

Report of Assessment and Situation Analysis in selected Hospitals in Sri Lanka

7 – 18 February 2005

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1 Background

Following the Tsunami disaster of 26 December 2004, the World Health Organization's department of Essential Health Technologies (WHO/EHT) has put forward a proposal for introducing a consultancy-based service system for eHealth for emergencies. The proposal is to provide electronic equipment to primary health care centres in areas of crisis, offering them access to networks of consultants in a range of clinical specialities. The service system is called "eHealth Emergency Hospital"¹ and will consist of laptop computers with software, satellite communication, generators and spare batteries. The purpose of the proposed service is to strengthen primary health care in crisis by providing online and offline advice for patient diagnosis and management.

The Norwegian Centre for Telemedicine (NST), the initial WHO Telemedicine Collaborating Centre, has previous experience of working in Sri Lanka². With this background, Sri Lanka was chosen as a pilot country for the proposed services, and NST was asked to undertake a needs assessment in selected hospitals in the country. This report deals with the findings of the assessment, which was carried out between 7 – 18 February 2005. The report includes a discussion of the key issues which emerged, and recommendations on how best to implement the proposed services for this country.

The proposal sought to pick out three hospitals affected by the tsunami disaster, which would be proposed as pilot sites. On the basis of discussions held with Dr. Palitha Abeykoon at the WHO Regional Office (WR) in Colombo, the following three hospitals were selected:

- Hambantota Base Hospital, Southern Region
- Tissamaharama District Hospital, Southern Region
- Ampara Base Hospital, Eastern Region

All three hospitals agreed to take part in the pilot teleHealth project, as described in chapter three. Meetings were also held with Kandy Teaching Hospital, which is serving as a resource hub in this project. Kandy Hospital, in the Central Region, is functioning both as a professional hub for the various medical specialties and as a technical hub. All servers are placed here.

The assessment has been undertaken by the author, with practical assistance from the WR office in Colombo. The findings of the assessment are discussed in chapter four. Meetings and discussions were held with the following people:

- Dr. U.P. Ariyawansa, MS, Hambantota Base Hospital
- Dr. Dharmasena Disseneyake, Director, Tissamaharama District Hospital
- Dr. M.G.P. Samarasinghe, Director, Kandy Teaching Hospital
- Dr. P.K.C.L. Jayasinghe, MS, Ampara Base Hospital
- Dr. Palitha Abeykoon, WHO Regional Office in Colombo, WR office
- Mrs. Jyotsna Chikersal, SEARO
- T.M.K.B. Tennekoon, Director of SLIDA (Sri Lanka Institute of Development Administration)

¹ "Establishment of an eHealth based consultation service for the strengthening of primary health in areas affected by the tsunami in India, the Maldives, Sri Lanka, Northern Sumatra and Thailand", WHO, 8 January 2005

² "Report on study tour of Sri Lanka, 26 April to 20 May 2004", conducted by NST and the Centre for International Health and representatives from the University of Tromsø.

- Shalika Subasinghe, Learning and Development Manager, DLC – Distance Learning Centre
- WR Technical Staff at Kandy TH and Ampara BH

1.1 Summary of recommendations

The success of developing and implementing an "eHealth Emergency Hospital" as proposed by WHO/EHT in Sri Lanka is to a large extent dependent on not making the implementation too complicated. The tasks needed are many and time consuming, and the assessment also identified that one of the key issues, the need for training of the users, is great. All available training resources should be directed at the ongoing teleHealth project, and the introduction of a system requiring separate and different training is not recommended. With this background it would not at present be advisable to introduce the "eHealth Emergency Hospital" project proposal as a separate system.

The emergency hospital concept is more likely to be a success if it is integrated with the existing activities already taking place in the country. There are some specific conditions which must be met in order to fulfil the proposed objectives. These include:

- Infrastructure expansion.
- The availability of electronic equipment.
- Developing and conducting continuous training programs.
- Appointing a local eHealth and training representative
- Ensuring sustainability.

1.2 Report summary

Chapter two gives a short overview of the Sri Lanka health sector. Chapter three is a description of the pilot teleHealth project which is already in place.

The objectives of the "eHealth Emergency Hospital" project proposal are described in chapter four, followed by the recommendations for implementation.

The assessment showed that the training of doctors and other staff is one of the key success factors for an eHealth project, and this topic is therefore discussed separately in chapter five.

2 Overview of the Sri Lanka Health Sector

Health services in Sri Lanka are provided by the public and the private sector, and the public sector is the larger of the two. All public health services are initially free of charge. Figure 1 gives a brief overview of the structure of the public health sector.

