indian Ocean. The disaster resulted in momentous consequences for large parts of south-east Asia – everything from personal tragedies to far-reaching consequences for countries' economies and populations. The aftermath will be felt far into the future.

The disaster did not only affect south-east Asia, but also influenced many countries far away from its epicentre. Never before had so many Swedish citizens been hit so hard by a disaster, despite the fact that it took place far from their own country. A little more than one year after the disaster it could be confirmed that 543 Swedes died. Eighteen are still missing.

For many of those who were not in the area it was clearly difficult to realise quickly enough the extent of the disaster and its impact on the large number of Swedish tourists that were in the affected areas, primarily in Thailand. Exhaustive reviews of what happened during the first days after the disaster, at government and authority levels, both in Sweden and in Thailand, have been made and published in the report from the Swedish Tsunami Commission as well as in a report by a group of experts within the field of disaster medicine. These reports describe the sequence of events in both the disaster area and at the Swedish authorities in detail, and in general they aim extensive criticism at the Swedish government, the Ministry for Foreign Affairs, Swedish authorities in the disaster area and the National Board of Health and Welfare.

The Swedish Disaster Medicine Study Organisation (Kamedo) and the two scientific secretaries had the National Board of Health and Welfare as their principal. When the decision was taken to produce a Kamedo report on the tsunami, the authority was well aware that reports would also be written by others, above all by the appointed Swedish Tsunami Commission. For that reason, this report was not completed until conclusions from the other reports had been drawn.

Kamedo has chosen to study the care of survivors and injured during their transportation from Thailand and during the early stages of their return to Sweden. Some of the text has been cited directly from reports already written by the Swedish National Air Medevac (SNAM), the Stockholm County Council health authorities, Västra Götaland region and Kamber (Ambulance, disaster and preparedness administration) in Skåne. Other information comes from briefer reports or interviews made by the chief editor of the report, who was himself involved in the care of casualties at the Karolinska University Hospital in Solna. The psychological and physical after-effects are presented in the form of a poll conducted one year after the disaster.

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The final processing of the material was carried out by *Louis Riddez*, which led to the conclusions and recommendations proposed in the report. These should thus be considered as *personal viewpoints*, which do not necessarily represent the opinions of all the groups of authors.

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# Abbreviations

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**ARCC** Aeronautical Rescue Coordination Centre

**BUP** Child and Adolescent Psychiatry

**CMKL** Central Medical Disaster Management

**ETA** Estimated Time of Arrival

**ETD** Estimated Time of Departure

**MRSA** Methicillin Resistant *Staphylococcus aureus*

**NU medical services** One of five hospital administration units in the region of Västra Götaland

**NÄL** Norra Älvsborg County Council hospital; part of NU medical care

**PKL** Psychological and Psychiatric Disaster Administration

**PKMC** Pre-hospital and Medical Centre for Disasters

**POSOM** Group working at municipal level, intended to lead and coordinate the psychological and social care of victims, relatives and personnel after major accidents

**RBL** Regional Physicians for Emergencies

**RMKL** Regional Medical Emergency Administration

**RTiB** Regional Officials on Call

**SNAM** Swedish National Air Medevac

**SOS Flygambulans** SOS Air Ambulance

**SOS OP** SOS Alarma Västra Götaland region

**SOS Skellefteå** SOS Alarm Skellefteå

**SU** Sahlgrenska University Hospital

**TiB** Official on Call

# Summary, Experience and Conclusions

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The tsunami disaster of 26 December 2004 indirectly hit Sweden hard. It put extraordinary demands on the Swedish emergency preparedness; preparedness that was not planned for events outside the country's borders. Thus, for a number of different reasons the measures taken to rescue Swedes involved, above all in Thailand, came to be delayed – which has already been analysed and criticised by the government appointed Tsunami Commission. In contrast, preparations for the reception of those returning from the disaster area were started early by all county councils affected, and cooperation between the authorities involved worked well. Daily telephone conferences between all key players were started the day after the disaster. This facilitated the spread of information and cooperation beyond county council limits, and also resulted in medical teams being sent to Thailand after a few days.

Regarding the transportation home of casualties, it was in the afternoon of 28 December that Västerbotten County Council was given the task of organising medically safe transportation home for the seriously injured. This would take place using the Swedish National Air Medevac (SNAM), which was not fully operational at the time. For this reason it came to be called SNAM light; two MD 80 aircraft with 36 stretcher places each, and an Airbus 340 with 20 stretcher places, were sent to Thailand. The first two flights with the MD 80 aircraft returned to Arlanda airport outside Stockholm on 1 January 2005 after three intermediate stops and almost 24 hours flying time. During the transportation dressings were changed and plasters were reset, but there were no serious medical problems. There were great difficulties involved in sending home manifests and lists of injured people however, which made reception at Arlanda difficult. The transfer of passengers from the ambulance aircraft at Arlanda was time-consuming and complicated, despite ambulance aircraft with more severely injured patients being assigned a special hangar. The management organisation for this transfer did not work satisfactorily. When the patients had finally been transferred to other specially chartered domestic flights, however, transportation proceeded with relatively few complications.

At Arlanda, slightly injured or uninjured passengers who had arrived at the airport with regular flights before the arrival of the SNAM aircraft, had already been taken care of, and this service had worked excellently.

A crisis centre had been established at Arlanda, manned by doctors, nurses, land ambulance personnel, as well as psychological and psychiatric disaster management (PKL) from Stockholm County Council. In addition there were personnel from the Red Cross, the police, the Swedish Church, the social services, travel agents, airlines, insurance companies, the Swedish Civil Aviation Administration, the Foreign Office and personnel from the



Norwegian and Danish embassies. A similar organisation was also established at Landvetter airport, Göteborg. All passengers were registered after the aircraft had landed, and many had their injuries examined and when necessary wounds were re-dressed, and those who needed psychological support were referred to appropriate personnel. There were good resources for onward transportation by ambulance, and therefore there were no unnecessary waiting times for continued land transportation. However, there were certain problems in sending the injured needing medical care in Stockholm to the right hospital since the initial plan was to have a system using rotation of hospitals, irrespective of their resources for offering the specialist care that was necessary. This was dealt with relatively well by the categorisation of injured at the airport, even though some competition arose between the hospitals.

In those counties which had the largest numbers of victims, emergency organisations started their work early. The Stockholm County Council health authorities came to be responsible for taking care of victims from their own area, as well as many of those who were flown to Arlanda airport and who then needed further transportation by ambulance to hospitals in their area of residence. A special reception organisation was created for this purpose at Arlanda. To be able to offer a continuous service of ambulances and medical staff at Arlanda help in the form of ambulance and medical personnel was needed from other county councils. The whole process was made far easier when the Rosersberg rescue centre was opened, which could offer good accommodation and the possibility of rest for ambulance personnel between shifts.

The Västra Götaland region Prehospital and Emergency Medical Centre was to become responsible for coordination of all onward transportation by air and ambulance after the arrival of injured people at airports in Sweden, as well as the reception of uninjured and injured people from the region itself. The work with coordinating all onward flights and ambulances to other parts of Sweden was extensive and demanded a well-established organisation with good contacts with a number of large players including the Swedish Civil Aviation Administration, the Aeronautical Rescue Coordination Centre, the management of SNAM, the National Board of Health and Welfare, airlines and all county councils involved.

The reception of injured and uninjured at Landvetter airport was similar to that in Stockholm. Medical resources at Landvetter consisted of regional emergency doctors, three medical groups (doctors and nurses), ambulance helicopters, psychiatric disaster management groups (15 people) and ambulance resources. An assembly place for injured people was set up in the arrivals hall.

The Skåne County Council health authorities would have the responsibility for the reception of uninjured and injured people in their own region. Also here good medical resources were organised at the airport, even though the number of passengers was considerably fewer. Like the county councils named above, personnel were also recruited who could be sent with medical teams to the disaster area.

Of those who had physical injuries, the majority were treated at different hospitals in the Stockholm region, of which the Karolinska University Hos-

pital in Solna received the most seriously injured. Empty wards were opened, which was important considering the special hygienic procedures that were required. Everyone who had been treated at hospitals in Thailand was initially given their own room when they arrived at the hospital where they could be registered and receive further medical care. Arrangements were made for relatives to be near each other, and to this end an empty department was opened that would function as a hotel.

Cuts and bruises to arms and legs were common and many were badly infected. There were apprehensions of a large number of MRSA infections, but in fact these were fewer than expected. On the other hand there were many wound infections caused by uncommon bacteria or other microorganisms, and in many cases these were difficult to treat, some of them later causing recurrent wound infections. Some of the injured who had major soft tissue injuries needed longer stays in hospital and in some cases advanced plastic surgery to help the healing process. There were no deaths reported during transportation home or afterwards.

Psychosocial problems were overwhelming for many who had lost relatives or family members. Early psychosocial support was offered to everybody when they arrived at airports, as at reception hospitals and/or at the district medical stations that would receive people affected by the disaster.

## Experience

### Home Transportation of Injured and Uninjured

- If the home transportation of injured people from Thailand had been started earlier, it would certainly have off-loaded medical care personnel in the disaster area and would probably have been able to relieve the worries and psychological impact on Swedes affected in the disaster area. Physical injuries, on the other hand, would not have been significantly better treated through earlier care at home in Sweden.
- In any future disasters abroad, the need to use SNAM must be evaluated early in the process.
- If it is judged that victims must be evacuated by air and that SNAM is necessary, it is important that the reconnaissance team from SNAM is sent to the disaster area as early as possible.
- The SNAM representatives who were part of the medical team sent to Thailand played a significant role in coordinating transportation from different hospitals to the airport. Despite this fact, there were problems in coordinating medical transportation from all hospitals with the flight departures available at the time.
- Plans for how SNAM flights are to be received at airports abroad need to be drawn up. On arrival at an airport abroad, embassy and SAS staff need to be informed in advance. The need for interpreters and guides must be determined, and they must either be on the plane or be in place when it lands. All SNAM personnel must have clothes that resemble uniforms and an ID badge stating their affiliation.

- It is important that all medical staff are provided with mobile telephones. Every medical team needs to be provided with satellite telephones, and it would be appropriate to train personnel in how to use them. Every team must have a mobile fax.
- The MD 80 aircraft flight time was long and included three intermediate stops. Their limited range of approximately 3000 km means that other options should be considered, such as the Airbus 340, in the case of longer distances. The SNAM light concept may, however, be developed as a part of SNAM. It has a large capacity and functions well in the transportation of slightly to relatively badly injured patients.

### Coordination of Onward Flights and Ambulance Transportation within Scandinavia

- Obtaining correct manifests from ambulance flights was the greatest problem for the unit (PKMC – Västra Götaland region) charged with coordinating the onward land ambulance or air transportation of tsunami victims within Scandinavia. The manifests arrived late, especially at the beginning of the evacuation, and were not always correct. The reason for this was lack of suitable communication channels from the aircraft. This led to confusion at Arlanda since certain patients were booked on flights and helicopters but could not be found after disembarking. In future, personnel on board aircraft need to be able to transfer information, which is at least partly subject to medical confidentiality, in the form of text and figures.
- In order to determine which county council and hospital a patient belongs to, access is required to the population register. In similar situations in the future it would be valuable to have access to this information if at all possible.
- A call-centre that can contact a large number of people quickly has an important function in similar events and must be able to start up activities quickly.
- PKMC flight coordination and ARCC needed to cooperate better. This would have provided a better grasp of the information, which was extensive and varied and in addition was divided between a large number of lists of arriving or planned flights.
- Civil aircraft ambulance proved to be very useful for transportation within and outside Sweden. Since there are several players involved, in future the aircraft must be ordered in a correct fashion, for instance only orders by fax by personnel with the requisite authority being allowed as the basis for an order.
- Cooperation with SOS International in Copenhagen did not work, partly as a result of unclear division of responsibilities, and must be improved. Increased cooperation between SOS International and the authorities involved in Sweden could improve conditions for handling any future crises.

- The Tp84 Hercules aircraft proved to be very useful for secondary transportation of a large number of injured people. However, its stretcher racks require that military stretchers be used. These stretchers do not fit into Swedish road ambulances, wherefore the injured must be lifted onto other stretchers. In bad weather conditions this must be carried out in a heated hangar.
- The system of using county council health authorities' Officials on Call (TiB) for general information, reports on arriving patients, ordering of ambulance transportation from airports and so on worked well. One condition for this, though, is that there is one contact point (portal) for information, preferably in the form of e-mail, which facilitates the spread of information on a large scale. Using only mobile telephones as contact paths, in certain cases exchanging numbers during ongoing measures, is not acceptable.
- The Stockholm County Council health authorities played a key role in the reception of patients from the disaster area. This is a role which it may be given in the future, since Arlanda is the airport where Swedish national ambulance flights land. The organisation for receiving patients therefore needs to be developed and trained. It is important that direct contacts are established between players responsible for secondary transportation and with somebody from the Centre for Medical Crisis Management or SOS Alarm. This is necessary to avoid what happened: too many players called PKMC to get their own information about passengers on arriving flights.

### Initial Care of Tsunami Victims at Arlanda and Landvetter

- Cooperation between medical personnel onboard SNAM aircraft and the medical management at receiving airports must function well and be trained regularly.
- The need to take care of patients' physical injuries at Swedish airports directly after their arrival in Sweden was probably overestimated in connection with the tsunami. Most people with serious injuries had been examined and had received treatment during the flight, and what they needed above all was continued and rapid treatment at a medical institution.
- On arrival at Arlanda, most passengers had their wounds assessed and re-dressed. It was apparent that a large number of wounds were infected. This delayed the onward transportation of patients and the value of examination is doubtful. Certain injuries were such that patients needed pain relief while they were being re-dressed. The types of bacteria were such that better isolation and cleaning between all re-dressing of wounds would have been appropriate.
- The medical requirements of each patient must as far as possible dictate where they are sent. This means that certain specialised hospitals will be used more than others. The situation is probably best solved by redirecting other patients instead of using a rotating schedule for hospitals receiving victims.

## Care of the Injured at Karolinska University Hospital, Solna

- Initial care went smoothly after the hospital opened empty wards that were well manned with nurses and doctors and where the injured were immediately given single rooms in which they were registered and given their first treatment. The fact that relatives were able to stay at the hospital was also very much appreciated and probably good support for those who needed continued medical care.
- The rigorous hygienic procedures that were applied at the hospital from the arrival of the first patients prove to be important, even though the number of MRSA positive bacteria cultures were considerably fewer than expected. However, the bacterial flora proved to include many uncommon bacteria or microorganisms that were resistant to many antibiotics. Despite the fact that on this occasion there was an overestimation of the number of patients having MRSA infected wounds, it is important to consider the risk of serious and unusual infections in similar catastrophes by ensuring that adequate hygienic procedures are followed, among other things.
- The different types of wounds that were observed were for the most part severely infected. Several different specialists were often required to treat them. Specialist plastic surgery skills were often important for final treatment of the most complicated soft tissue injuries.

## The Psychological and Social Reception after Returning Home and the Psychological State of Victims 14 Months after the Catastrophe

- Only about half of those who received the questionnaire about their psychological state 14 months after the catastrophe actually answered it. This proportion naturally reduces the extent to which results can be generalised and invites caution when drawing conclusions from the results. Of those who did respond, one quarter stated that they still had impaired psychological well-being 14 months later. Relatives, friends, colleagues and neighbours most commonly provided support after their return home.
- The questionnaires showed that victims used many paths to seek help. As shown in other studies, help from relatives was most important, followed by that from friends and colleagues. The support from schools and employers seems to have been great. The public bodies used were primarily crisis groups and family doctors, and counsellors or psychologists at medical centres.
- Only a small proportion of those who responded to the questionnaire had sought psychiatric help. This may indicate that many received adequate help after returning home, and that there was good knowledge of the effects of traumatisation among care providers in counties and municipalities, in crisis groups and private care providers. With respect to the respondents' satisfaction with support, among the most commonly men-

tioned were private psychotherapy, priests, religious groups and insurance companies.

# The Event

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The earthquake on the seabed off the coast of Indonesia and the resulting tsunami on 26 December 2004 had catastrophic consequences for a large number of countries in south-east Asia, where it resulted in widespread death and destruction.

The disaster did not only affect south-east Asia, but also had a great impact on many countries far from the epicentre of the earthquake. One of the European countries hit hard was Sweden, where many people found it difficult to comprehend the extent of the disaster at an early stage. Swedish emergency preparedness, which was not intended for an event in which Swedes would be affected outside the country's borders, faced a completely unplanned situation.

At the time of the enormous tsunami disaster there were probably more than 20,000 Swedes in south-east Asia. The tsunami hit Thailand's coast just after 10:00 local time; first the island of Phuket and then the islands of Phi Phi. These areas have been established tourist resorts for many years. Fifteen minutes later the wave reached Khao Lak, which lies north of Phuket and is one of the most recently developed tourist areas in the province of Phang Nga, with hotels and bungalows along a beach about 20 kilometres long. Many tourists had gone down to the beach when the wave hit. People probably did not understand what was happening when the water drew back. The wave, which in reality consisted of several waves, carried people for up to one kilometre in some cases. Others were stuck in palm trees and the tops of other trees, while some escaped by climbing to the upper floors of hotels.