2.1 Public Health Sector

The following figure provides an overview of the structure of the public health sector.

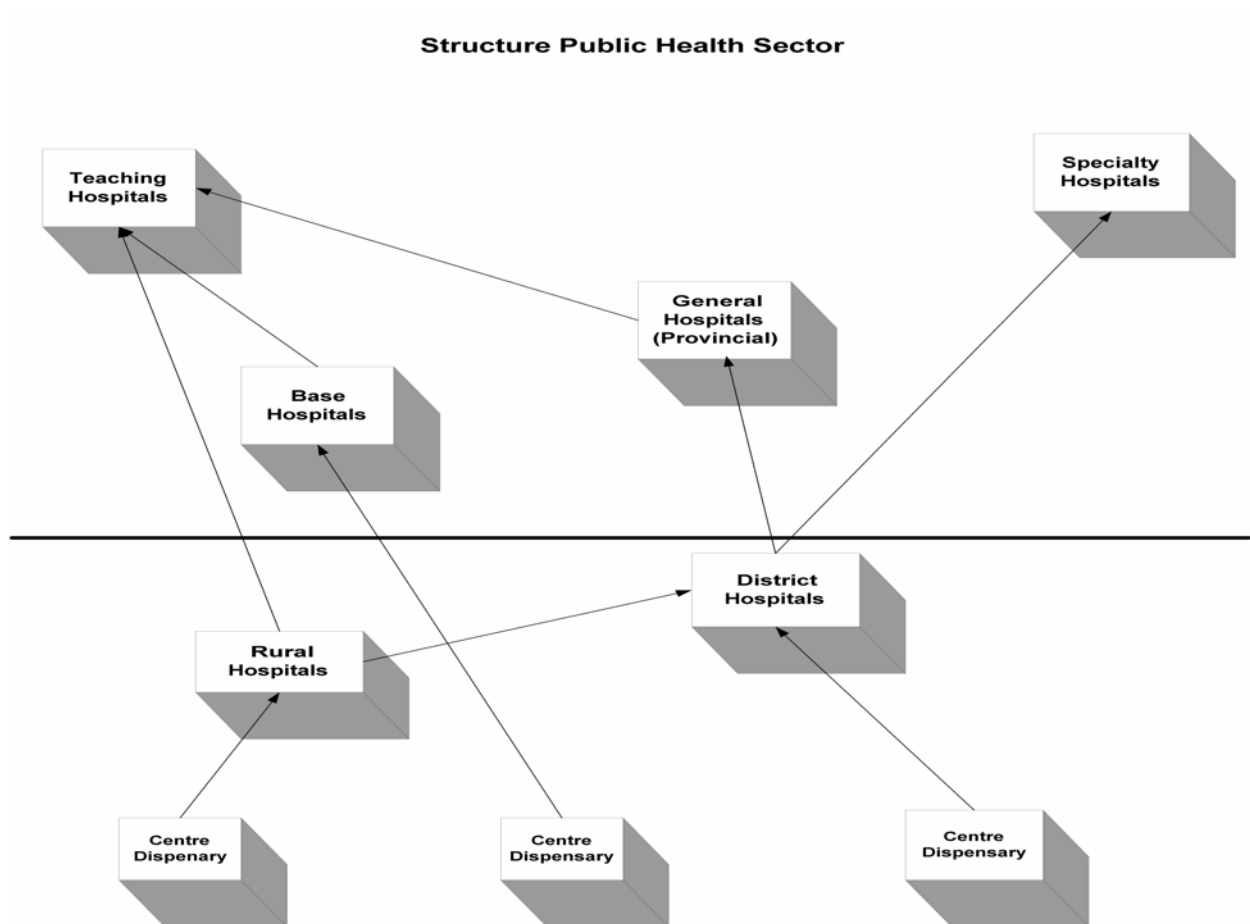


Figure 1 : Structure of the Public Health Sector

There are 12 Teaching Hospitals in the country, but only 6 of them are directly connected to a local university. The hospitals below the horizontal line in Figure 1, the Rural Hospitals and the District Hospitals, together with the Centre Dispensaries, are defined as the primary health care centres.

2.2 Current use of electronic services

Most of the hospitals lack computers and other electronic equipment. Registration of patients and patient data is done manually and the information is mainly stored at the local hospital level.