Up until 15 January 2005 the police authorities in Sweden registered approximately 19,000 people returning home. Some of them had travelled to the disaster area after the event to search for relatives, others came from other tourist areas who had landed in south-east Asia en route home, and who were perhaps not directly affected by the disaster. The major travel agencies estimated the number of Swedes in the disaster areas in Thailand at between 6,000 and 8,000.

For many reasons measures to rescue Swedish victims, above all in Thailand, were delayed. This has already been described and criticised by the Tsunami Commission appointed by the government. The first group of medical personnel was sent to Phuket on the third day after the disaster to evaluate medical needs at the airport and to accompany injured people on the flight back to Sweden. When the need for medical care proved to be extensive, more medical personnel were sent to Phuket on the fourth day after the disaster. In contrast, preparations for the care of people from the disaster area were started in time in all county councils affected. Likewise, a national network was started as early as one day after the disaster, and after some days the Swedish National Air Medevac (SNAM) was able to carry out its first major assignment, albeit in a modified form. The National Board

of Health and Welfare was responsible for formal assignments to county councils, which were requested to supply medical personnel for the medical teams sent to the area. The county councils were responsible for the composition of the teams, the medical equipment and care provided both on-site and during transportation home.



# The Tsunami Network – a Form of Cooperation between All Players Involved in the Country

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On 27 December 2004 at 10:00, after a proposal from SOS Alarm, the National Board of Health and Welfare initiated a telephone conference with the disaster management teams of the Skåne County Council health authorities, the Stockholm County Council health authorities, Västra Götaland region, the Ministry for Foreign Affairs, the National Center for Disaster Psychiatry and SOS Alarm Stockholm. The National Board of Health and Welfare chaired the telephone conference, while administrative responsibility was taken by SOS Alarm. It was soon clear that more telephone conferences would be necessary, and 24 hours later two telephone conferences per day were established between the above organisations. Other bodies soon joined them, such as the Swedish Armed Forces, The Swedish Association of Local Authorities, The Federation of Swedish County Councils, the Swedish Civil Aviation Administration, the Swedish Police Board, The Swedish Rescue Services Agency and Södermanland and Västmanland county councils. Even though all of the players did not take part in every conference, many issues covering the entire field of disaster medical care could be dealt with and many questions regarding responsibilities could be cleared up. When, after some time, the division of responsibility was clarified for various activities on the part of county councils involved, these telephone conferences were of great value in the recruitment of medical personnel to be sent to Thailand as well as cooperation between county councils and other players.

***Authors' comments:** Telephone conferences with all players involved must be able to be started up immediately. The National Board of Health and Welfare has procured a service for convening and executing telephone conferences in the case of major incidents. In brief, this means that SOS Alarm – on request by the National Board of Health and Welfare or another player – can very rapidly call together all players and administrate and document telephone conferences. It is primarily the National Board of Health and Welfare that will utilise the service, but county councils also have the right to do this without the National Board of Health and Welfare being involved.*

# Air Transport to Sweden from the Disaster Area

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Soon after the disaster there was a great need to evacuate the injured by air from Thailand to Sweden. The possibility of using Swedish National Air Medevac (SNAM) was put under scrutiny at an early stage in Sweden. The work involved in building up a national air ambulance organisation was still not completed at the time. The project is described in detail in appendix 1.

On 28 December the Swedish Civil Aviation Authority (CAA) was given the commission by the Ministry for Foreign Affairs to examine the possibility of bringing home injured people from Thailand using specially equipped ambulance aircraft from SAS.

When the tsunami disaster struck, the SNAM intensive care stretchers were not ready for use. The earlier air evacuation concept of the Total Defence Force was used instead, with 36 stretchers in the aircraft type MD 80. The evacuation by air of slightly and moderately injured that could be offered by the Swedish CAA was called SNAM light.

Many Swedes were transported home in other ways than by the SNAM light service. Several Norwegian SAS Braathens aircraft (Boeing 737) were used to bring home Swedes, as were a Falkon 900 aircraft from Volvo-Ericsson-Skandia and a Boeing 757 from Icelandair. A number of Swedes were also transported home by the German and French air forces via Frankfurt and Paris respectively.

## Cooperation from North to South

Actions were managed from the Swedish CAA operations room at Arlanda. The area of responsibility for the management staff was later expanded to cover Norwegian Braathens, Icelandair and Volvo-Ericsson-Skandia.

SAS took on the job of temporarily converting two of their regular MD 80 aircraft and later an Airbus 340 into ambulance aircraft. Medical personnel were mainly recruited from Västerbotten County Council, but other county councils also contributed personnel. All of them had been trained by SNAM.

The region of Västra Götaland coordinated the onward air and ground transportation of injured and other persons from Arlanda or Kastrup to other areas in Sweden. The Stockholm County Council health authorities had responsibility for the practical details of care at Arlanda.

## Air Evacuation in Chronological Order

*On the evening of 26 December* the head of the medical project at SNAM contacted the manager of the Unit for Emergency Preparedness at the National Board of Health and Welfare. The purpose was to raise the question

of whether injured Swedish citizens could be evacuated by air using the SNAM concept, but since the project had not been completed a simpler concept using military stretchers in an MD 80 aircraft was proposed. The National Board of Health and Welfare contacted the Ministry for Foreign Affairs and offered to contribute services by attempting to mobilise this resource, but the Ministry for Foreign Affairs answered that this was not currently in question. The National Board of Health and Welfare contacted the county councils in Stockholm, Skåne and Västra Götaland and requested that they prepare for the possible care of Swedish citizens arriving on regular flights at the major airports in Sweden (Arlanda, Sturup and Landvetter). *On 27 December* in the morning and the evening, SNAM representatives put forward the proposal of using SNAM light, but this was still not requested.

*On the morning of 28 December* the project management of SNAM discussed by telephone conference how a possible evacuation of injured Swedish citizens could be carried out, despite the fact that there was still no request for the service. One of the main issues that needed to be solved before a commission could be taken on was identified at the meeting; mainly, who would take responsibility for medical care. On the afternoon of Sunday December, Västerbotten County Council was given a preliminary request from the Swedish CAA to carry out an evacuation mission using SNAM light, and at the same time to be responsible for a medical crew and medical equipment for two MD 80 aircraft, each containing 36 stretchers. The Director and Commissioner of the county council were contacted and both gave the go-ahead. Despite the continued absence of a formal commission, medical personnel started preparations.

*On 29 December* at 11:00, Västerbotten County Council was given a formal request by the CAA. On the same day the county council booked transportation of the medical crew to Arlanda, medicine and medical equipment was packed in accordance with lists already prepared, and insurance and vaccinations were arranged for the personnel. Two people, one doctor and one nurse, were appointed to take part in the medical team that was sent to Phuket on the evening of 29 December with the aim of preparing a medical evacuation. At 20:00 the medical crew and equipment left Västerbotten for Arlanda. On the same evening the Västerbotten County Council established a staff team at the operations centre at Norrland University Hospital. The staff was to support the medical team, and started preparations for the commission which could follow. From 20:00 the Västerbotten County Council contributed with the head of medical management for the commission at the CAA management staff at Arlanda.

***Authors' comments:*** *It cannot be established that the earlier use of SNAM would have been able to offer earlier and safe home transportation of those with the most severe physical injuries. In all probability the physical course of injuries would have been the same. The medical services in Thailand, which were under an enormous load in the region affected by the disaster, would however certainly have been relieved by the service.*

## Departure of Two MD 80 Aircraft

*Early in the morning of 30 December* oxygen and medicine was prepared for the two MD 80 aircraft. The decision was taken that the medical crew would fly with Thai Air on a regular flight the same day. The medical supplies and equipment were sent as freight on the same flight. The two MD 80 aircraft were flown without passengers and equipment to be as light as possible. In this way they would be unable to reach Bangkok with only one intermediate landing. The two MD 80 aircraft departed at 12:00 and the Thai Air aircraft at 14:00, all with the final destination of Bangkok.

## Commission Increased to Three Aircraft

The management staff at Arlanda was given a further commission *on 30 December* to prepare a medical crew and equipment for an Airbus 340 with 20 stretcher places for departure from Kastrup airport in Copenhagen on 31 December. The management staff at Norrland University Hospital arranged a third medical crew for this commission, with participants from Umeå, Sundsvall, Östersund, Norrköping and Göteborg. Medical supplies and equipment for the commission were packed and sent to Arlanda. The third SNAM light group in the Airbus 340 departed at around 12:00 on 31 December.

## Collecting Patients for the MD 80 Aircraft

The medical team (reconnaissance team) that had been appointed and sent ahead arrived in Phuket *on 29 December* and started intensive work collecting patients as quickly as possible from the hospitals in Phuket and arranging for their transport to the airport for the flight home. SNAM personnel were wearing uniform clothes and an ID badge, which gave the mission an official appearance.

The two MD 80 aircraft arrived in Bangkok *early in the morning of 31 December*. There were problems in gaining access to the medical supplies and equipment that had been transported as freight with Thai Air. For some time it was also unclear when the two MD 80 aircraft would be available. A representative from SAS who had been prepared to receive the crews of the ambulance aircraft was not in place. When he arrived the problem was however quickly solved. The equipment was quickly packed into the aircraft, largely unchecked in the tight time schedule. One aircraft then took off for Phuket.

The MD 80 aircraft that had been redirected to Phuket was met by medical personnel and conditions that were to some extent prepared but still rather chaotic. There were injured people in a hangar which was used as a reloading place. This was staffed by Swedish medical personnel among others. Injured people were transported to the aircraft in flight buses. The aircraft was loaded within approximately two hours, which under the circumstances was a short time.

The crew of the second MD 80 aircraft in Bangkok immediately started to collect patients. Some of them were already in ambulances at the airport but

they did not fill the aircraft. There was conflicting information about the possibility of taking more patients from hospitals onboard the aircraft. After notification by the medical commander at the aircraft to ambulance crews that there was capacity to fly home more Swedish citizens, the aircraft was quickly filled with injured people and their relatives.

***Authors' comments:** Air medics are now included in the National Board of Health and Welfare assessment team that has been organised to rapidly assess requirements for helping Swedes affected by a disaster abroad.*

## Collecting Patients for the Airbus 340

The third medical crew flew from Arlanda in another Airbus than the one equipped with stretchers in Copenhagen. During the flight to Bangkok, the staff at Arlanda prepared the embassy in Bangkok, the reconnaissance team and SOS International for bringing patients to the airport in time for the planned departure time of 06:30 on 1 January 2005. Everybody in Bangkok said that it would be impossible to do this by that time since it was night, New Year's Eve and the traffic was very congested in Bangkok. Moreover, the patients were spread over many different hospitals. SAS was informed of this and after discussions with the management staff it was agreed to postpone the departure by eight hours.

Just after the Airbus crew had landed in Bangkok, however, the SAS local representative said that they had decided to ignore the decision for postponement. The aircraft would depart at 06:30 as originally planned, since they did not believe the status report received from the management staff at Arlanda, the embassy, the reconnaissance team and SOS International.

There were only two hours left before departure. This led to great frustration and intensive work, but the plane took off according to the timetable. Without the intensive work carried out by the medical crew of the aircraft and the Thai medical and ambulance crews, this would not have been possible. But despite the efforts made, not all stretcher places were filled and many seats were empty. There was simply not enough time to fill the aircraft.

***Authors' comments:** In disaster areas and large cities, such as was the case in Bangkok, the coordination of transport from many hospitals to an aircraft with a fixed departure time will always be a difficult mission. Good local knowledge is required and departure times must be flexible if aircraft capacity is to be utilised to the full.*

## Medical Care during Air Transport

Medical work onboard the three aircraft was characterised by care, skill and a clear ambition to help the injured and their families. Flying time, including intermediate landings, was approximately 20 hours. Despite the long flights and the military stretchers, most patients thought that the transportation was surprisingly comfortable. Difficulties encountered included finding equip-

ment in packages that were not marked and the lack of simple but important details such as urine bottles, bedpans and medicine in tablet form. Requirements that arose included listing patients on computers and being able to send these lists via Internet. This was solved instead at intermediate landings in Delhi, Dubai and Istanbul, or by reading patient lists into satellite telephones. None of these solutions worked perfectly, and it was difficult to send complete patient lists to Västra Götaland, which was responsible for continued transportation after landing at Arlanda.

The medical teams proved to have a good composition. The medical teams in the MD 80s consisted of two anaesthetists, four anaesthetic/IVA nurses, one surgeon and one orthopaedist. The medical team serving on the Airbus 340 consisted of three anaesthetists, one surgeon, one orthopaedist and nine nurses. One anaesthetician had been appointed as chief in each team, and there was one replacement for him/her. The chief also had responsibility for passing on information to the media.

The presence of orthopaedists and surgeons for examining and re-dressing wounds and improving plaster casts was invaluable. The cooperation between the medical staff and flight crews was characterised by the wish to solve everything in the best way, and great professionalism was shown on the part of SAS. One exception was the captain of the Airbus flying patients from Bangkok, who did not allow the medical team to use the satellite telephone on the aircraft. This created difficulties in supplying management staff at Arlanda with information about which persons were onboard the aircraft.

***Authors' comments:** Flight times were long and included several intermediate landings for the MD 80 aircraft. In the event, this was not a great problem for the injured, who were probably able to sleep for some of the time. However, working shifts for the medical personnel were long. The limited range of the MD 80 aircraft – approximately 3 000 km – makes it important to consider the use of other types of aircraft such as the Airbus 340 for longer distances.*

## Reception at Arlanda and Kastrup – SNAM Crew Viewpoints

The Stockholm County Council health authorities were responsible for the reception of the MD 80 aircraft at Arlanda. Västra Götaland region had ordered aircraft and helicopters and had requisitioned ambulances to transport patients to receiving hospitals in different places in Sweden. In a similar way, Västra Götaland region had made preparations for the reception of the Airbus 340 aircraft at Kastrup in Copenhagen.

The coordination of resources for reception at Arlanda was not optimal. It took a long time, sometimes up to two or three hours, for the injured and their families to leave the plane. Families were split up and there was a general sense of frustration.

At Kastrup the process was much smoother and was completed in less than one hour.

After completion of the mission, the crews of the MD 80 aircraft and the Airbus 340 were given therapeutic talks, food, drink and rest. They were offered accommodation at hotels and/or transport home, depending on where they lived.

***Authors' comments:** It is essential that cooperation is well developed between medical personnel on the SNAM aircraft and management of the medical operation at receiving airports.*

## Enlargement of Task for the Management Staff

The management staff at Arlanda was successively increased during the period between 29 December and 4 January when it was given the wider task of coordinating all air ambulance transportation of Swedish citizens in the Nordic countries. Several Norwegian SAS-Braathens 737s, one Falcon 900 from Volvo-Ericsson-Skandia and one Boeing 757 from Icelandair were included. In addition, the staff was to ensure that all injured Swedish citizens that had flown with German and French air force aircraft to Frankfurt and Paris were brought home.

In total there were 67 injured people on stretchers, 36 seated upright and 46 family members evacuated by air from Thailand under the operation by SNAM light. The management staff at Arlanda was responsible for a further 55 stretcher patients, 48 seated and 12 family members brought home with other aircraft.

When the concept was tested under practical conditions in Asia it was found to be in need of various improvements. Experience gained will be incorporated into future work by SNAM.

## Proposals for Improving SNAM after the Tsunami

- *Assessment units:* As soon as the need for air evacuation of injured has been identified and SNAM has been assessed as a possible tool, it is important that a reconnaissance team working for SNAM is sent to the damage area as a complement to the assessment team included in operations now under the responsibility of the National Rescue Services Agency, commissioned by the Ministry for Foreign Affairs. A suitable team may consist of one doctor and one nurse with aeromedical competence. The requirement for interpreters needs to be checked. Official documents, verifying on whose commission and on what task the team will work, need to be brought.
- *Preparations before departure:* The medical personnel who may be required for any evacuation task need to be given information on the task at an early stage. One basic prerequisite for this is the appointment in advance of the person or persons given the task of providing this information. The intended participants in the task, staff, managers and supervisors, need to be called to an information meeting as soon as possible.

- *The medical crews:* In addition to anesthetics/intensive care personnel, the basic crews in SNAM need to include surgeons and orthopaedic specialists. Depending on the particular nature of the task, a rapid assessment must be made of whether other personnel are required. This also means that certain key positions such as burn injury specialists, paediatricians, operation nurses and psychiatric personnel will need to be trained by SNAM.
- *Packing of medical supplies, equipment and oxygen:* Depending on the type of injuries expected, lists prepared in advance of medical supplies and equipment adapted to the task will be required. Packages and liquids must be marked so that contents are clear from the outside. There should preferably be a plan of the location on the aircraft of equipment and supplies. The handling of oxygen tubes, connections and fastenings must be prepared and approved from the safety perspective.
- *Vaccinations:* Basic vaccination requirements for personnel must be established in collaboration with infection specialists, and it is preferable that vaccinations are carried out as soon as an agreement has been made with participating personnel.
- *Insurance:* Insurance policies for personnel, patients and equipment must be signed before the commission starts.
- *Communications – mobile telephones:* It is important that all medical personnel are equipped with mobile telephones. Pre-programmed SIM cards with subscriptions and important telephone numbers need to be arranged. People with key functions in the medical teams must be equipped with mobile telephones that receive and transmit calls. Every medical team needs to be provided with satellite telephones and personnel need to be trained in how to use them. Mobile faxes must be supplied to every team.
- *Briefing at Arlanda:* Before a commission, detailed information will be given to the personnel. Staff work will include active searching for information from the Ministry for Foreign Affairs, embassies and other interested parties.
- *Work at airports:* Plans for how SNAM will be received at airports in Sweden and abroad need to be drawn up. It is appropriate that embassy personnel and SAS personnel are notified and are able to join up on arrival. The need for interpreters and guides must have been clarified in conjunction with preparations for the commission, and these personnel must either fly with the others or join up on arrival in another country. All SNAM personnel must have clothing that resembles a uniform and an ID badge stating their affiliation. The clothing must be adapted to local conditions; summer and winter clothing must be prepared and ready in stores. Protective gear such as hearing protectors must be included in the equipment.
- *Transport to the disaster area and the evacuation by air:* Medical personnel and equipment need to be transported in the same aircraft to enable preparation of medical supplies and equipment during the journey.



- *Work onboard the aircraft during transportation of the injured:* An agreement between SAS and SNAM needs to be drawn up so that aircraft communication equipment may be used by medical personnel, provided this is possible from the flight safety perspective. This applies in situations when important information must reach management staff. It is important that storage shelves on the aircraft are marked so that it is clear where medical equipment is located. Plans for how to work in the cabin need to be drawn up. Division into teams and areas of responsibility should preferably be finalised before departure.
- *Support from staff:* Staff units at Umeå and Arlanda are absolutely essential and need to be developed through training and expanded so that they can be manned round-the-clock. Staff units need to ensure in their procedures that communications work, that administrative support is provided, that there is enough personnel to replace others, and that there are sufficient food and drinks for personnel.
- *Reception at Arlanda/Kastrup:* Train and work together with all personnel responsible for the reception, transfer and registration of patients at receiving airports.
- *Extended SNAM training:* Further develop SNAM training, train surgeons and orthopaedists as well as people for key positions. Develop courses to orient people about SNAM for personnel who may need to accompany flights such as support staff and personnel trained in psychiatry or psychology.
- *Suitability of aircraft:* Develop and train the concept of SNAM light as one part of SNAM. It has a large capacity and functions well in the transportation of slightly injured to moderately injured patients.
- *Auxiliary equipment during home transportation:* Produce journal documents printed on cardboard specifically intended for use by SNAM. Equip the crew with plastic aprons, waist bags and headlamps. Go through lists of medical supplies and supplement with medicine in the form of tablets to alleviate pain, nausea, anxiety and insomnia. Provide suitable bedpans and urine bottles.
- *Psychological phenomena/reactions:* Include emergency crisis management as a part of SNAM training. Orientation about the task in hand, therapeutic talks and debriefing are all valuable in missions of this type. Impressions received by those involved need to be worked through. The SNAM organisation must ensure that this is incorporated into operations.
- *Handling materials after the mission:* it is important to plan the home transport of personnel and to ensure that there are other personnel to take care of the medical equipment on its return. The aircraft may also need to be re-equipped in the case of a renewed mission directly afterwards.
- *Contacts with media:* media management needs to be included in SNAM training. Media managers in staff and SNAM aircraft must be appointed. It is necessary to act in advance and plan ahead when meeting media. It is important that the media receives information that can be supplied in

order to reach others with the desired message, and to avoid being disturbed in work directly connected with patients and evacuation.

- *Follow-up*: The recruiting base for management personnel needs to be broadened, communication strengthened, contacts with relevant authorities prepared and the need for interpreters in missions abroad assessed.
- *Endurance*: When planning a mission it is important that manning levels are adapted and consideration given to the need for relieving personnel so that working shifts do not become too long.

# Reception of Injured and Uninjured Passengers at Arlanda

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## Actions in Chronological Order

*On 27 December 2004*, the chief physician at Karolinska University Hospital in Solna made the decision, together with the disaster management team at the hospital, to back up its emergency medical services at Arlanda. The backup consisted of one doctor with management training to help with the normal duties performed by emergency nurses at the airport.

*On 28 December 2004* the first aircraft from Thailand arrived early in the morning. A crisis centre had been opened at Arlanda with doctors, nurses, ambulance management personnel and PKL from Stockholm County Council health authorities. In addition there were personnel from the Red Cross, the police, the Swedish church, the social services, travel agencies, airline companies, insurance companies, the Swedish CAA, the Ministry for Foreign Affairs, and personnel from the Norwegian and Danish Embassies.

Medical care at the airports was under the control of the medical director on-scene appointed by the Central Medical Emergency Administration (CMKL). Channels of communication were already well established since the medical director on-scene was familiar to most people there. A management group with representatives from the CAA, the police, the Swedish Rescue Services Agency and medical services was soon established. The management group decided at an early stage to establish a crisis centre, to cordon off one of the piers and to designate one specific arrival terminal for flights from the disaster area. Due to prevailing weather conditions it was decided that ambulance aircraft would be taken into a hangar where passengers could be transferred to other ambulance aircraft, helicopters or road ambulances.

The medical services were organised so that a medical group consisting of one doctor and two nurses was placed at every gate, where they made a preliminary injury categorisation (triage) as passengers came off the aircraft. People with physical as well as psychological injuries were shown to a medical station located by the pier for arriving aircraft. Uninjured persons were registered by police and taken to the established crisis centre to undergo a second assessment carried out by medical personnel groups and groups from PKL.

The injured that were taken care of by medical and PKL groups at the crisis centre all had their wounds reassessed. Bandages were removed and, depending on the nature of the injury, patients were either referred to health centres or were cared for in hospital. At this triage stage no journals were written and no treatment was given. Any antibiotics treatment received by patients in Thailand was continued until a new assessment was made at the

health centre or hospital. No samples for cultures were taken since this was not possible given the large influx of passengers.

***Authors' comments:** It is debatable whether assessments of injuries and re-dressing a large number of infected wounds should be carried out under relatively primitive conditions at an airport. Some wounds needed to be re-dressed with adequate pain relief, and the bacteria flora was such that better isolation and disinfection between changes of dressings would have been appropriate. Measures taken were not documented and they probably did not add any medical value to what had already been done.*

The medical teams sent to Arlanda had different personnel combinations. Medical competence from the Stockholm County Council health authorities was in the form of anaesthetists, while doctors in other medical teams from other county councils were often surgeons, infection specialists or general practitioners.

***Authors' comments:** According to the medical director on-scene, it was the surgeons, infection specialists or general practitioners who were best suited for the work required.*

The aircraft ambulances that had more seriously injured patients were received in a specially designated hangar. The hangar was divided into two sections: one section where personnel on the arriving aircraft could take out the passengers, and one section where re-loading and triage was controlled by the medical director on-scene at Arlanda. After the injured had been taken out of the arriving aircraft, a new assessment was made by a doctor in the medical group who, depending on the nature of the injuries, decided whether onward transportation to the person's local hospital was possible and in what way this would take place. Some were redirected to hospitals in Stockholm if it was judged to be necessary for medical care. The medical director on-scene at Arlanda had medical responsibility for patients during the time that they were being transferred to onward transportation. For those patients who were transported home in aircraft manned by doctors, such as the Hercules Tp84 to Göteborg, the medical responsibility was quickly handed over to the doctors on board the aircraft. Many patients were transported home in road ambulances.

### Summary of the Medical Director On-scene's Experience at Arlanda

- The greatest problem at the airport was the poor information about arriving aircraft and the number of injured passengers. Never during the whole mission did the medical director on-scene have access to the information he desired. This applied to the aircraft ambulances too. The situation made it very difficult to plan for onward transportation and to know which hospitals were relevant to contact.

- It was difficult to get the PKL activities working properly. The limits between PKL and POSOM were unclear and some rivalry between the two arose.
- Personal familiarity between the police, the CAA and medical personnel at Arlanda proved to be useful in terms of constructing the chain of medical care within the Stockholm County Council health authorities' area.
- The triage of injured patients carried out at Arlanda was important for "the right hospital to get the right patient". It improved after the CMKL released their centralised routing to hospitals appointed in advance. Instead of this, patients in need of trauma care, plastic surgery, treatment in a decompression chamber or child hospital resources were sent to the Karolinska University Hospital in Solna, while other hospitals took care of patients with less specialised needs.
- All ambulance aircraft had their own medical teams that accompanied injured patients. There were several parties involved such as SAS, Finnair, Icelandair, Braathens and Nato-manned aircraft, as well as the so-called Volvo-Ericsson aircraft.

***Authors' comments:***

- 1. Categorising patients in order to send them on to other medical care resources should be carried out as far as possible on the basis of the medical care required by each patient. This means that some specialised hospitals will be burdened more than others. The situation is best solved by re-directing other patients, and probably not by using rotating schedules for the receiving hospitals.*
- 2. It is important that cooperation between medical personnel in the SNAM aircraft and the management of the medical mission at the receiving airport is well developed and has been trained for.*

# Coordination of Secondary Air Transportation after Arrival at Arlanda and Kastrup Airports

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## Background

Officials from the Prehospital and Disaster Medical Centre (PKMC) in Västra Götaland had previously taken part in different components of the SNAM project. During one management seminar at Rosersberg during the autumn 2004, representatives from PKMC proposed that secondary transportation in Sweden should be coordinated by PKMC. A decision on this issue was never taken, however, and the management unit had never trained when the tsunami hit on Boxing Day.

## Coordination of Secondary Transportation by PKMC

(The coordination commission of secondary transportation by PKMC is described in detail in Appendix 2 in chronological order.)

*On 28 December 2004* PKMC was requested if it could arrange secondary transportation in Sweden, and answered in the affirmative. The commission was formally confirmed by the National Board of Health and Welfare two days later.

*On 30 December* the commission was started, and continued until 5 January 2005. Initially the commission covered coordination of the secondary transportation from the two Swedish MD 80 aircraft that flew one or more times to Thailand. This commission was extended during the following days.

Västra Götaland Regional Medical Emergency Administration (RMKL) decided during the day on 30 December to separate the planning and handling of secondary transportation from other operations, both in terms of personnel and premises. During the following days personnel worked in shifts, which was also the case for several doctors on call that were involved in this coordination unit. The coordination of home transportation had these goals:

- Injured people who had returned home with SNAM would be transported to their local hospital as quickly as possible.
- Families would be kept together during secondary transportation.

It was also decided at an early stage to use normal procedures for ordering secondary transportation.

To reduce the need for secondary transportation, PKMC proposed that, as far as possible, aircraft should be loaded in such a manner that people who

lived in Stockholm and further north would travel in aircraft directed to Arlanda, while people who lived in Skåne, Småland and along the west coast would travel in another aircraft that would be directed to Landvetter in Göteborg, possibly landing at Sturup en route.

During the daytime on 30 December PKMC was informed by telephone from SOS Flygambulans that Volvo-Ericsson-Skandia's directors' aircraft had been made available to fly ten injured people from Thailand to Lund on commission of the Ministry for Foreign Affairs.

During the afternoon and evening of 30 December, and during the following days, the doctor on call at PKMC was in telephone contact with a large number of players, both on his own initiative and through incoming calls. All available air transportation resources (civil and military) put at their disposal were listed. The library they were using soon proved to be too small to work in, since it did not have enough space for the number of whiteboards required. Operations were moved to one of the lecture rooms at PKMC, which had enough space but only one telephone line. This proved to be too vulnerable and they were forced to move back to the staff room at RMKL where there were more people who could help to answer the telephone when work was at its most intensive. It was then possible for the first time to keep a minute-by-minute operations log using the secretarial help that was available.

In addition to the telephone conferences that were held within the framework of "network Tsunami", regular telephone conferences were held with the Skåne County Council health authorities, the Stockholm County Council health authorities, CAA and SOS Alarm to check on the planning of secondary transportation. Two different solutions were produced, depending on whether both aircraft would fly to Arlanda or if one would be redirected to Sturup/Landvetter. Concerning Arlanda, it was planned to utilise airplanes for transport to Landvetter and helicopters for onward transportation to hospitals without airports in the vicinity. Both the Defence Forces and Police Aviation through the Aeronautical Rescue Coordination Centre (ARCC) put large resources at the disposal of PKMC. All outbound information went from PKMC via its mailing list to the county councils' *officials on call* and was also copied to SOS Alarm for dissemination to parties affected throughout the country.

The Emergency Medical Communication Centre (EMCC) at Ullevål Hospital in Norway was also contacted since the commission was received to coordinate secondary transportation of Braathens flights with injured Swedes who would land at Gardermoen. The EMCC promised to coordinate secondary transportation to Sweden.

During one of the telephone conferences between Västra Götaland region, the Stockholm County Council health authorities, the Skåne County Council health authorities and SOS Alarm, it was made clear that the Stockholm County Council health authorities intended to carry out triage at Arlanda in order to find out whether all the injured could manage onward transportation. At that point it was unclear who would coordinate onward land transportation. According to the official at SOS Alarm, it should have been possible to utilise part of the "national" road ambulance resources that had been mobilised from surrounding county councils and put on standby at Rosers-

berg, at least for transportation within the area of Mälardalen. The Stockholm County Council health authorities protested that they would need the ambulances for their own use. With around 30 ambulances on standby at Rosersberg, PKMC judged that at least some of these could be released for secondary transportation to other parts of the country.

The Aeronautical Rescue Coordination Centre (ARCC) indicated at one point that there was a Tp84 Hercules aircraft (with 30 stretchers) and seven military helicopters available (three at Berga, two at Ronneby and two at Säve).

E-mail with information about expected arrivals at the major airports in Sweden was sent regularly to all *officials on call* at county councils. The county councils that would receive injured people were contacted by telephone regarding medical requirements, identity etc.

*On 31 December* it was decided to set up a call centre at PKMC.

Manifests that came to PKMC were transcribed, checked against the police (population) register and sorted into county council areas. These were sent by e-mail to the responsible authorities of each county council and medical service.

Information on arriving flights expected at airports other than Landvetter was forwarded to the Skåne County Council health authorities and the Stockholm County Council health authorities, as well as to SOS Alarm.

During the next few days much information was processed and forwarded regarding arriving flights to Sweden, Denmark and Norway, and secondary transportation was coordinated using civil and military helicopters, Defence Force transport aircraft (Hercules Tp 84), regular aircraft, specially arranged flights and transportation by ambulance and bus.

PKMC coordinated onward transportation of people requiring intensive care and who would be flown to other parts of Europe. E-mail was sent regarding these cases to SOS Alarm for forwarding to all *officials on call*.

*Table 1. Processed patient list for ordering secondary transportation*

Name
Civic registration number
Post code
City/town/village
County Council
Uninjured
Injury
Relations
Flight
Secondary transport
Means of transport

Frequent telephone, fax or e-mail contact with SOS-OP, the Ministry for Foreign Affairs, SNAM, ARCC, the medical director on-scene at Arlanda and the Skåne County Council health authorities followed a similar pattern on most days.



On Wednesday 5 January 2005 PKMC wound up the commission of co-ordinating secondary transportation within the country.

***Authors' comments:** coordination of secondary medical transportation by air is a wide-ranging commission involving work with many players. It is important to appoint a very well tuned organisation such as PKMC in Västra Götaland for commissions of this type. PKMC had expertise in the area of medical services for disasters, but above all experience in quickly establishing an organisation that allows continuous follow-up and adaptation to all the information received. It also had well-established contacts with many of the players involved in the work.*

## Summary of Conclusions and Reflections by the PKMC Manager

### *Manifests*

Manifests from the ambulance aircraft were the greatest problem. At least during the early stage of the evacuation, these came late and were not always accurate. The reason for this was poor communications channels on the aircraft. The original plan was to fax the lists from Thailand directly after the aircraft had taken off. Evidently passengers had boarded the aircraft so quickly that nobody on the ground was able to compile a list of who had been taken onboard. The fax from the first intermediate landing in Delhi of the MD 80 did not work, for unknown reasons. Lists were faxed from Dubai, but were not always up-to-date since patients were taken on and off on different occasions due to changing health status.

The Airbus A340 flew nonstop from Bangkok to Arlanda and the captain refused to allow the medical crew to use the aircraft communication equipment. Contact could only be established after he had been replaced. The aircraft from which it was easiest to send information was the SE-DVE, with which direct contact could be established and reports sent via the satellite telephone on the aircraft. However, this was only feasible due to the limited number of injured people on board.