At present, there is no formal patient referral system. The ideal system for referring patients should be in ascending order from bottom to the top of the hierarchy. However, the typical situation is that patients can be and are referred from any hospital to any of the others, as shown by the arrows in Figure 1. A patient may also choose to go to any hospital without being referred there. This obviously has some negative effects for the patients, the general practitioners, the specialists and for the system as a whole. Some of them can be described as follows:

- There is no feedback to the referring hospital on the outcome of consultations
- The GP has difficulties in following up the patients
- The lack of feedback leads to problems maintaining the best quality of the health care
- Without a scheduling system, the specialists have difficulties planning their work

Several projects have been initiated to overcome these problems by introducing reporting and referral systems. One of these is the pilot teleHealth project³ which began three years ago in selected hospitals in the south and the south-east of Sri Lanka.

³ SEARO memorandum, "Health Telematics Project proposed in WR Sri Lanka", 18 July 2002

3 The pilot teleHealth project in Sri Lanka

As part of a regional plan for an inter-country health programme which began three years ago, WR office in Colombo and SEARO⁴ worked together to implement a pilot ICT⁵ system in Sri Lanka. Eight hospitals were chosen to take part in the project, with Kandy Teaching Hospital serving as the hub, the central point for referral and second opinion. The project covered the following areas:

- Installing external infrastructure, consisting of a mix of leased lines and dial-up connections
- Installing internal infrastructure in the selected hospitals, including computers and peripherals such as digital cameras, microscopes and scanners
- Developing software for registering and storing patient information, including a referral and consultation feedback system
- Installing email systems
- Providing general Internet access
- Developing training packages for doctors and other local staff

3.1.1 Contents of currently installed pilot system

The existing platform consists of standard software for Internet access, and Microsoft Outlook is used as the email system. In addition to standard procedures for sending and receiving emails, specially designed Outlook Forms are used for patient registration. These forms cover all the information necessary to track the patient's history, and make it possible to include attachments such as digital images or digitized X-ray films.

The forms are designed for offline registration and their use has several purposes:

- Storing patient information for later use
- Submitting requests to the specialists, mainly at the Kandy Hospital, for second opinions
- Receiving speciality consultations and advice for each patient case
- Referrals
- Keeping track of a patient's history

When the forms are registered, a request for second opinion or a referral can be sent to Kandy Hospital. At the same time, a copy of the forms is stored on the central server. The specialist at Kandy will review the case, make the necessary comments and store the results of the consultation in the same server. The forms, now containing the answers from the specialist, are then transferred back to the originator. This store-and-forward system is easy to use, and functions both as a system for second opinion and as a referral system for the hospitals which are part of the network.

At present there is no formal referral system established on a national basis. Any patient from any part of the country can go to whatever hospital they prefer. The normal situation, of course, is that patients tend to use their local hospitals. However, if they do not attend their local

⁴ SEARO – WHO South East Asia Regional Office

⁵ ICT – Information and Communication Technology

hospital, or if they are referred onwards, the results of the consultation or investigation are not normally sent to the local hospital

The pilot teleHealth project is now being extended through the addition of a new project, the ICT project. The objectives of the ICT project are to expand the existing system to a larger number of hospitals and to prepare to extend the range of services covered. The expansion will seek to establish a broader infrastructure and to plan for the development and distribution of various electronic systems including Hospital Information Systems, Multi-Disease Surveillance Systems and eHealth solutions.

The assessment draws upon the experience of the pilot teleHealth project plus the planned expansion to be incorporated in the ICT project.

4 Report from Hospital visits

The hospital visits were conducted on 9-10 February and 17-18 February, and the sites visited were Hambantota Base Hospital, Tissamaharama District Hospital, Kandy Teaching Hospital and Ampara Base Hospital.

4.1 Needs assessment

The purpose of the meetings held with the local staff was twofold. The main purpose was to assess whether the hospitals were candidates to serve as pilot users for the "eHealth Emergency Hospital" project proposal. The second purpose was to do a needs assessment relating to the installation and use of the equipment needed for the project.

This chapter provides a technical description of the assessment done at the different hospitals. The findings are also summarized in Table 1 - Overview of assessment on page 11.

4.1.1 Hambantota Base Hospital

The Hambantota BH, located in the eastern part of the Southern Region, is currently equipped with 3 PCs and peripherals which include a PC-based videoconference system. The hospital has an 8-port switch and a router with a VOIP⁶ module from Cisco. The connection is over a leased line to the hub in Kandy, and the bandwidth is 64 Kbits.