The inaccuracy of the lists used for transport planning caused confusion at Arlanda; certain patients were booked on aircraft and helicopters but could not be found after unloading. Considering that the SNAM aircraft type MD 80 only having a range of 3000 km, communications equipment must be installed onboard that allows transfer of information in the form of text and figures, which to some extent will fall under medical confidentiality. It is also important to send out a reconnaissance team/advance troops as early as possible to make an inventory of transportation requirements and to prepare manifests. A template indicating the form and contents needs to be drawn up.

### *Population Registry*

To be able to find out which county council and hospital a patient belongs to, access to the population register is necessary (and a good map). This was solved through contact with the police, but in future direct access to this reg-

ister would make work easier. On several occasions passengers requested not to be taken to their local hospital. In one case this was because the patient was an employee at the local hospital and did not feel up to meeting his colleagues. In other cases it was due to the fact that a family member or relative was on the way to another hospital. In all cases where such requests were made they were granted, in certain (but not all) cases after approval by *officials on call* at the county councils involved.

### *Call-centre*

This important activity needs to be included in the plan for preparedness to enable a quick start, and to ensure that it will function. An agreement needs to be signed in advance.

### *Cooperation with ARCC*

During the course of events a large number of lists of arriving/planned flights came in to SOS Alarm. On several occasions there were uncertainties regarding the quality of these lists, since the designation of the same flight could vary. A liaison officer from ARCC could have solved these problems.

### *Resource Utilisation – Preparedness*

An aspect that was not discussed at all during the event itself was the cost involved. PKMC had at their disposal from the start a large number of aircraft resources, both civil and military. Certainly the situation was unclear, but an early assessment was that there were more aircraft and helicopters available than would be required. Should preparedness on the military side have been reduced, and should PKMC have declined the offer of all police helicopters at an early stage? It was not entirely clear who had such a mandate, and this must be clarified for any future events. Furthermore, the options of equipping military helicopters with medical crews have decreased in recent years. Procedures for how this will be solved in the context of SNAM missions need to be worked out separately.

### *Civil aircraft ambulances*

The civil aircraft ambulances proved to be very useful for transportation within and outside Sweden. They were ordered through SOS-OP to SOS Skellefteå and were distributed between the two players on the Swedish market (SOS Flygambulans and Flygtransport) in the normal way. For some reason SOS Flygambulans was given all the missions. When an attempt was made to find out how this happened, it seems that SOS Skellefteå was bypassed and that the missions were distributed in another way than planned. This type of shortcut through management structure must be counteracted, e.g. by using only faxes by an authorised person as a basis for orders in future. Another aspect of the civil aircraft ambulances that caused confusion was lack of information about their identity. On one occasion this caused the “wrong” aircraft to be routed to Arlanda and the patient being sought could not be found.

### *SOS International*

Cooperation with SOS International in Copenhagen did not work. According to members of the medical group sent out by the Västra Götaland region, their coordinator in Bangkok had booked places on the ambulance aircraft on a number of occasions. When the aircraft was ready to depart these patients were not there, which meant that the capacity of the aircraft was not fully used. PKMC found it difficult to contact the SOS International office in Copenhagen (no reply at the number given) and were given contradictory decisions on whether injured people should be taken care of by them or by PKMC. In one case an injured person had even been “threatened” that he would waive any claims through his insurance company if he allowed himself to be transported by SNAM. Injured people were evacuated to Göteborg in Danish ambulances without any previous contact with PKMC and caused the police in Göteborg, among others, to wonder what was happening. Cooperation with SOS International must be investigated immediately.

### *Reloading of Patients*

The Tp84 Hercules proved to be very useful for the secondary transportation of a large number of injured people. The stretcher racks in the aircraft require that military stretchers be used, however. Such stretchers do not fit Swedish road ambulances and patients must be transferred from one stretcher to another. At the time in question it was below freezing point and windy at Landvetter. Transferring patients outdoors on the tarmac was out of the question in such conditions and they were instead transferred inside the heated aircraft. Only one patient at a time could be transferred, which made the process time-consuming. If a heated hangar at Landvetter or another receiving airport could be used, this would drastically shorten the time required for transfer to road ambulances.

### *Dissemination of Information*

The system of using Officials on Call, TiB, in the county councils for general information, information on arriving patients, ordering of ambulance transportation from airports etc., proved to work well. The prerequisites for this, however, is that only one contact point (path in) for information is used, preferably in the form of e-mail, which allows large-scale dissemination of information. Only using mobile telephones for contact, in certain cases changing numbers during ongoing measures, is not acceptable. The fact that PKMC received telephone calls from the disaster management group at individual hospitals on some occasions indicates that the internal dissemination of information within county councils did not work. The responsibility for rectifying this lies with the responsible authority.

### *Stockholm County Council Health Authorities*

Cooperation with the Stockholm County Council health authorities worked very well, but can probably be further improved. To a large extent the good cooperation can most likely be explained by the fact that everybody involved knew each other already and also had great trust in each other.

Stockholm County Council played a key role in the reception of patients, since most of the injured were from Stockholm and since Arlanda was the airport where the “national aircraft ambulances” landed. It is likely that this will be the case in future SNAM missions, not least depending on the fact that Stockholm lies geographically near the centre of the country, and it is here that SNAM will be equipped and have its “home base”. The impression gained by PKMC was that it was not always clear with whom they had contact in Stockholm – CMKL or SOS Alarm – since the same person answered at two different telephone numbers/units. This is perhaps not of major importance as long as the units are separated internally. In contrast, PKMC was called up on several occasions by people who functioned as “medical director on-scene” at Arlanda, as well as management bodies of several hospitals in Stockholm. This indicates that information transferred within Stockholm County Council was not sufficient. It is possible that this was due to the delay in manifests that caused planning of secondary transportation by PKMC to be so delayed in turn that there was not enough time to transfer information to the aircraft in question before they landed at Arlanda. However, there is reason to reconsider how information about patients on incoming flights and orders for secondary transportation reaches the relevant decision-makers at Stockholm hospitals and Arlanda airport. In practice, this information was conveyed to SOS Alarm/CMKL by e-mail towards the end of the period, but also directly by mobile phone to the person responsible at Arlanda. The risks associated with such shortcuts in communication are obvious though, and must be reviewed.

## Report from Two Transportation Missions using a Hercules Tp84 Aircraft in January 2005

On the morning of New Year’s Eve Lidköping Hospital received a request to man one of the Air Force’s Hercules aircraft for onward transportation of injured people who had landed at Arlanda, in addition to sending a medical team for an assignment in Göteborg. About 35 patients needed to be transported within the country, none of whom was severely injured. Some were on stretchers and the remainder either sitting, in wheelchairs, on crutches or could walk without help. Two MD 80 aircraft from south-east Asia (with approximately 20 hours’ flying time behind them) were estimated to land in Stockholm at around 04:00 on New Year’s Day. We decided to meet immediately at the hospital to go through the assignment, familiarise ourselves with the facts at hand, check equipment from the emergency stores and organise uniform clothing. We had repeated contacts with the Sätenäs wing and checked off planning details.

At about 03:00 we took off from Sätenäs. Cooperation with the Hercules crew was professional and friendly. Organising equipment and supplies in the aircraft and cooperation within the groups went very well. The atmosphere in Stockholm was calm despite the crowds of people and one of the two arriving ambulance aircraft being extremely delayed. Many patients had to wait for a long time lying on stretchers or sitting on chairs before they could be taken onboard for transportation home.

Once at Arlanda, we were given more and wider management tasks than we had counted on. For many of us this was our first major disaster/transportation assignment, but everybody did the best they could and took care of patients in the best way possible. Warm blankets, warm words and hands, and between times warm drinks made the long wait reasonably bearable. We tried to allow the injured to stay with their families. We finally took off at 08:30 from Arlanda and just over one hour later we landed at Landvetter, where new checks were made on the patients from injury lists and after a while rather rapid onward transportation was arranged using various ambulances and one or two helicopters or ambulance aircraft.

*Table 2. Patient/injuries list for the Tp84 Hercules*

Name
Civic registration number
Postcode
City/town/village
County
Injury
Relatives
Incoming flight
Local hospital

A Hercules aircraft from Sâtenäs was also used on the second transportation assignment on 4 January 2005 to fetch around 25 patients from Arlanda. The medical team consisted of two anaesthetists, one anaesthesia nurse and one nurse from the casualty department. In addition there was a conscript medical orderly on board. Work at Arlanda went a lot better this time. The medical team was quickly given direct and relatively extensive leadership tasks, and the distribution, marking and organisation of patients/passengers went much faster and better. One of the patients had to be sent directly to a hospital in Stockholm due to deterioration of his medical condition. On arrival at Landvetter the plane was met by medical teams and the reporting, transfer and onward transportation of the passengers progressed quickly and easily.

## Organisation at Landvetter Airport

It was clear at an early stage that Swedes returning home would fly to Landvetter airport. We were forewarned in the evening of 26 December that an aircraft with 360 passengers on board would probably land at Landvetter on 28 December. Discussions were quickly started about how the organisation would be structured and what resources would be required at the airport. Among others, *regional officials on call* (RTiB) were in contact with Härryda municipality and the Welfare group at the airport (a crisis group for victims at the airport) for information and organisation of psychosocial care.

The POSOM organisation in Härryda municipality organised around 500 personnel to help with care providing at the airport. The personnel came

from POSOM organisations in other municipalities, the Swedish church and the Red Cross. The organisation remained there until 10 January.

With respect to medical care, RMKL was responsible for ensuring that there were medical care resources at the airport and that hospitals and primary care units received information and documentation for the assessment of resource requirements.

Initially a medical care organisation was put together before the arrival of the first direct flight to Landvetter. Medical care resources consisted of regional emergency doctors, three medical teams (doctors and nurses) including an ambulance helicopter, PKL groups (15 people) as well as ambulance resources. A casualty assembly point was set up in the arrivals hall. Before the arrival of the second aircraft on 29 December, a similar organisation was put together. There were doctors onboard the two direct flights landing at Landvetter who were able to provide information about the medical status of injured passengers to the regional emergency doctor at the airport.

Just over 700 passengers arrived on the two direct flights from Thailand. Fourteen of these were cared for in different hospitals in southern and western Sweden, as well as Norway. The two Hercules Tp84 aircraft that landed later were received by the same organisation as the first aircraft, though on this occasion there were only 33 injured passengers, who were taken to different hospitals in western Sweden. In addition, there were family members and uninjured people from the west of Sweden on the aircraft.

In the morning of 29 December, the director of primary care in Göteborg was asked about the possibilities of primary care opening up a medical centre at Landvetter airport that would be manned around the clock. In the afternoon a primary care team had been organised and was in place at the airport until 9 January. During the first days there was a primary care team (doctor and nurses) there around the clock. As requirements decreased, night-time manning was phased out. Approximately 70 patients received treatment by primary care during that period.

## Summary of Experience from Landvetter

- Airport management quickly set up staff and a staff room which was manned around the clock when required, and passed on direct telephone numbers. Preparatory staff meetings were held in the staff room with representatives of all organisations involved one and three hours respectively before aircraft landed. Staff meetings felt like a good preparation in which every organisation could present their plans, which were then brought into line with each other to give a good organisation.
- Information from the Airbus aircraft was poor and in some respects completely incorrect, but provided at least some indications of the situation. Information about the injured in secondary transportation with the Hercules aircraft was relatively good. Information about the number of victims and their injuries was important to enable a correct estimate of the medical services that would be necessary.
- The medical services had three medical teams available on arrival of the aircraft. One of the groups worked together with the medical team from the medical care centre at a casualty assembly point for those who were

obviously injured, and the other two medical teams worked with the registration of passengers in the two corridors drawn up by the police. These two groups were able to provide all passengers with an initial medical assessment as they passed by, on a voluntary basis. Since it was unclear at this point how many were injured and what injuries or requirements they had, the different medical teams that had anaesthetic and surgical skills for acute needs and the primary care group for the assessment of minor injuries proved to be an excellent combination. They complemented each other's skills very well.

- A casualty assembly point was set up by the medical services at the arrivals gate. Most of the injuries consisted of wounds (some of which were infected), broken bones, one concussion and soft tissue injuries with bruises, but no life-threatening injuries. Transportation of the injured by ambulance was organised after collaboration between the medical director on-scene and managers of the ambulance service. The whole process was made easier by a previously produced allocation key for the different hospitals receiving patients. A general letter of referral was used to document treatment or medication given to patients, who were then transported onward to hospitals. Very little medication was used.
- The organisation of the reception of the Hercules Tp84 with 33 injured patients, of which 11 were children/young people, worked well. There were two anaesthetic doctors and four nurses onboard the flight who were not able to hand in any supplementary medical reports since it was virtually impossible to carry out direct medical work during the Hercules transportation due to the noise levels and cramped conditions.

***Authors' comments:** The need to take care of physical injuries at Swedish airports directly after the patients' arrival in Sweden was probably overestimated in connection with the tsunami. Most of those with serious injuries had been examined and received treatment during the flight, and what they needed above all was continued rapid care at a medical facility. A journal was kept in those cases where an examination or medical treatment was carried out, which was good and different from procedures at Arlanda. The difference may have been due to the smaller number of passengers to examine compared with Stockholm. Injury cards must always be kept in some way, even if simplified forms are necessary in situations like this.*

# Medical Emergency Measures in the Most Affected Regions

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## Stockholm County Council Health Authorities

In the evening of *26 December 2004* the official on duty at the County Council health authorities' CMKL was contacted by the *official on call* at the National Board of Health and Welfare. This led to the official on duty at the County Council health authorities trying to obtain more information the following day. At the same time he tried to reach the people who would be part of the board of staff that was on red alert from 28 December 2004 and used the so-called underground room as its staff room. The work was subsequently carried out according to the central medical disaster plan of the County Council health authorities. Contact was quickly established with the National Center for Disaster Psychiatry in Uppsala, with the CAA, PKL organisation coordinator, SOS Alarm, the Stockholm County Council health authorities' media unit and the County Council health authorities' medical director on-scene.

When information came through on *27 December* that an aircraft from the disaster area in Thailand was expected to land in Stockholm within 24 hours, extra resources were called in for medical care at Arlanda. They consisted of more personnel in the form of one doctor and nurses from the Karolinska University hospital in Solna. From the first arrivals at Arlanda early in the morning of 28 December, around ten were taken to the Karolinska University Hospital in Solna and to Danderyd Hospital. During the day medical teams were also sent to the airport as requirements became clearer. There were then four medical teams, one PKL group, nine ambulances, one intensive care ambulance and four Stockholm buses at Arlanda to receive people returning home. The medical director on-scene at Arlanda administered and coordinated medical and psychological care at this initial stage.

An inventory of hospitals was carried out by the staff at CMKL and information was gathered to make decisions about which hospitals would receive patients. Planning and coordination of ambulances was initiated.

### *Tuesday 28 December*

In the evening of 28 December an aircraft flew to Phuket in Thailand to bring home Swedish tourists. One doctor and two nurses from Stockholm County Council were on the flight.

### *Wednesday 29 December*

Several aircraft arrived, both directly from the disaster area and from other airports in Europe. Medical services at Arlanda were further reinforced with medical teams, PKL groups, ambulances, emergency vehicles and vehicles



with stretchers. Pressure on psychological care was large. Emergency reception hospitals for physical injuries during the evening were the Karolinska University Hospital in Solna and Söder Hospital. One more aircraft with doctors and nurses from Stockholm County Council was sent to the disaster area on the same day.

#### *Thursday 30 December*

Several aircraft from the disaster area arrived during the day. At Arlanda there were 15 ambulances, one emergency vehicle, one so-called Jumbulance (a bus with spaces for 30 seated passengers and three lying down) and four medical teams. At this stage the psychological services were reinforced with representatives from the Child and Adolescent Psychiatry Department (BUP), since there was a need for specialised support for children. BUP was on site after this around the clock. Coordination of the psychological services started to become problematic. To solve this a fire engineer was brought in to manage the organisation and units associated with PKL and psychological support.

An aircraft with doctors and nurses from Stockholm County Council left for the disaster area during the day. Stockholm County Council started to have problems with endurance and needed extra resources from surrounding counties for medical teams, PKL groups and ambulances. There were also endurance problems with personnel at CMKL. From Stockholm, Sörmland and Uppsala there were 18 ambulances in total and between seven and eight other transportation vehicles on site.

It was decided to open a resource centre for ambulance vehicles and ambulance personnel at Rosersberg in order to achieve better coordination of ambulance transportation and to be able to offer ambulance personnel board and lodging.

In addition it was decided to open seven dedicated care clinics for disaster victims in the county council. Returning tourists could turn to these clinics for help with wounds and minor injuries that did not require hospital care and for psychological support.

The processing of information within Stockholm County Council started to undergo large strains at this point, both internally and externally. Backup staff linked to the County Council Office was set up by the county council director on 30 December. Lists of people expected to be returning were administrated here, and queries from the public were also answered.