The peripherals are:

- Printers
- Scanner
- Digital Camera
- Polycom ViaVideo Video Conference

The doctors report that they are using all of the equipment, for different purposes and to a varying extent. Most of the doctors are familiar with the use of the digital camera, and with sending digital images as attachments by email. They benefited from this facility during the tsunami crisis. The hospital has a film-based X-ray machine, and X-ray images of adequate quality are scanned and sent by email.

The main areas of use are:

- Sending digital images by email for second opinion
- Sending scanned X-ray images for second opinion
- Using the Internet to search for and download articles from medical journals.
- Participate in the ongoing tele health project implemented by Searo and WR by using the electronic patient registration forms.

The hospital will benefit from a bandwidth upgrade. Currently, their access to the Internet is slow, and it is not possible for them to use the videoconference equipment.

The general awareness of e-Health and telemedicine applications is high, as is the willingness to use the systems.

⁶ VOIP – Voice over Internet Protocol (IP)

Training

The hospital is in need of IT training, ranging from basic computer training (how to operate a PC) to more advanced training such as the advanced use of Excel and Outlook, using a scanner and so on. There is a continuous need for training, as trained staff are often reassigned elsewhere and their replacements must be trained from the beginning again.

Consultancy Networks

The doctors will benefit from the establishment of networks of specialty consultation services. General medicine, histology and radiology are of special interest.

Other comments

Some of the equipment already installed is not being used due to the shortage of funds for running costs. So the equipment and the services which could be provided are of no value if the running costs and the cost of spare parts are not covered.

4.1.2 Tissamaharama District Hospital

Tissamaharama DH is also located in the eastern part of the Southern Region. The hospital is currently equipped with one PC with peripherals. The hospital has a dial-up connection to the hub in Kandy. The Internet connection has been used for downloading medical journals and for using the electronic patient registration forms. The hospital only has one telephone line, which has to be shared between the PC and office use. This means that it is not possible to make phone calls in or out of the hospital while the PC is connected, or to use the PC when calls are being made. This obviously limits the use of the systems, and the equipment is not used as much as the staff would like to do.

The peripherals are:

- Printer
- Scanner
- Digital Camera

The hospital has 10-12 doctors, including one paediatrician. The willingness to use the systems is there, but the awareness of the different type of applications is somewhat limited. The limitations of the infrastructure, both technical and related to the hospital premises, are also considerable.

Training

The hospital is in need of training ranging from basic computer training (how to operate a PC) to more advanced training such as the advanced use of Excel and Outlook, use of the scanner and so on.

The staff also needs general training for the various e-Health applications. This will serve two purposes, enabling the use of the applications and creating awareness of what can be achieved.

Speciality Networks

The need for second-opinion networks is great. The doctors will benefit from networks of clinical specialty consultation service. General medicine and paediatrics are of special interest. This hospital also reports an urgent and increasing need for assistance in the psychiatric field.

4.1.3 Kandy Teaching Hospital

Kandy General Hospital is the second largest Teaching Hospital in Sri Lanka. It is located in the Central Region, and has about 2,000 beds plus up to 200 floor patients. The hospital has more than 680 medical staff, specialized in many different areas, including radiology, oncology, paediatrics, ENT, gastrosurgery, and mammography. This is a specialist centre for kidney transplantation, and most of the patients nationally who require kidney transplants are referred here. The hospital has 20 operating theatres and 10 ICUs. The medical students at the local university receive most of their clinical training here, and they also do most of their postgraduate training here. The teaching facility also includes a nursery school.

Patients are referred to the hospital from the different regions of Sri Lanka: North, North East, East and South East. Many patients who survived the tsunami disaster have been and still are referred here.

Infrastructure

Kandy TH has an active role in the existing tele-Health project, as it is the central hub for the other participating hospitals. Two members of staff, one network administrator and one doctor, are assigned to the main operation of the network and assist the other users. The hospitals taking part in the existing pilot project use Kandy TH for patient consultations, and as such this hospital is their main source for second opinion. The doctors at the hospital appear to have a good awareness of the benefits of e-health and telemedicine applications.

The hospital is equipped with a network which consists of three workstations with peripherals. In addition, the servers needed for the tele-Health project are located here. An expansion of this infrastructure is highly recommended. Because this is the main hospital providing second opinions, it is of vital importance that the appropriate equipment is available for the specialists when required. A shortage of available computers may lead to a decrease both in the use of and in the interest in the applications. This would negatively affect the other hospitals participating in the project.

Training

Though most of the doctors are familiar with the use of computers, and they seem to have a good understanding of the possibilities of telemedicine and e-Health applications, basic and advanced computer training will still be of high value. They also need general training in the range of e-Health applications. This will serve two purposes, an increased use of the applications and creating further awareness of what can be achieved.

4.1.4 Ampara Base Hospital

The hospital is a Base Hospital serving as a District Hospital for the Ampara District in the Eastern Region. It has 430 beds, 70 doctors and 630 other staff. The hospital has ICU facilities and a neonatal intensive care unit.

Infrastructure

The hospital is currently equipped with 4 workstations and peripherals, including a PC based video conferencing system. The connection is over a leased line to the hub in Kandy, on a bandwidth of 64Kbits.

The equipment includes:

- Printers, digital camera

- Pathology workstation with microscope and digital camera
- Radiology workstation with digitizer for film-based X-rays
- Polycom ViaVideo Video Conference
- LAN

The main purposes for which the equipment is used include:

- Sending digital images by email for second opinion
- Sending scanned X-ray images for second opinion
- Sending pathology images for second opinion
- Using the Internet to search for and download articles from medical journals.
- Participation in the ongoing telehealth project implemented by Searo and WR by using the electronic patient registration forms.

A bandwidth upgrade is highly recommended.

Training

Ampara BH is the largest user of the telehealth project. Most of the doctors are well trained and are familiar with the use of the digital camera, sending digital images as attachments by email, using the digital microscope, and so on. Training at this hospital should mainly be directed towards other staff, both clinical and administrative. The areas of training should cover basic computer training (how to operate a PC) and more advanced training such as the advanced use of Excel and Outlook, etc.

Consultancy Networks

The general awareness of e-Health end telemedicine applications is high, as is the willingness to use the systems. The doctors have already obtained benefits from participating in the networks for specialty consultations. During the tsunami crisis, requests for specialty advice were sent to the international medical community, for instance to Harvard University. From there, the hospital staff received all the help possible for treating patients with medical conditions which they had not previously experienced. This is an excellent example of how e-Health applications and international medical speciality networks can be used.

Overview of assessment

Hospital	Meeting held with	Current infrastructure	Recommended upgrade	Computer training needed	Consultancy networks wanted
Hambantota BH	Dr. U. P. Ariyawansa, MS	3 workstations Printer Scanner CD-Writer Digital Camera Video conference 64 Kbits leased half Circuit	Primarily bandwidth upgrade is needed. Laptop computer with network connection	Basic and advanced computer training to all staff. Training in telemedicine and e-Health services	General medicine Histology Radiology Psychiatry
Tissamaharama DH	Dr. Dharmasena Disseneyake, Director	1 workstation Printer Scanner Digital Camera Dial-Up Connection	Connection upgrade to leased line. Laptop computer with network connection. Router/Switch	Basic and advanced computer training to all staff. Training in telemedicine and e-Health services	General medicine Psychiatry
Kandy TH	Dr. M. G. P. Samarasinghe (Director), Several section leaders, WR Technical Staff	4 workstations Mail Servers (IMAP4/POP3) Backup equipment Printers Digital Camera Small LAN	LAN expansion. Increased availability of computers. Bandwidth upgrade for Internet Connection	Doctors well trained. High awareness of available e-Health and telemedicine services. Basic and advanced computer training to general staff. Training in telemedicine and e-Health services for all.	N/A
Ampara BH	Dr. P.K.C.L. Jayasinghe (MS) Section leaders WR Technical Staff	4 workstations Printers Digital Camera Scanner Tel Pathology Equipment (AMD-410 microscope with digital camera) Connectivity through 64Kbits leased line	Primarily bandwidth upgrade is needed. Laptop computer with network connection.	Doctors well trained. Basic and advanced computer training to general staff. Training in telemedicine and e-Health services for all.	General medicine

Table 1 - Overview of assessment

5 The "eHealth Emergency Hospital" project proposal

Following the tsunami disaster, the lack of equipment and routines for the recording of patient data has been exposed. Patient information is mostly handwritten and stored manually. In a major emergency, the local doctors will inevitably have to deal with unfamiliar patient conditions, and the need for second opinions may be urgent. With this background, WHO/EHT has put forward the "eHealth Emergency Hospital" project proposal. The various objectives of the proposal, and how it can best be implemented in Sri Lanka are discussed below.

5.1 The "eHealth Emergency Hospital" project proposal – the proposed services

The objectives of the proposal as put forward by WHO/EHT in Geneva are as follows:

1. Improved capacity for recording and reporting

- a. Introduction of laptop computers with electronic health records (EHR) software in three relief and medium-term primary health care centres of the affected areas.
- b. Trained national staff in the use of computers and software

The expected outcome of this part of the project will be that it assists countries to establish a national plan for maintenance of the provided hardware and software.