On 30 December Stockholm County Council held the first press conference. Press conferences were held daily after this time, and included reports on the situation at different hospitals.

#### *New Year's Eve and New Year's Night, 31 December – 1 January*

During the night of New Year's Eve a large number of people from the disaster area arrived on a number of flights. Several of the aircraft were ambulance aircraft and transported a number of severely injured people. At Arlanda on the evening of New Year's Eve there were three medical teams, 29 ambulances, one emergency vehicle and 15 other medical transportation vehicles. In addition there were about 25 more ambulances on call near Ar-

landa at Rosersberg. Support from PKL in other counties was brought in during the day.

#### *New Year's Day, Saturday 1 January until Tuesday 4 January*

Ambulance aircraft continued to arrive at Arlanda. The number of patients with severe physical injuries was relatively small however, and the medical situation continued to remain under control. Coordination of psychological care was working well by this time, which was essential since crisis counselling was one of the most demanding of the care services provided.

The PKL groups stayed on to provide psychological care. In addition there were two medical teams, alternating from Uppsala, Sörmland and Östergötland, which remained at Arlanda until 4 January. One command ambulance and a number of other ambulances were also on call. For every day that went past, more and more people went to the seven newly opened units.

During the time period from 5 January – 10 January, work at Arlanda was reduced since victims from the disaster area were no longer expected to arrive in the same numbers as previously. On 6 January there were no disaster victims seeking care at Stockholm Hospital, but psychological care remained very active at BUP and the seven units, among other places. From 5 January onwards, CMKL brought down their level of alert to green.

On 9 January medical services provided by the doctor and command ambulance were phased out at Arlanda. Only two personnel from PKL remained on site. On 10 January the backup staff in the county council was disbanded.

## Västra Götaland Regional Authorities

At 18:30 on 26 December, the National Board of Health and Welfare received the first external information about the disaster. Later the same evening, at 20:50, SOS Alarm contacted the *regional officials on call* (RTiB) and left a message that the National Board of Health and Welfare *official on call* wanted to have contact. At 21:00 contact was established and the National Board of Health and Welfare reported that there were a large number of injured Swedes who were going to be evacuated from south-east Asia, primarily Thailand. An enquiry was made regarding preparedness in the Västra Götaland region and whether the authorities there could take care of a large number of injured Swedes.

RTiB reported that the regional medical emergency administration could respond quickly if required and that hospitals in the region could provide care for the injured. On the basis of information received from the National Board of Health and Welfare and the information given by the mass media, RTiB contacted the regional emergency doctor in service, the emergency psychologist, director of the Härryda Municipality, SOS Alarm and others. RTiB also contacted the safety director of Härryda Municipality who has responsibility for psychosocial care at Landvetter airport, and the information manager at Landvetter airport who activated the welfare groups (the crisis group for victims at the airport).

During the night there were incoming telephone calls from relatives of deceased or injured Swedes in Thailand. They were referred to the municipal POSOM groups.

The first indication that the region would be involved was a message received at about 23:00 on 26 December from Landvetter airport that an aircraft from Thailand with approximately 360 passengers was expected to land at Landvetter on 28 December.

RTiB was contacted during the night by the mass media who wanted information about what measures had been planned in the region.

#### *Monday 27 December*

Those contacted during the morning included the director of the regional authorities, the director of health and medical services, the chairman of the crisis administration board, the chief physician at Sahlgrenska University Hospital, the police authorities, the PKL chairman at Sahlgrenska University Hospital, the emergency coordinator at Södra Älvsborg Hospital, NU medical services and Skaraborg Hospital, the *officials on call* at Halland County Council, Göteborg Municipality, the County Administrative Board, and the health authorities in Stockholm County Council and Jönköping County Council.

At lunchtime the National Board of Health and Welfare organised a telephone conference between Västra Götaland regional authorities, the Stockholm County Council health authorities, Skåne regional authorities and SOS Alarm in Stockholm. Information was given about a number of flights that were expected and possibly a number of injured Swedes onboard.

### Regional Medical Emergency Administration

To coordinate and administrate actions by the regional authorities on the basis of information about the disaster that was available on the morning of 27 December, the RTiB/regional emergency physician decided to set up a Regional Medical Emergency Administration (RMKL). A board of staff was established at 12:15 on 27 December in the management room prepared at PKMC premises in Göteborg. RMKL remained active until 7 January, after which continued work was absorbed into ordinary activities at PKMC.

RMKL was manned largely by the units in the staff working plan. The number of people and units varied during the time. Basic personnel were seconded from PKMC, but for the national assignment, which was primarily the coordination of secondary transportation, RMKL was backed up with doctors from different hospitals. The doctors were also part of the organisation of regional emergency physicians and had good knowledge of the medical emergency organisations in the region.

RMKL was responsible for the overall regional medical emergency administration. This function had many components:

- Coordination of activities affecting hospitals and primary care.
- Repeated inventories of available beds in the regional hospitals. Medical care of potentially infected patients was prepared in collaboration with SU/Sahlgrenska and the infectious disease unit.

- RMKL was responsible for the provision of medical services and organisation of PKL groups at Landvetter airport to cater for people in need of medical or psychosocial care.
- RMKL had frequent contacts with surrounding county councils (Värmland, Halland, Örebro and Jönköping) regarding activities in the region as a result of the disaster.

## Internal and External Information

The demand for information was extremely large. Information services were reinforced with information officers from information departments in the region. Their task was to gather and compile internal and external information from authorities, municipalities, medical services and so on, and to deliver internal and external information. They wrote about ten press statements and organised two press conferences.

Within the regional authorities there was also a great demand for information, and RMKL continuously provided hospitals, the infectious disease unit, ambulance services, primary care, regional administration and others with information. Channels of information used included telephone, fax, e-mail, Internet and intranet. The internal and external regional authorities' websites were continuously updated.

## Contact with Authorities etc.

RMKL had continuous contact with the National Board of Health and Welfare, SOS Alarm in Göteborg and Stockholm, the police authorities, the County Administrative Board, the disaster administration group in Göteborg municipality and others.

## Telephone Conferences

An important forum for the exchange of information and coordination was telephone conferences, which were held daily (refer to the section *The Tsunami Network – Form of Cooperation between All Players Involved in Sweden*).

## Voluntary Personnel

RMKL received applications showing interest from a large number of people offering their services for work in Thailand and the Västra Götaland region. This was good support when RMKL was commissioned to organise medical teams from the region for tasks in Thailand.

## Preparedness and Activities in NU Medical Services in Chronological Order

*28 December 2004.* The hospital director on duty at NÄL introduced a discussion on NU medical services preparedness with the senior physician at NÄL, the senior physician at Uddevalla Hospital, the clinic manager at the psychiatric clinic, the clinic manager at the emergency department, PKL,

hospital churches, the medical information service and others. A press statement was released at 13:15 encouraging people in need of psychosocial support to contact the medical information service, who would refer them to other instances. Primary care/emergency clinics would be the first in line to care for these people, and psychiatric and BUP services second in line.

*29 December 2004.* An inventory of hospital beds was initiated by RMKL through “informal” staff status. The administrating body PKL at Uddevalla Hospital and NÄL had good contact with the municipalities involved. The PKL group from NÄL was sent to Landvetter airport, where aircraft landed with 359 passengers from Thailand.

*30 December 2004.* NU medical services decided to increase preparedness in the following way: at the same time as patients returning from South-east Asia were admitted to hospitals, contact would be made with personnel on call at the infection clinic. This applied to all specialist doctors, irrespective of the patients’ injuries or medical status. Hospital care of patients would take place primarily at the infection clinic in Uddevalla, where beds were made available. Readiness was also established to open one more ward (KAVA 1) in order to release more beds for infection patients. Tests would be made on all patients with wounds for MRSA (methicillin resistant *Staphylococcus aureus*).

At NÄL, ward 65 was opened for hospital care of patients returning from the disaster in south-east Asia. From 08:00 on 31 December there was a basic staff level on the ward which could be increased if necessary to provide enough personnel for 13 hospital beds. In those cases where patients needed psychosocial care in conjunction with hospital care, contacts would be made in accordance with standard procedures. At NÄL the hospital church was contacted and at Uddevalla Hospital the almoner was contacted. If necessary these organisations would call in PKL.

Contact details for municipal POSOM groups were available from municipality websites.

One medical team with participants from Uddevalla and NÄL was sent to Thailand. One medical team was on call, ready to be transported to Landvetter if required, the first on call from NÄL and the second from Uddevalla Hospital.

A reinforced call line for the standby group at the surgical clinic was established at NÄL over the New Year weekend.

The supply of personnel and bacteria culture tubes from the national pharmacy were checked and reconciled with primary care and the clinic for children and young people. It was decided to list the number of visits to primary care and hospitals, and the number of patients admitted. It was also decided that all emergency treatment would be free for those returning to the region of Västra Götaland between 31 December and 5 January.

A call-centre was established at NÄL at 19:00 on 31 December to relieve the ordinary call-centre in Kalix and this was in operation until 16:00 on 1 January. Its task was to give information to relatives and family members about the ambulance aircraft that landed at Arlanda during the night of New

Year's Eve, and as far as possible to inform callers about which regional hospital the patients had been taken to. Calls from the Ministry for Foreign Affairs and the National Police Board also came to the telephone exchange at NÄL. More personnel were required for the telephone exchanges at NÄL and Uddevalla Hospital for this reason.

*On 2 January 2005* preparedness was reduced for NU medical services. Over 180 people had sought medical care in the region up to that date, and about 40 people remained in hospital. Nine of these were at the infection clinic at Uddevalla Hospital. The final total number of patients given care at the infection clinic was twelve.

The crisis management board started an inventory of the need for psychosocial care in the region.

To sum up, the crisis preparedness and care of victims and family members through NU medical services in conjunction with the tsunami disaster in south-east Asia was judged to be of good quality.

## Skåne Regional Authorities

In the evening of *26 December* the Skåne County Council health authorities' *official on call* (TiB) was contacted by *official on call* at the National Board of Health and Welfare. The information was essentially a confirmation of what had been disseminated by the media during the day. The regional medical emergency administration (RMKL) at this point consisted of TiB and *regional doctor on call* (RLB). During the evening this body informed hospitals in the region through formal channels. Hospitals were given the task of reviewing internal paths of information and preparing for the possible arrival of patients from south-east Asia. At this stage there were no definite assignments since available information indicated that the first victims would not arrive until the following day at the earliest.

*On 27 December* RMKL formed a board of staff with RLB, TiB, staff doctors and information officers. The staff contacted collaborating organisations and authorities and checked paths of information in their own organisation. Five of the regional hospitals were requested to plan for receiving ten victims per hospital at five hours' notice on a signal from RMKL. The other three hospitals received similar instructions for receiving five victims each. After consultation with the infectious disease physician, who subsequently participated in all staff reviews, it was decided to concentrate admissions of victims to the University Hospitals of Malmö and Lund. Special wards and clinics were opened there for the infection problems that were anticipated.

RMKL staff meetings were synchronised with the telephone conferences administrated by the National Board of Health and Welfare (see below). These meetings were indispensable to understanding the problems that existed and why there were difficulties with information. Problems and solutions could be discussed and a common indication of status could to a certain extent be obtained. All hospitals in the region were updated by RLB after the meetings.

In the evening of 27 December the first flight from Thailand arrived at Sturup, where medical teams, ambulances and crisis groups from the University Hospitals of Lund and Malmö worked together with the crisis group at Sturup. There were also representatives from POSOM in Svedala, the Red Cross and the Swedish church. RMKL staff also moved to Sturup to be able to see and understand how large the needs were and how they related to resources sent. It gave a good insight into how personnel at Sturup airport organised care services. This breach of rules, moving away from the staff site, proved to be functional when the care of victims at Sturup and Kastrup airports was being planned and calculated from the perspective of medical services. The resources for this first reception of victims were clearly over-dimensioned and could be reduced for later arriving flights. Information about passengers on the aircraft that arrived in Sweden, on both regular flights and on specially arranged flights, was deficient to the point of being almost non-existent, which meant that the authorities were forced to over-dimension services for all arriving flights. In contrast, the transportation of injured people that was organised within Sweden, such as secondary transportation from Arlanda, was carried out with good cooperation and sufficient information to provide the right resources for every patient.

Contact with the Emergency Medical Coordination Centre in Copenhagen was established as early as 27 December 2004. Since they had not received an alarm from either Kastrup airport or the police, at that point in time they had no plans to send medical personnel to Kastrup. This meant that the Skåne regional authorities had to wait before sending Swedish medical personnel there. The Swedish police and POSOM Malmö were there from the start however, and received information about what they should say to passengers in need of medical care. After three days the Danish medical services were in place, and the Skåne regional authorities were able to send medical teams and ambulances to meet flights. The same problems were encountered here with information as at Sturup. Crisis groups from PKL Malmö were also there during the first days, but these later had to be used for internal work at the University Hospital in Malmö.

Skåne regional authorities, like some other county councils, succeeded in recruiting and equipping two medical teams at relatively short notice. When the inquiry came from the National Board of Health and Welfare to send a medical team to Thailand, the Skåne regional authorities were given a departure time for the flight to Thailand as a deadline. This was quickly solved, but the equipment taken was over-dimensioned and in the short time available recruiting was not as good as it could have been if everything had been prepared.

*On 28 December* a special PKL coordinating meeting was held.

*On 29 December* the County Medical Officer (communicable infectious disease) joined RMKL. Care of patients was concentrated to the University Hospitals of Lund and Malmö, but all hospitals were on alert to open "infection places" within six hours.

*On 30 December* special information was passed on to the Regional Board.

*On 2 January 2005* the alert was scaled down so that hospitals would be ready to have extra beds available within 12 hours.

*On 3 January 2005* the alert was further reduced so that it only applied to the University Hospitals of Lund and Malmö.

*On 5 January 2005* normal activities were resumed, but the University Hospital of Malmö maintained its Asian care unit. The medical alert was removed from Kastrup and RKML resumed its normal level of alert.

### Experience from Skåne County Council Health Authorities

- There were some initial problems with information and communication but these were improved relatively quickly, mainly through using personal networks.
- There was good preparedness on the information side.
- PKL cooperation in networks was initiated and has continued to be developed since then.
- Cooperation with the County Medical Officer (communicable infectious disease) worked well.
- People were motivated to participate in support and cooperation functioned well in the whole region.
- It was an advantage that the ambulance service was integrated in the medical disaster organisation.
- Fewer injured patients than expected were admitted to hospitals in Skåne. This meant that the planned preparedness at hospitals and the medical care alert at the airport were over-dimensioned during the whole period. This could possibly have been averted if information about passengers on flights coming to Sweden had been more complete. Under the circumstances at the time, accepted principles of emergency medical services were applied. It is better to have too much rather than too little.
- The medical personnel that participated in the "Volvo aircraft" made contact with the TiB group at the National Board of Health and Welfare and were given instructions to contact the Skåne County Council health authorities for them to take on responsibility as employers and care providers. This was solved within a few hours after a discussion with one of the doctors. In a stricter sense, the legal aspects of the procedure could certainly be debated, both concerning own medical teams and the "Volvo aircraft". That issue will hopefully be solved in the future.



# Emergency Care of Injured Persons at Stockholm County Council Emergency Hospitals

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In total there were 460 patients received by the Stockholm County Council health authorities' hospitals, from the occurrence of the disaster until 18 January 2005. Of these, 70 were under 18 years of age. Five patients received treatment at the intensive care unit.

Seven local care units were opened in Stockholm County Council for victims of the disaster. The child and youth psychiatric emergency unit received a total of 893 people, of which 163 were under 18.

## Karolinska University Hospital in Solna

Of the 460 patients received at hospitals in Stockholm County Council, 174 received the first assessment at the Karolinska Hospital in Solna. Of those, 75 patients were admitted for continued care, above all for problematic wounds to arms and legs. Most of them were first taken into surgical and orthopaedic wards which could be opened after being closed over the Christmas holiday, even though more than half of the patients were given final treatment in the plastic surgery department.

Of the total number of patients seeking care at the hospital, 35 were under 18 years old. Children in need of hospital care were admitted to Astrid Lindgren's Children's Hospital, which is located very close to the Karolinska University Hospital in Solna.

## Organisation at the Hospital

On 27 December 2004, the Karolinska University Hospital in Solna formed a minor, unofficial disaster committee consisting of the chief physician at the hospital and clinic managers (of which several clinic managers were acting during the Christmas and New Year holidays), or standby units from the clinics that were estimated to be involved in the care of the wounded. Since there was time to plan before the first victims were expected to arrive in Sweden, there was no need to declare an emergency alert. Preparations could be thoroughly made without following the usual emergency plans at the hospital, which were not entirely appropriate for this very special situation.

That same day it was understood that it would be difficult to obtain the necessary information about the number of patients expected to arrive at the hospital and the injuries they had sustained. For this reason the disaster committee at the hospital offered to provide the National Board of Health and Welfare and the Stockholm County Council health authorities with a

medical team of two doctors and two nurses, one of whom spoke Thai, to go to the disaster area in Phuket. The objective was to assist in the inventory of the number of injured in hospitals, to help select priority for home transportation, and to be able to provide the Karolinska Hospital and county council health authorities' leaders with the information required to plan medical care in Stockholm. Some of the doctors in service had already received good information about the emergency situation in Phuket by telephone from a colleague at the surgical clinic who was in Thailand as a tourist when the tsunami hit the area. He was able to actively participate at Phuket hospital and could report on the chaotic situation.

This offer was initially declined, but a request was later made for help and the medical team could be put together in less than 24 hours. This medical team was able to fly from Arlanda on 28 December and landed in Phuket about 13 hours later.

The following evening, one of the doctors in the medical team was able to make an initial status report to the collected disaster committee at the Karolinska Hospital in Solna. This report, in addition to other information from the media, made it clear to everybody that there would be a large number of injured people arriving in Sweden, mainly at Arlanda airport, during the coming days. The senior consultant at the pre-hospital section at Karolinska was given the task of assisting at Arlanda in judging priorities and transportation of victims to hospitals, including Karolinska.

### Organisation of Care for the Injured at Karolinska in Solna

Since it was during the Christmas and New Year holidays, activities at the hospital had been reduced to emergency services in principle. This turned out to be a benefit since it was relatively easy to open two of the wards that had been closed, and there was enough capacity to open others. One more ward was opened later, but only to offer beds for family members who wished to stay at the hospital. This was very important, since there was a great need to keep families together when one or more of their members were missing.

The two wards were staffed by voluntary nurses, assistant nurses and secretaries, and were fully operational when the first victims arrived in Stockholm. Each ward was also staffed by two departmental doctors during the daytime and during the night-time one doctor, who was on call for only these two wards. There was thus one extra doctor on call in the evenings and nights at the hospital, who was able to devote himself to caring for victims of the disaster. This proved to be necessary since examinations, direct medical care and psychological support were extremely time-consuming, especially when the number of patients admitted was at its peak.

The intention behind this structure was that all patients who arrived at the hospital would be immediately registered in the emergency department, and later quickly taken to a ward where they could be examined and registered in peace and quiet by the ward doctor and nurses waiting for them. This procedure prevented patients from having to wait in an emergency ward after a long and tiring journey. Moreover, the workload for the emergency de-

partment would not be above the usual, which meant that emergency care could function normally.

Patients were able to take family members with them to the ward, which also proved to be of great value, not least since so many had lost some of their family in Thailand.

### Special Medical Problems to Consider

Every patient who had open wounds stayed in a private room until cultures had been grown from bacteria in the wound and the absence of methicillin resistant *Staphylococcus aureus* bacteria (MRSA bacteria) was confirmed. Patients who had two negative cultures (absence of MRSA bacteria) were then placed in wards with several beds in accordance with a flow chart for tsunami patients that was followed. Family members were allowed to stay in the same room as the patients. Strict hygienic regulations were of the utmost importance and the following guidelines were followed, in brief:

#### For MRSA

- Uncomplicated cases with patients with **negative** primary cultures needed no further cultures, but could be given care at optional health care centres at a later stage.
- Uncomplicated cases with patients with **positive** primary cultures were reported/referred to the Department of Infectious Diseases, which followed up the patient.
- Admitted patients with **positive** primary cultures and small surgical problems were transferred to the Department of Infectious Diseases at Karolinska in Huddinge for continued care.
- Admitted patients with **positive** primary cultures and larger surgical problems were transferred to the Department of Infectious Diseases at Karolinska in Solna for continued care.

#### Bacteria cultures were grown in accordance with a special memo

Cultures were liberally grown for stomach/intestinal symptoms, such as faeces cultures for salmonella/shigella, *E. coli*, cysts and worm eggs.

#### Antibiotics were given in accordance with the following schedule

- Septic patients (patients with blood poisoning) with large open or difficult wounds: Fortum™ 1g x 3 intravenously (i.v.) on day 1 and subsequently 0.5 g x 3 + Vancocin® 1g x 2 i.v.
- Septic patients without wounds: Fortum™ 500 mg x 3 (i.v.) day 1 and subsequently 0.5 g x 3 + Vancocin® 1g x 2 i.v.

#### Vancocin concentrate after the third dose

- Patients with wound infections and high temperatures, or infection parameters (signs of infection) or pneumonia: tablets Dalacin® 300 mg x 3 + tablets Ciproxin® 500 mg x 2.
- Patients with uncomplicated wound infections: tablets Dalacin® 300 mg x 3.

### Re-dressing of wounds

Aquacel® + porous bandages.

### Thrombosis prophylaxis (to prevent blood clots)

Klexane® 20 mg subcutaneously daily to immobile patients.

### Laboratory tests

Daily check of blood status and CRP (inflammation test), subsequent tests as specified by a doctor.

***Authors' comments:** In retrospect, the anticipated problem of many patients with MSRA infected wounds was exaggerated. Only seven patients were found to be MRSA positive. However, the bacteria flora was different and included many unusual bacteria or microorganisms that proved to be resistant to several antibiotics. It is important to consider the risk of serious and unusual infections from similar disasters, and to introduce adequate hygiene procedures.*

## Special Plastic Surgery Problems

40 injured patients needed treatment at the plastic surgery clinic for complicated wounds to arms and legs. In several cases multidisciplinary cooperation was necessary, not least due to the difficult problems of infection and a few cases of open fractures. The multidisciplinary approach also included treatment of the severe psychosocial trauma suffered by many.

The most complicated cases of patients with major soft tissue damage, fractures and atypical bacterial flora required many days of nursing in the intensive care unit, and later in intermediate wards, with some continuous monitoring and a large number of operations. There were three severe cases of patients with extensive wounds who were given hyperbaric oxygen treatment (HBO: oxygen treatment in a pressure chamber).

***Authors' comments:** Of those patients suffering from wounds, only a very small proportion received this form of supplementary treatment in addition to surgical wound treatment. A large number of wounds could be healed through direct surgery and antibiotic treatment without any hyperbaric oxygen treatment. On the other hand, several amputations were carried out on patients who did not receive HBO; whether results would have been better with HBO is not possible to prove either way.*

*The mechanism of HBO is reduced hypoxia (shortage of oxygen) in threatened tissues (oxygenation of ischemic/hypoxic tissues to help them survive), improved healing of wounds and improved immunity to infections (decreases inflammatory injury mechanisms, provides white blood cells with oxygen so that they are able to perform "oxidative killing" of bacteria, and improve the efficacy of certain antibiotics that are ATP dependent (ATP = adenosine triphosphate, the body's energy carrier) for its absorption through cell membranes etc.).*

Most patients had relatively minor soft tissue damage, but the specific bacteria flora made treatment more difficult than usual.



*Figures 1a. and 1b. Minor wounds on hands and feet.*

*Photo: Åsa Edsander-Nord*

A large number of bacteria cultured from these wounds had not previously been seen. Some bacteria were resistant to the antibiotics normally used.

Table 3. Bacteria and fungi that could be cultured from wound cells

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<i>Acinetobacter</i>
<i>Aeromonas hydrophilia</i>
<i>Allescheriasis (Scedosporium apiospermum)</i>
<i>Bergyella zoohelum</i>
<i>Candida (Candida tropicalis)</i>
<i>Chryseobacterium meningosepticum</i>
<i>E. coli</i>
<i>Enterobacter faecium</i> and <i>cloace</i>
Coagulase-negative staphylococci
<i>Microsporum gypseum</i> (dermatophyte)
<i>Pseudomonas</i>
<i>Zygomycos (Saksenaea vasiformis)</i>

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Most wounds were treated with daily re-dressing using saline dressings, but sometimes acetic acid dressings were used. This re-dressing, usually in combination with surgical wound review, was normally carried out using anaesthetics. In some cases wounds had been sewn in hospitals in Thailand, but on arrival at Karolinska all wounds had to be opened.

The closure of the wound was then adapted to the size and depth of the wound and the degree of infection, resulting in all forms of closure. Secondary healing took place in the case of minor wounds, meaning that they healed spontaneously without further measures required other than simple re-dressing. In cases where wounds were deeper and required active drainage, vacuum bandages were connected to a suction apparatus and when the wounds were considered clean, some could be closed using stitches at a later stage, so-called secondary closure. When wound surfaces were too large they had to be later covered with a skin graft, and in two cases it was necessary to prepare a skin flap for transplantation or muscle tissue for transplantation in order to cover the soft tissue.

### Subsequent Complications and After-effects in Patients treated at the Karolinska Hospital in Solna

One patient with severe soft tissue damage in combination with difficult open fractures had to undergo a lower leg amputation. One patient with major soft tissue damage that required long-term treatment now has good use of his leg but with some effects on the nerves, which has led to permanent invalidity.

Most soft tissue injuries have healed without leading to any serious physical suffering, despite long-term treatment. However, several cases of subsequent or recurrent soft tissue infections caused by *Mycobacterium abscessus* and/or *Cladophialophora bantiana* have been noted.



*Figure 2. Subsequent recurrent soft tissue infections.*  
*Photo: Filip Farnebo*



# Traumatic Stress Reactions of Survivors and their Early Care

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It is a well-known phenomenon that people exposed to traumatic events may develop psychological problems and psychiatric conditions, both in the short term and the longer term.

In the case of a disaster, there are above all two explicit stress factors that may lead to severe, difficult reactions such as psychiatric health problems in the longer term, namely

- Sudden and unexpected loss of a close family member under traumatic conditions.
- Exposure to a large and imminent threat to one's own life.

In disaster situations it is not uncommon for people to experience a combination of these two factors, but there may also be situations in which a person has been a first-hand witness to difficult events that have affected family members or others. A person's own failure in attempting to save others may also be a complicating factor in the longer-term perspective.

The possibility of gaining support and help after a traumatic experience is also considered to influence the future course of a person's development.

At the time of the great tsunami disaster, there were probably more than 20,000 Swedes in south-east Asia. The tsunami hit the coast of Thailand just after 10:00 local time, first at the island of Phuket and then the Phi Phi islands. These areas have been established tourist resorts for many years. Fifteen minutes later the wave reached Khao Lak, which lies north of Phuket and is one of the most recently developed tourist areas in the Phang Nga province, with hotels and bungalows built along a beach about 20 kilometres long. At the time when the flood wave hit, many tourists had gone down to the beaches. In general they probably did not understand what was happening when the water drew back. The wave, which in reality consisted of several waves, carried people up to one kilometre in some cases. Some were stuck in palm trees and in the tops of other trees, while others escaped by climbing to the upper floors of hotels.

During the time period until 15 January 2005, the police authorities in Sweden registered approximately 19,000 people returning home. Some of these had travelled to the disaster area after the tsunami to search for family members, some came from other tourist resorts and had made intermediate landings in south-east Asia and were not directly affected by the disaster. The major travel agencies estimated the number of Swedes in the disaster areas in Thailand at 6,000 – 8,000. In other words, a very large group of Swedish people were subjected to traumatic experiences far from their home country. The event was characterised by its abruptness and the lack of any time for anybody to prepare.



It was therefore judged as urgent to make a systematic follow-up of the Swedes returning home with the aim of mapping:

- The occurrence, degree and type of traumatisation.
- What aid they had received.
- The current health status and psychosocial problems just over one year after the disaster.

In collaboration with the three major medical service regions of Stockholm, Göteborg and Malmö as well as some minor county council areas, an extensive survey by questionnaire was carried out 14 months after the tsunami disaster. In Norway as well as Denmark corresponding follow-up studies had been performed during the summer and autumn of 2005. The Swedish study was executed at the National Center for Disaster Psychiatry – KcKP – at Uppsala University.

Those included in the study were people registered in the Swedish Criminal Investigation Department's list of arrivals to Sweden from 26 December 2004 to 15 January 2005 and who were residents in one of the county council areas that participated in the study. In the beginning of March 2006, 10,116 questionnaires were sent to people over 16 years old in the group described above. The questionnaire consisted of 29 pages that included questions about background factors, experiences during the tsunami itself, reactions afterwards, health status, loss of close family members and questions about support and care received.

An ethical committee has inspected and approved the execution of the study. Several internationally validated rating scales were included in the questionnaire. The General Health Questionnaire 12 (GHQ-12) was used to evaluate people's psychological status, and an average value of three or more symptoms was used as an indication of failing psychological well-being. The Impact of Event Scale – Revised (IES-R) was used to evaluate post-traumatic reactions. Total scores of 33 points or more on the IES-R was set as the limit for explicit symptoms of post-traumatic stress reactions.

The number of responses received was 4,932, which gives a response frequency of 49% out of the 10,116 people who received the questionnaire. Out of these responses, 4,910 were included in the study. The other 22 responses came in too late for processing in the first study. The highest response frequency was noted in one of the minor counties, Blekinge. The lowest frequency was noted among residents in the county of Stockholm, while the other city areas of Västra Götaland and Skåne had slightly higher response frequencies.

Table 4. Response frequency (General Health Questionnaire) in different counties.

County council, region	Number of responses	Proportion of responses (%)
County Council of Blekinge	58	65
County Council of Östergötland	225	55
County Council of Jönköping	189	54
Skåne Region	582	54
County Council of Väster-norrland	94	53
County Council of Väst-manland	108	51
Norrbotten County Council	114	50
Uppsala County Council	257	50
Västra Götaland region	1 315	48
Stockholm County Council	1 939	45
Unknown counties	29	1
<i>Total</i>	<i>4 910</i>	<i>49</i>

Of the 4,910 computer-processed questionnaires, the proportion of male respondents was 45% (2,191) and female respondents 55% (2,719). Most of the respondents (95%) had grown up in Sweden. Almost half had university or college education, or the equivalent.

The age of respondents varied from 16 to 90 years old. The highest proportion of responses came from the age group 41–50 (26%) and 51–60 (21%); see Figure 3. Of those responding, 70% (3,451) stated that they were married or living with a partner.

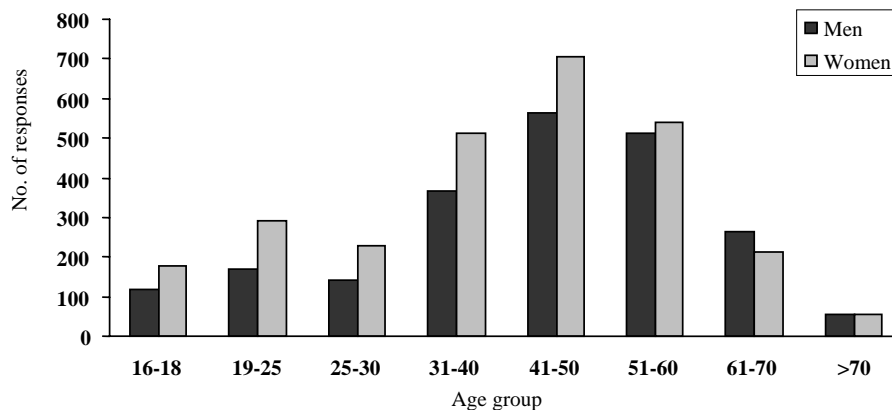


Figure 3. Age and gender distribution (General Health Questionnaire).

The number of people that stated they were in the area hit by the tsunami (exposed) was 3,781 (78%). Almost half of them were in boats far from the land, in the water near the beach or on the beach. One third noticed tremors and that the water drew back. Of the 1,546 who were in the area when the

water drew back, 16% stated that they moved away from the beach, while 60% stayed where they were.

One fifth of those exposed, 756 people, stated that they were separated from others in their company and were then uncertain about what had happened to them. Among respondents, 71% had witnessed people looking for close family members, and somewhat fewer (62%) had come into close contact with survivors who had severe physical injuries. Just under 15% had been exposed to many dead bodies, and 35% had seen abandoned children.

## Emergency Help Action before the Journey Home

Figure 4, below, shows in per cent the respondents' evaluation of the different types of support before the journey home. The question was: "How satisfied/dissatisfied are you with the help from the following people and organisations before the journey home?" The figures in brackets state the number of people for which this was relevant. Responses could be given as *dissatisfied*, *both satisfied and dissatisfied*, or *satisfied*. Respondents were most satisfied with the help they received from the local population, close family, others affected by the disaster and local medical personnel. Most dissatisfaction was reported for other Swedish authorities, the Swedish embassy/consulate and the Swedish Rescue Services Agency. These responses must be seen in relation to the number of respondents for each category. It may be noted that in some cases only a small proportion of respondents evaluated some support measures; for example, only 981 people or 20% of all respondents evaluated measures taken by the Swedish Rescue Services Agency.