2. Improved capacity for communication, in a medium-term perspective

- a. Provision of access to Internet and e-mails
- b. Trained national staff in the use of Internet and e-mail

The expected outcome is to assist countries to establish or link up to national connectivity that will replace the medium-term connectivity established to achieve objective 2.

3. Improved access to specialist advice in a medium-term perspective

- a. Provision of access to networks of medical specialist consultation service that can provide online and offline advice (the "eHealth Emergency Hospital" project proposal)
- b. Trained national staff in the use of consultation network services

The expected outcome is to assist countries in establishing national network services that will replace the medium-term consultation network services established under objective 3.

4. Long term solutions to objectives 1-3

- a. Establish a national plan for maintenance of the provided software and hardware
Trained national staff in the use of consultation network services
- b. Establish, or link up to, national connectivity that will replace the medium-term connectivity established to achieve objective 2

5.2 Integration of the proposed eHealth solution

Currently, the use of computers and other electronic equipment in the public health care system in Sri Lanka is very limited. Most of the doctors are familiar with this equipment, but this is not always true for other staff. The levels of computer literacy vary widely, and the need for training in this field is considerable. The expansion which has already begun of the pilot teleHealth project is partly intended to overcome this. An important part of the project will be the training of hospital staff in the use of electronic equipment, particularly in the applications being implemented.

The existing infrastructure is largely absent or insufficient to meet the needs. This is true both for interconnectivity between hospitals and for in-house networks. The implementation of a sustainable computer infrastructure should be a high priority. This is a long-term, complicated and costly task, but vital to the future of electronic health networks in Sri Lanka.

The success of further developing the teleHealth project is to a large extent dependent on not making the implementation too complicated. The tasks which are necessary are multiple, and time consuming. The assessment has also revealed an extensive need for training of the users. With this background, it is not advisable at present to introduce a separate telemedicine system intended to function as an emergency hospital, but it would be more effective to integrate the elements of the proposed "eHealth Emergency Hospital" project proposal into the existing ICT project of the country.

The following is a discussion of the objectives introduced in the proposed emergency hospital system and how it can be implemented in Sri Lanka.

5.2.1.1 Objective 1 - Improved capacity for recording and reporting

- *The introduction of laptop computers with software for Electronic Health Records.*

The expected outcome of this objective is to establish routines and solutions for tracking and maintaining patient information. The existing software for registering and storing patient information implemented through the pilot project may be well adapted as a system for this purpose. It is easy to use and well accepted by the doctors using it. Because they are familiar with the system, there will not be a need for extra training in the use of software and hardware specially designed for emergency purposes. All data entry is done offline in the field, and uploaded to the central server when the connectivity is available. This means that the current solution will be stable, easier to use, and will work even when Internet connectivity is not available.

There may be a need for further development regarding the compatibility of the different patient forms used. At present each form is treated individually, and the continuity necessary for serving as an electronic patient record may not be there. The recommendation remains that the current system is suitable for this purpose, but further development should be considered.

For this system to function during a crisis situation, the necessary equipment must be available. This means that each participating hospital must be equipped with laptop computers for this purpose. To ensure that these computers are functioning and have the capability to run the most recent software versions, they may well be used on a daily basis as a part of the hospital's local

network. Systems should be in place to ensure that these laptops are always accounted for and that they are available for dedicated field use during an emergency.

5.2.1.2 Objective 2 - Improved capacity for communication in a medium-term perspective

- *Provision of access to Internet and e-mails*

Expected outcome is to enable the doctors to communicate with each others and specialists around the world electronically. The ICT project aims to strengthen the existing infrastructure between the hospitals as well as the Internet access. At present, the users have access to both email and Internet, though the bandwidth is limited in some cases. It is important that the infrastructure, both external and internal, is designed to ease this access. The currently installed solution already provides both email and Internet access, and the staff involved is more or less using these services on a daily basis. Many of the doctors involved in the pilot tele-Health project are using their Internet access for searching for relevant medical information and downloading articles from medical journals.

5.2.1.3 Objective 3 - Improved access to specialist advice in a medium-term perspective

- *Provision of access to networks of medical specialist consultation service that can provide online and offline advice*

Access to international medical expertise for second opinion and advice is of great importance and may in many cases be life saving. This was clearly demonstrated during the tsunami crisis when the Ampara Hospital asked for assistance from Harvard University. In this case the specialists at Harvard did respond to the requests, but they could have chosen not to. This shows that the expertise may be available, but at the moment there are no established formal specialist networks on an international basis. In order to make these types of networks function properly in an emergency situation, they must meet certain criteria:

- They should consist of a limited number of specialists
- The specialists should cover all time zones
- The networks must be formalized
- Necessary commitments must be made by all involved parties
- Care should be taken when dealing with security issues and protecting patient privacy

Establishing such networks is time consuming and should be considered a long-term objective. The initial work should therefore start as soon as possible and routines should be established to ensure that these networks are maintained on a regular basis.

On a national basis Sri Lanka is already in the process of establishing these types of networks. At present, the Kandy TH is serving as a hub in the existing teleHealth network. The participating hospitals are using Kandy and the specialists there as the primary resource for consultation and second opinion. The expansion of the ICT project will include up to 6 Teaching Hospitals along with a number of Base and District Hospitals. This means that the availability of specialists will increase dramatically, but so will also the number of requests being made. Many of the same criteria being applied to the international networks are relevant; some are even more pertinent in an in-country context.

Building specialist networks, both on a national and international basis, is not only a question of making the different medical specialties available. It is of equal importance that the network itself is working internally. That is, the specialists are not only available to provide advice to clinicians in the primary care system; they are also there for each other. As part of different eHealth projects, many countries have established Web-based applications for this purpose. By accessing the Web, the specialists can exchange information with each other, establish discussion groups and so on. These applications can be of great importance, but their quality is largely dependent on one or two key persons for maintenance, raising funds for the operation and so on.

Protecting patient privacy is of great importance. When transmitting patient information across the Internet, it is of great importance to have routines to make sensitive data anonymous.

5.2.1.4 Long term solutions to objectives 1-3

The long term solutions to objectives 1 – 3 will be highly dependant on whether the expected outcomes of these objectives are achieved. A successful implementation of objectives 1 – 3 will ease the transition to long term sustainable solutions. Establishing national plans for maintenance of equipment and ensuring national connectivity should be a natural extension of the first three objectives.

5.2.2 Responsibility

The term "responsibility" covers at least three aspects:

- Being responsible
 - For instance when dealing with issues like assigning a doctor who is responsible for the treatment of the patient when he or she is at the hospital. Who is responsible for the patient in a telemedicine or eHealth setting?
- Acting responsibly
 - This refers to the ethical-legal norm put on all health care personnel to conduct their practice in accordance with the best standards, and to be "measured" against these standards. This is the aspect of responsibility as a so-called legal standard.
- Being held responsible
 - Refers to the fact that a doctor (or any/many other health care personnel) can be met with sanctions if the legal or ethical requirements are not met or not satisfactory fulfilled.

Ultimately, the question of responsibility is settled by courts or supervisory bodies based on concrete issues and situations. In these cases, all aspects of the situation at hand is assessed, such as the competence of the personnel, the specifics of the treatment situation, urgency of the case, available expertise and equipment, etc.

From the very start of telemedicine in Norway, health care personnel have raised questions concerning responsibility, and it is reasonable to assume that this is a concern shared with colleagues and patients world-wide. One key question is that of which is the responsible practitioner, when the patient is present with his GP and the specialist is present by means of a video conference, or by means of any other kind of interface, online or offline. Generally it can be said that the use of telemedicine does not change established procedures, and telemedicine practice must perform within existing legislation.

5.2.2.1 Quality of information

The general principle is that the health care personnel are responsible for the treatment given based on the information at hand. How the information is received, whether in a face-to-face meeting, through video conferencing or by sound samples or pictures of the patient, is irrelevant. The recipient of the information must consider whether the information is good enough – in terms of both quality and quantity – to start treatment, give advice or initiate other actions. In a telemedicine or eHealth setting this means that if the doctor finds that the information received is not good enough, more information must be obtained.

5.2.2.2 Establishing routines

It is of great importance that the systems and routines are in place. Some examples of routine questions that should be asked are:

- What is the situation at hand; a referral from a GP to a specialist, or advice from a specialist to a GP?
- Is the information received sufficient for a responsible medical judgement?
- Who will keep and be responsible for the health records?

5.2.2.3 Emergency situations

The above discussion relates to the use of telemedicine and eHealth consultations on a regular basis. During a crisis, the application of these issues must necessarily be different. In an emergency situation, time is often a crucial factor for patient treatment, and complicated legal issues may be less relevant. This does not mean that the parties involved can ignore them, but some of these issues should not prevent the fastest possible treatment.