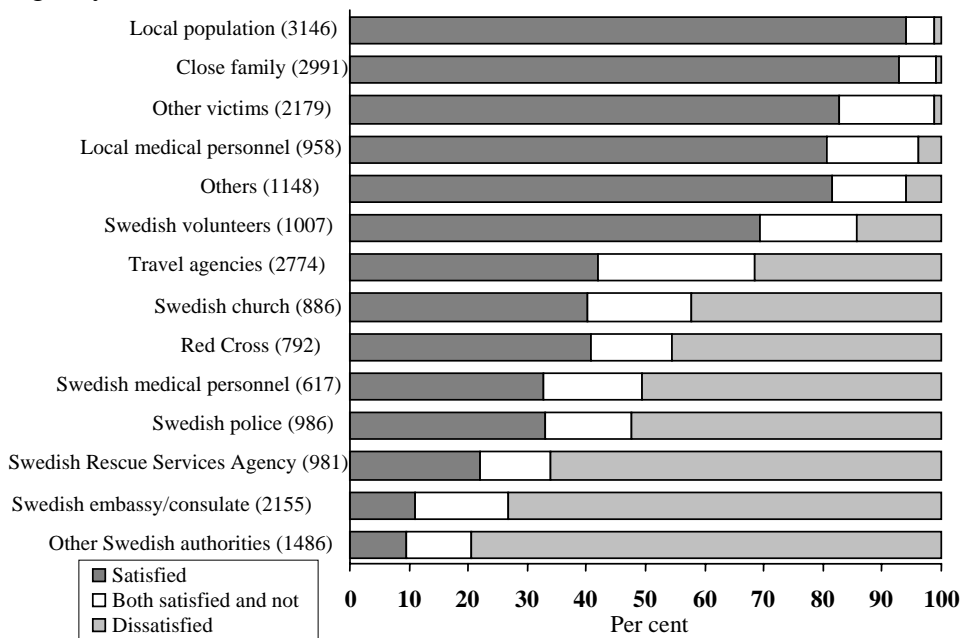


Figure 4. Evaluation of help before travelling home (number of respondents per category in brackets).

## Care Provided on Arrival Home

Before the tsunami victims arrived home, preparations had been made for medical, psychological and social care at the arrival airports of Arlanda, Landvetter, Sturup and Kallax. Respondents evaluated the significance of these measures by the criteria "some importance" or "had great importance". The evaluations of care at Arlanda airport are shown in Table 5.

*Table 5. Care provided at Arlanda*

Care provided	Relevant sponses	re-	Evaluation of care provided, % of relevant number			impor-
			Some tance	impor-	Great tance	
Medical	830		28		51	
Psychological	1 843		35		48	
Practical, social support	2 210		33		54	

Just over 2,200 respondents evaluated their impressions of the practical and social support on arrival at Arlanda. Almost 90% felt that this support had been of some importance or great importance. Similar results were found for psychological support, for which 83% felt that it had been of some importance or great importance. Information about psychological reactions after disasters had been handed out at the airport and had been received by 944 respondents. Of these, just over half (534 people) felt that the information had been helpful. Care provided at other airports was evaluated as positive by three quarters of the respondents.

## Reactions

Of the respondents in the total group, 247 people (5%) reported themselves that they had problems with their physical health, and a further 479 (10%) stated that they "to a certain extent" had physical problems as a result of the tsunami. The corresponding impact on psychological health was stated by 464 people (10%) and "to a certain extent" 1,034 (21%), making a total of 1,498 people (31%). The number of people for which the GHQ-12 indicated signs of impaired psychological well-being was 1,086 (23%). A high level of post-traumatic stress reactions was reported by 474 people (10%). Those people who had been in an area hit by the tsunami, who had found their own lives threatened, been physically wounded or subjected to losses were affected by impaired psychological well-being and post-traumatic stress reactions to a greater extent 14 months after the disaster (Figure 5). Women had higher scores on these scales. Different examples of post-traumatic stress reactions are persistent memory images, nightmares, a sense of worthlessness, avoiding any reminders of the disaster, impaired concentration and sleep disturbances.

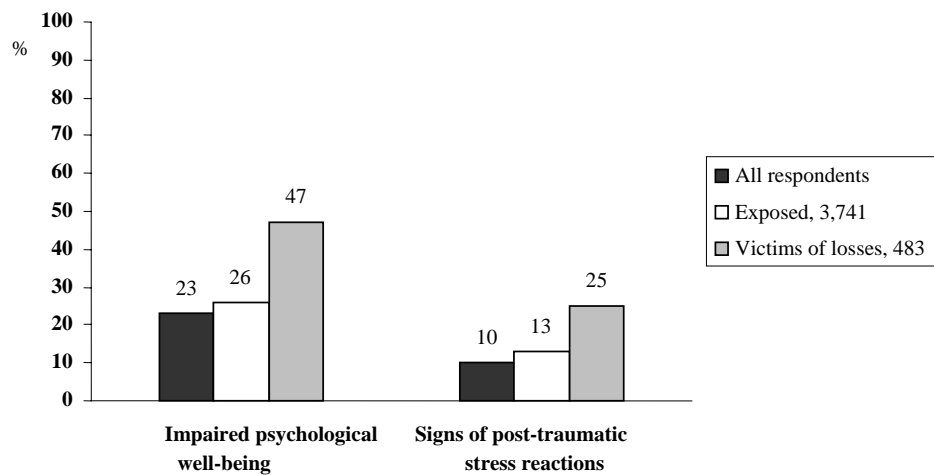


Figure 5. Impaired psychological well-being and signs of post-traumatic stress reactions in the whole group, exposed (were in an area hit by the tsunami) and victims of losses. (Impaired psychological well-being: GHQ 12,  $\geq 3$  points. Signs of post-traumatic stress reactions: IES-R,  $\geq 33$  points.)

## Health Care and Aid Measures

About 17% of the respondents had turned to the medical services for advice after returning home. Roughly one third of those who were in the company of adults close to them on holiday said that they were worried about them. Approximately 45% of those who had children with them on holiday were worried about their physical or psychological health 14 months after the disaster. Just under 60% of these children were reported as having received professional help, while 13% were still receiving help at the time of the survey.

It is important to note here that several respondents may be referring to the same child or children.

32% of the respondents had contacted their family doctor for a medical examination after returning home. The most common answer to the question whence they had obtained help was from close family members on the same trip (60%). Other family members (44%), friends (55%), colleagues (38%) and employers (29%) were the next most frequent answers after close family members. Crisis groups were stated by 23%, family doctors (14%), and counsellors and psychologists in primary care (12%). Priests or similar (10%) were the next most common among public aid measures. The proportion of respondents who had received care at hospitals was 8%, and approximately the same proportion had received help from private psychotherapy or company healthcare. Only 4% had sought help from adult psychiatric services, while 2% had received help from the social services. Insurance companies had provided help for 33%.

## Victims of Loss

A total of 483 people or 10% of the 4910 respondents had lost somebody close to them, of which 156 people had lost a close family member. Of

those suffering from losses, 187 people stated that their close ones had been transported back to Sweden via the previous Air Force Wing at Uppsala, what is now Ärna airport. 126 people stated that they had taken part in the reception there. Of these, the majority (94%) were satisfied or very satisfied with the reception.

## Reporting Sick and Medication

One quarter of the respondents had reported sick after returning home. Among these, 880 people or 18% of all respondents stated that the sick leave was connected with the tsunami disaster. In most cases the sick leave was short, but 147 people had been on sick leave for more than one year. 335 people stated that they had been on sick leave during the four weeks before they filled in the questionnaire. The use of medication in the form of sleeping pills, tranquillizers and antidepressants was at a low level directly after the tsunami and had decreased further after 14 months; refer to Table 6. Women reported on average a higher consumption of medication than men. One example of this is sleeping medication, which 6.7% of women used on a daily basis compared with 3.7% of men one month after the tsunami.

*Table 6. Use of medication after the tsunami*

Medication	First month after			Latest month		
	Never/ seldom	Sometimes/ weekly	Daily	Never/ seldom	Sometimes/ weekly	Daily
Sleeping med.	91.2	3.8	5.0	95.0	2.7	2.3
Tranquillizers	96.4	1.8	1.8	98.2	0.9	0.9
Antidepressants	95.8	0.4	3.9	95.5	0.3	4.2

With respect to alcohol consumption, 81% stated that this was unchanged after the tsunami; 9% stated that they drank more alcohol, while approximately the same proportion said that they drank less.

## Outlook on Life after the Tsunami

The feeling that things will go well in life, that the world is fair, predictable, can be controlled and is good and benevolent seems to have been spoiled for a proportion of respondents. This change was most marked among women. On the other hand, the effect was the opposite with respect to life being meaningful and the feeling of being a person of worth. This type of experience seems to have been reinforced among some of the respondents, especially among women.

## Coping with the Strain

In total, 1,681 respondents (34%) replied that they had not experienced any strain after the tsunami. Among those who had experienced strain, it was their own powers and help from family, friends and colleagues that had been

most important. Going back to Thailand was reported by 74% as being important to cope with the strain. With respect to professional support, 49% said that it was important.

*Table 7. Evaluation of what provided most help to cope with the strain*

Most help from	Relevant sponses	re-	Evaluation of help factors, % of relevant numbers		
			Important	Neither nor	Not important
Own powers	3 180		93	6	1
Family, friends, colleagues	3 195		93	6	1
Support groups for tsunami victims	1 200		32	33	35
Professional sup- port (psychologist, doctor etc.)	1 587		49	27	24
Help from authori- ties	1 201		18	38	43
Travel back to Thailand	1 371		74	12	14
Other	350		63	12	25

## Discussion

A large proportion of those who took part in the study were in the area when the tsunami struck. Just under half of these people experienced the situation as life-threatening for themselves. One quarter stated that they still had impaired psychological well-being 14 months later. People close to them, friends, colleagues and neighbours were the most common sources of support after returning home.

People's resilience in coping with traumatic experiences depends on a number of factors. The feeling of helplessness and lack of control may contribute to the problems, and diffuseness is an important factor that may affect the degree of traumatisation. The fact that victims felt they had little control over the situation is clear, since 75% stated that it was only coincidence and luck that allowed them to escape. However, this contrasts with the fact that just over half, or 54%, thought that the ability to assess the danger of a situation was important for survival, indicating that some people had a certain sense of control despite the previous statement.

A disaster is characterised by a chaotic situation. From the Swedish tourists' perspective, "tsunami" was an unknown concept for most and the situation was complicated by the fact that they were far away from home. After major accidents, spontaneous support is often given by people locally before more organised forms of aid arrive.

The investigation shows that victims chose many paths to seek help. As has been the case in other studies, it is clear that help from family and relatives is most important, followed by friends and colleagues. Support from schools and employers seems to have been significant, too. Of the public

services used, it was primarily crisis groups and family doctors, counsellors or psychologists at health centres that were referred to. A minor proportion had sought help from psychiatric services. Professional help was obviously important for many, which may indicate the importance of adequate knowledge of the effects of traumatisation at county council health authorities and municipalities, in crisis groups and in primary care, and in some cases with private care providers. With regard to the satisfaction with different forms of support, private psychotherapy, priests and religious groups and insurance companies were named. Disasters evoke existential questions, and the results of this investigation indicate that religious groups were able to deal with these needs in a satisfactory way for many people.

The proportion of non-respondents was relatively large, which is not uncommon in follow-ups of disaster victims. Women were in the majority among the 4910 respondents. The proportion of men was greater among the people to whom the questionnaire was sent. There were no significant differences in response rates between counties. It was primarily younger men who did not return the questionnaire. The motives for this are the subject of speculation and need to be examined more closely. The low response rate obviously reduces the extent to which results can be generalised and calls for caution in drawing conclusions from the results. The response frequency of 49% is considered to be acceptable in an international perspective. The corresponding frequencies for the Norwegian and Danish tsunami surveys were 32% and 46% respectively.

This chapter is a shortened and partly revised version of the first descriptive report "Uppföljning av svenska resenärer efter tsunamin 2004" that was published on December 4, 2006 ([www.katastrofpsykiatri.uu.se](http://www.katastrofpsykiatri.uu.se)).



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## Swedish National Air Medevac (SNAM)

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In June 2001, the Swedish Civil Aviation Authority (CAA), SAS and the National Board of Health and Welfare started up the collaboration called the Swedish National Air Medevac (SNAM). The objective was to organise a Swedish national civil aircraft ambulance service that, within six hours of an alarm, would be able to equip and man an SAS aircraft of the type Boeing 737-800 to be used as an ambulance aircraft. In order to be used in wartime or after a disaster, the aircraft was planned to transport 35 patients. Advanced intensive care could also be provided onboard.

The Norrland University Hospital in Umeå was given an important role in the project, which it still has today. The long distances in the region have led to investments in developing ambulance aircraft, and unique competence has been built up in this area. Every year about 1,600 patients are transported by air in Norrland.

All parts of the project were planned to be completed by the end of June 2006. The intention was that SNAM would also be able to assist other countries or organisations with air transportation, such as the UN. The cost for every assignment was estimated at approximately half a million Swedish crowns.

The aircraft type Boeing 737-800 was chosen because there is a good supply of these aircraft and they are able to land at most Swedish airports since they do not require long runways. The ordinary SAS crew flies the aircraft, which can be in the air for approximately 3,000 km without refuelling. This means that most destinations in Europe can be reached without any intermediary stops.

The aircraft is temporarily rebuilt for service as a civil aircraft ambulance and will be ready for use within six hours after a decision has been taken on a mission. A large number of aircraft seats are removed and replaced with stretchers. When the refurbishment is complete, every aircraft is equipped with six intensive care beds, six ambulance stretcher places for patients with minor injuries, and seats for 23 sitting patients, relatives or other passengers. The medical equipment in the aircraft is approved for safety in the air and for patients.

The stretcher for intensive care patients used in the project has been developed at the Norrland University Hospital in Umeå. All medical equipment required by a patient goes with the stretcher. A ventilator and monitor are included with every stretcher and there are 1,800 litres of oxygen built in. In the stretcher frame on the aircraft there are a further 7,000 litres of oxygen per stretcher place. The patient is moved on the same stretcher from the place of loading to the receiving hospital. The stretchers must be able to fit into ambulance aircraft and helicopters as well as road ambulances.

When the aircraft was put into use in conjunction with the tsunami disaster it was in a modified form, since the concept was not fully operational. The intensive care equipment for ambulance aircraft was still under development, and for this reason the project was called SNAM light.

## Aeromedically Trained Personnel

The medical team in the SNAM aircraft consists of seven doctors, eleven nurses and a medical technical engineer. Four teams have been trained up to the present, which means that it is always possible to put together a medical team without maintaining formal alert on call.

The personnel selected for assignments must have sound medical knowledge and practical experience of medical care. They must be specialists in anaesthesiology and intensive care. Many of those trained have previous experience of working in ambulance aircraft. In aeromedical training, flight simulators are used to show how g-forces affect the body. Personnel must also have experience of the symptoms of oxygen shortage that may arise during a rapid pressure drop at high altitudes. This is trained in a decompression chamber. The effects of these special factors of an aerial environment on patients' medical status must be considered when the decision is taken on whether a patient can manage air transportation or not. This requires aeromedical competence.

# Coordination of Secondary Transportation in Sweden by PKMC

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## Chronological Report, Day by Day

### Tuesday 28 December 2004

At 20:35, the SNAM management sent an inquiry to all personnel trained on the project by e-mail, asking if they wished to participate if SNAM was taken into operation. In time, this led to PKMC being asked if they could coordinate secondary transportation, which was answered in the affirmative.

### Wednesday 29 December 2004

The Ministry for Foreign Affairs formally gave the commission to the Swedish Civil Aviation Authority (CAA) to carry out transportation of injured people using two MD 80 aircraft within the services of SNAM light. At the same time the question was asked whether the National Board of Health and Welfare had given the commission for coordinating secondary transportation in Sweden to PKMC. Confirmation of this could not be obtained until the following day.

### Thursday 30 December 2004

PKMC started the mission, and it was assumed that this would mean coordinating secondary transportation by two Swedish MD 80 aircraft that would fly once or more to Thailand and land at Swedish airports. This mission, however, was extended during the following days.

Västra Götaland RMKL made the decision on Thursday 30 December to separate the planning and handling of secondary transportation from other operations, both in terms of personnel and premises. During the days that followed people worked in shifts, as did several doctors on call that were included in this coordination function. The coordination of onward transportation had two goals:

- The injured that had returned home with SNAM would be transported to their local hospital as soon as possible.
- Families would be kept together during secondary transportation.

It was also decided at an early stage to use normal procedures for ordering secondary transportation.

According to the plan that PKMC received from the SNAM management, both aircraft would fly via Bangkok to Phuket and then transport injured people to Arlanda (ARN) in Stockholm. To decrease the need for secondary transportation, PKMC proposed that, if possible, people who lived in the Stockholm region and further north should be put on the one aircraft and others who lived in Skåne, Småland and along the west coast on the second.

The latter aircraft would then be directed to Landvetter (GOT) in Göteborg, possibly landing at Sturup, in Skåne, en route. Since only one of the aircraft flew to Phuket, while the other evacuated injured people directly from Bangkok, this plan became irrelevant as soon as it was confronted with the real situation.

At 13:00 PKMC heard by telephone from SOS Flygambulans that the Volvo-Ericsson-Skandia director's aircraft (SE-DVE) had been put at their disposal to fly 10 injured people from Thailand to Lund on commission of the Ministry for Foreign Affairs. Estimated time of departure (ETD) from Arlanda was stated as 13:00. The call was referred to the management of SNAM, who gave a preliminary decision on the estimated time of arrival (ETA) for the aircraft sent. They would land at 0:45 and 0:50 (with five minutes interval) on 1 January 2005.

During the afternoon and evening of 30 December and during the following days, the PKMC doctor on call contacted a large number of players, both on his own initiative and through incoming calls. All available aircraft transportation resources (civilian and military alike) that were put at their disposal were listed. The library they were using soon proved to be too small to work in since it could not have enough space for the number of whiteboards that were needed. Operations were moved to one of the lecture rooms at PKMC, which had enough space but only one telephone line. This proved to be too vulnerable and they were forced to move back to the staff room at RMKL where there were more people who could help to answer the telephone when work was at its most intensive. It was then possible for the first time to keep a minute-by-minute operations log using the secretarial help that was available.

At 17:30 on 30 December, the Skåne County Council health authorities, the Stockholm County Council health authorities, CAA and SOS Alarm held a telephone conference to check the planning of secondary transportation. Two different solutions were produced, depending on whether both aircraft would fly to Arlanda or if one would be redirected to Sturup/Landvetter. Concerning Arlanda, it was planned to utilise aircraft for transport to Landvetter and helicopter for onward transportation to hospitals without airports in the vicinity. Both the Defence Forces and the Police Aviation through the Aeronautical Rescue Coordination Centre (ARCC) put large resources at the disposal of PKMC. All outbound information went from PKMC via its mailing list to the county councils' *officials on call* and was also copied to SOS Alarm for dissemination to parties affected throughout the country. Later in the evening renewed contact was made with ARCC, and disposable air resources were judged as being more than sufficient for the mission.

At 21:05 a request was made by the then manager of the unit for emergency preparedness at the National Board of Health and Welfare for Västra Götaland region to send one more medical team with one of the Britannia flights from Arlanda at 23:55 the following day to evacuate nine injured people from Thailand. After direct contact with Fritidsresor/Britannia, this request was withdrawn at 21:20, which was reported to the National Board of Health and Welfare by e-mail at 21:22.

At 21:20 PKMC contacted the Emergency Medical Communication Centre at Ullevål Hospital in Norway, since the commission was received to coordinate secondary transportation of Braathens flights with injured Swedes who would land at Gardermoen on the Braathens flight on 31 December at 05:00. The Emergency Medical Communication Centre promised to coordinate secondary transportation to Sweden.

### New Year's Eve, 31 December 2004

At 02:10, SOS Alarm reported that a patient who should have arrived in Oslo had been left in Dubai. Other Swedes on the aircraft who landed at Gardermoen were admitted to the University Hospital of Ullevål.

At 10:05 the SNAM management reported that both MD 80 aircraft had left Thailand at almost the same time with a total of 58 patients on stretchers and 50 in seats. ETA at Arlanda was 04:00 on 1 January 2005 after three intermediate landings in Delhi, Dubai and Istanbul.

Shortly afterwards, Västra Götaland region, the Stockholm County Council health authorities, the Skåne County Council health authorities and SOS Alarm held a telephone conference. It was heard that the Stockholm County Council health authorities intended to carry out triage at Arlanda to check whether the injured could manage further land transportation. At that point it was unclear who would coordinate onward land transportation. According to the official at SOS Alarm, it should have been possible to utilise part of the "national" road ambulance resources that had been mobilised from surrounding county councils and put on standby at Rosersberg, at least for transportation within the area of Mälardalen. The Stockholm County Council health authorities protested, claiming that they would need the ambulances for their own use. With around 30 ambulances on standby at Rosersberg, PKMC judged that at least some of these could be released for secondary transportation to other parts of the country.

PKMC also heard then that the Volvo-Ericsson-Skandia director's aircraft (SE-DVE) was in Bangkok, as well as a Viking flight. The Skåne County Council health authorities had also received information from SOS International that they would land with injured people from Skåne at 0:45 at Kastrup.

At 12:00 contact was once again made with ARCC. There were one Tp84 Hercules aircraft (30 stretchers) and seven military helicopters available (three at Berga, two at Ronneby, two at Säve).

At 13:55 an e-mail was sent to all Officials on Call, stating that two MD 80 aircraft had taken off at 09:00 with 58 stretcher patients and 40 seated patients. ETA at Arlanda was 04:00 the following day. County councils that would receive injured people were to be contacted by telephone with details of medical care requirements, identity etc.

14:00 It was decided to set up a call-centre.

15:00 No manifests had been received.

16:30 The Swedish Defence Forces' Tp84 Hercules aircraft and helicopters were activated through SOS-OP and ARCC.

16:41 E-mail was sent from Viking Airlines via SNAM saying that ETD from Bangkok on 1 January 2005 was 07:00.

18:10 Decision from Landvetter that 27 patients were expected to arrive with the Tp84 Hercules at 06:00 on 1 January 2005.

18:30 Decision by ARCC that the Defence Forces had put one SAAB 340 with space for 30 seated passengers at their disposal after 08:00 on 1 January. There was a two hours' alert time but no medical crew. PKMC also received a decision that the flight crew on the Tp84 Hercules must have 10 hours' rest after they returned from Arlanda.

19:05 Information about SK 7014 was faxed by request to Karolinska Hospital management centre.

19:30–20:00 Manifests for SK 7014 were transcribed, checked against the police (population) register and sorted into county council areas. These were sent by e-mail to the responsible authorities of each county council health authority.

20:00 A telephone call was received from SOS Flygambulans with information on injured Swedes that would be arriving on flight SE-DVE (three on stretchers/three in seats) to Sturup at 9:30 on 1 January. This was forwarded to the Skåne County Council health authorities and SOS Alarm.

21:28 E-mail was received from the SNAM management requesting that PKMC should coordinate continued "national" air transportation.

## New Year's Day 1 January 2005

The following flights landed:

Flight	From	Dest	Arrival	Lying	Sitting	Relatives
SK 7015	PKT	ARN	4:00	36	8	12
SK 7014	BKK	ARN	5:30	22	6	14
SE-DVE	HDY	ARN-LIN-Säve	10:00–12:15	4	2	0
SK 7048	BKK	CPH	12:17	8	22	19

02:00 SOS Flygambulans made enquiries about secondary transportation Arlanda–Skåne.

04:00 Manifests were sent to each county council health authority affected.

05:15 Doctors (Skåne County Council health authorities) at Kastrup reported that SOS International had landed at Kastrup and sent five patients by Danish ambulance to Göteborg. Information was received from the SNAM management that the Tp84 Hercules was delayed and must land at Säve instead of Landvetter due to bad weather conditions.

05:25 The planned helicopter transportation to Karlstad could not be carried out due to risk of ice formation.

05:35 Two medical teams from Huddinge and SÖS were on the way to Arlanda.

05:50 It was planned to use a Jumbolans (rebuilt handicap-adapted tourist buses with space for patients lying, in wheelchairs and seated) instead of helicopter transport to Gävle. PKMC received information that 16 people from SNAM personnel were going to land at 12:17 at Kastrup, where they would be relieved. CAA would organise transportation home for them. On the same aircraft there were 29 Swedish patients, about whom PKMC had no information.

6:30 PKMC decided with SOS Alarm that they would use helicopter transportation instead of the Jumbolans to Gävle.

6:55 PKMC contacted *officials on call* in Skåne regarding a flight to Kastrup. Skåne made an inventory of their reserve capacity, PKMC tried to organise a flight.

07:15 A list of patients travelling on with the Hercules Tp84 from Arlanda to Landvetter was e-mailed to SNAM management for forwarding to the loading master.

07:40 TiB in Skåne reported that there were five injured people from Skåne onboard an Airbus with an ETA of 12:17 at Kastrup.

08:00 Eleven ambulances were directed via SOS-O to Landvetter to meet the Tp84 Hercules.

08:05 A decision was received that neither of the two military helicopters that had been directed to Arlanda was required for transportation of patients.

08:35 The police were requested to meet flight SE-DVE, which had an ETA of 12:40 at Säve.

09:05 New ETA of 12:15 for SE-DVE, the police were informed.

10:00 Information that SE-DVE would deliver injured to Arlanda, Linköping and Säve.

During a telephone conference, the Stockholm County Council health authorities reported that it was not possible to allow any of the ambulances at Rosersberg to be used for secondary transportation. The Airbus that was about to land at Kastrup was confirmed as belonging to "SNAM", i.e. that PKMC would coordinate secondary transportation. No manifest was available. Planning evacuation of injured from Kastrup by ambulance to Skåne and by military helicopter to Göteborg.

11:30 PKMC told by SOS that six patients who should have been on the Tp84 Hercules to Landvetter were not onboard. All information checked with the Stockholm County Council health authorities, who reported at 12.30 that none of these six patients were in any hospital in Stockholm.

11:42 New manifests arrived from SOS Alarm.

12:00 Information was received that Tp84 Hercules had delivered its last injured passengers at Landvetter. Contact was also made with the SNAM management and information received that Viking Airlines was included in SNAM. Swedish ACC reported that this aircraft would take off from Bangkok but gave no exact information on ETD. No other aircraft were planned to be sent from Sweden. However, Norway, Finland and Iceland had offered to help with the airborne evacuation.

14:30 New telephone conference in which the Skåne County Council health authorities reported that the Airbus had delivered passengers to Kastrup without any problems.

16:05 Report from SOS-O that the military Vertol helicopter from Ronneby had taken eight injured people to Sahlgrenska/Östra Hospital. These patients had arrived with the Airbus that landed at Kastrup. One patient would be transported onward to Uddevalla by road ambulance, since the ambulance helicopter could not fly due to bad weather conditions.

17:31 E-mail was sent to PKMC from SOS Alarm with a manifest for flight SE-DVE which would arrive at Arlanda in the evening of 2 January 2005.



18:20 SOS-O reported that the air ambulance 005 could not find any patients at Kastrup.

20:30 Telephone call from Lufttransport wondering why SOS Flygambulans had been given all extra flights.

23:30 Manifest for BRA 1278 arrived by fax from Norway. It was forwarded to SOS Alarm and the SNAM management.

## Sunday 2 January 2005

The following flights landed:

Flight	From	Dest	Arrival	Lying	Sitting	Relatives
BRA 1278	BKK	ARN	8.55	9	0	4
VIK 9086	BKK	ARN	13.30	0	4	2
SE-DVE	PKT	ARN	21.50	3	0	1

06:00 BRA/BU 1278 flight manifest faxed to SOS-O.

09:11 E-mail sent from the SNAM management regarding two patients who would arrive with a military plane in Paris. They needed onward transportation to Jönköping.

10:00 Telephone conference: it was confirmed that PKMC would coordinate onward transportation of patients who needed intensive care and who would be flown to other parts of Europe. E-mail about this was sent to SOS Alarm for forwarding to all *officials on call*.

17:20 The National Board of Health and Welfare reported that SK 7136 had 20 patients who would be on stretchers. The aircraft made an intermediate landing in Dubai at 22:00 to take on board a patient who had been left there earlier. Also informed that the SNAM management would be dissolved the following day.

18:00 Contacted Jämtland County Council PKMC and wondered if there were patients from their county council who were admitted to other Swedish hospitals. The reply was negative.

18:45 ARCC had an enquiry about the level of infection risk for flight crews if there were patients onboard with methicillin resistant *Staphylococcus aureus* infections (MRSA).

18:50 ARCC received decision that everybody with positive cultures would be contacted.

21:59 Manifest for SK 7136 received.

## Monday 3 January 2005

The following flights landed:

Flight	From	Dest	Arrival	Lying	Sitting	Relatives
OY-CLN	CDG	Axamo	11.40	2	0	0
SK 7136	BKK	ARN	10.25	10	10	2

04:20 SOS-O made enquiry about flight DK 150.

05:20 Telephone call with Central Medical Emergency Administration about Paris.

06:20 SOS-O enquired about flight SK 707.

08:50 The Ministry for Foreign Affairs enquired whether Danish citizens were on flight SK 7136. Answer was negative.

12:20 Icelandair FI 1397 now counted in with SNAM. Capacity was 18 stretchers and 45 seats. ETA for aircraft at Arlanda 20:00 on 4 January.

16:00–17:45 Manifests checked on request from the Ministry for Foreign Affairs to find any "missing" persons (people registered at hospitals in Thailand but later not localised). None found.

17:30 Telephone call from military helicopter regarding risk of being infected by injured passengers. Infection unit contacted, who in turn would contact ARCC.

18:15 Fax with manifest for flight FI 1397 sent to SOS Alarm.

18:40 Direct contact with medical director on-scene at Arlanda regarding passengers on FI 1397.

18:40 Contact with Lidköping to organise medical team that would be on Tp84 Hercules to Arlanda on 4 January.

20:40 Information received on patients on SE-DVE via the Skåne County Council health authorities.

## Tuesday 4 January 2005

The following flights landed:

Flight	From	Dest	Arrival	Lying	Sitting	Relatives
FI 1397	BKK	ARN	23.28	18	27	0
SE-DVE	DBX	ARN		2	1	0

08:35 Tp84 Hercules ETD 14:30 from Säve airport.

08:40 Medical team in Lidköping informed and activated.

09:30 Helicopter division requested written guidelines for cleaning/sanitisation of aircraft.

09:55 Report with ID of family left in Dubai passed on to call-centre and police.

10:00 Telephone conference with report on FI 1397, ETA in Sweden 23:30 with 18 patients on stretchers and 28 seated.

12:33 E-mail from SOS Alarm with new manifest for flight SE-DVE.

14:00 Contact made with Swedish embassy in Dubai and flight times for SE-DVE verified.

14:30 The Ministry for Foreign Affairs wanted a decision on the three named people on FI 1397. These planned to fly with the Tp84 Hercules to Göteborg.

15:00 Question regarding flight SK 7138 that was going to land at Gardermoen with Swedish citizens onboard.

16:00 Police in Västra Götaland region received ETA for Tp84 Hercules.

17:00 Contact made with SOS and ambulance service in Göteborg for planning of transportation from Hercules Tp84.

18:10 Contact with ambulance helicopter, discussion on whether it could be used during the night. However, weather forecast so dubious it was decided to only use road ambulances.

19:50 PKMC contacted ARCC and the Air Force Wing in Säve to obtain definite information ETD for the Tp84 Hercules from Arlanda.

19:51 New ETA for FI 1397 stated at 23.37.

19:59 SNAM management dissolved on 5 January 2005 after Fi 1397 had landed.

20:10 CAA reported that the weather situation at Arlanda was such that all air traffic may have to be cancelled. A backup plan was initiated for waiting flights FI 1397 and SK 7014. PKMC also contacted the chief physician at Sahlgrenska University Hospital and the ambulance medical service in Göteborg, SOS-OP and ARCC.

21:40 The SNAM management reported that anti-skid measures were underway at Arlanda.

22:00 The ambulance service in Göteborg manned extra vehicles since they could not wait for a definite decision.

23:05 Message that the Tp84 Hercules had landed at Arlanda. The crew wondered about their position and the inquiry was forwarded to SNAM management.

23:29 Message that flight FI 1397 had landed at Arlanda at 23:28 according to the SNAM management. Information was passed on to the chief physician at the Sahlgrenska Hospital, SOS-OP, the ambulance service in Göteborg and CAA Landvetter.

#### *Planning/requirements for long secondary transportation*

Flight	Dest	Road amb.	To	Number
Tp84	GOT	Amb	SU/Ö	14
Tp84	GOT	Amb	Uddevalla	1
SE-IXC-005	Sturup	Amb	Lund	3
SE-KFP-006	Växjö	Amb	Växjö	1

23:40 PKMC received request from Tp84 Hercules regarding the type of stretcher on flight FI 1397, but was referred to the SNAM management.

### **Wednesday 5 January 2005**

00:25 SOS Alarm was contacted regarding previously promised onward transportation of uninjured who had arrived at Arlanda with a regular flight and who were travelling to Landvetter. The aircraft was delayed however, and the Tp84 Hercules did not wait from these passengers.

00:35 Telephone call from Air Force Wing in Säve: Tp84 Hercules ETA 03.00 at Landvetter.

01:00 Decision from the SNAM management that injured people must be moved to other stretchers.

02:30 Fax from Norway that flight SK 7138 was going to leave a patient on a stretcher at Sturup for onward transportation to Malmö University Hospital. The aircraft was expected to land at 07:40. The Skåne County Council health authorities TiB were informed about this.

02:45 Information that the Tp84 Hercules had taken off.

03:36 Tp84 Hercules landed at Landvetter. The first patient left the airport at 04:05 and the last at 04.40.

04:59 The SNAM management sent e-mail to PKMC with manifests for flight SK 7136.

13:00 Mission completed.