6 Training

The assessment shows that the need for training in computer literacy is great. With exception of some of the doctors, mainly the younger ones, basic computer skills are often absent. This is of course largely due to the fact that the IT equipment has simply not been present in the hospitals. The expansion plans for the ICT project and the recommended deployment of laptop computers for eHealth purposes will create an immediate need to increase the levels of computer literacy.. The scope of the training should range from basic computer use to more advanced use, including the use of peripherals such as scanners and digital cameras and eHealth applications.

6.1 Training methodologies

The training methodologies which are applicable include:

- On-site training with instructor
- e-Learning: Web based training, interactive – non interactive
- Distant training by video conference
- Any combination of the above

This assessment has revealed some of the basic needs for generalised computer training. In view of the expansion planned within the ICT project, a separate, more detailed, assessment may be helpful. Its main purpose should be to identify the most effective training methodologies, and the staff eligible for training courses, and to establish the scope of the training needed for the different groups. Training modules covering the various areas should be devised, or the availability of existing modules from external sources should be investigated.

The training needs assessment should also establish whether there is a need for training in particular medical skills, both for the specialists and for the GPs. The speciality networks may be a good source for both uncovering the needs and for discussing the most effective ways of providing the training.

6.1.1 Different approaches

The success of the training is directly dependent on how it is implemented. Obviously it is of no use to offer Web-based training if the infrastructure is missing, or the basic computer skills are not there. An effective process for securing a successful outcome of a training program might be to:

1. Make sure that the infrastructure is in place
2. Make sure that computers and other equipment is available on site
3. Train one person to be appointed as a local eHealth and training manager, a local "super-user"
4. In the light of the earlier assessment of the level of existing computer skills, provide the initial basic training on site, in co-operation with the local super-user
5. Training modules should include individual "hands-on" training to be done locally between courses
6. When the basic knowledge is in place, it may be appropriate to continue with Web based training or distance training by means of videoconferencing

The training of local staff is a continuous process. Reassignment of doctors and turnover of other staff requires the constant availability of training materials and teaching staff. To avoid costly travel or video conferences, some of training material should be made available on CD-ROM and distributed to the hospitals. The local eHealth manager will then coordinate the use of this material ensuring that all staff obtain the training they need.

6.2 Distant Learning

There are a number of companies which deliver distant learning services. The Global Development Learning Network (GDLN), funded by the World Bank, is one of them. They are now in the beginning of an expansion phase, establishing learning centres throughout Sri Lanka. By using GDLN as a partner, the health sector may benefit from the professional staff available and also benefit from the infrastructure. The GDLN will build their own network suitable for video conference for the purpose, and the hospitals can rent the facilities on an hourly or daily basis. The training is offered both as Web-based (eLearning) training, and by video conferencing.

The Norwegian Centre for Telemedicine has long experience in the eLearning field. The centre has for many years coordinated distant learning, and participated in the development of eLearning training both on a national and an international basis. Currently, the centre is cooperating with the Centre for International Health and the University Hospital of Northern Norway, both in Tromsø, in developing Web-based training for the Teaching Hospital in Batticaloa. This work is done as a part of the establishment of a Faculty of Health Care Sciences at the Eastern University in Batticaloa. Further information about these activities can be found in the "Report on Study Tour in Sri Lanka, 26 April to 20 May 2004".

6.2.1 Infrastructure for Distant Learning

Distant learning by video conferencing can be done by using satellite, telephone or the normal data network. Different requirements will apply depending on the solution being used.

6.2.1.1 Satellite transmission

The bandwidth needed for the transmission of live video, especially two-ways, is normally very expensive. Using satellite transmission for distant learning is a major commitment for any project and should be very carefully considered. In addition to the financial aspect, the setup and use of equipment may be complicated.

6.2.1.2 Telephone transmission

In order to obtain sufficient quality for video transmission over telephone lines, it is recommended to use ISDN. However the availability of ISDN within Sri Lanka is limited. This too may be an expensive solution, because the charges must cover both monthly rental and the charges for each call. ISDN services are at the moment available in the following areas:

Colombo	Maradana	Maharagama	Ratmalana
Central	Slave Island	Homagama	Biyagama
Kollupitiya	Havelock	Moratuwa	Malwana
Mattakkuliya	Town	Boralesgamuwa	Hokandara

Katunayake
Nugegoda

Kotte
Hambantota

Piliyandala

Mount Lavinia

The extension of ISDN services to Kalutara and Kandy is planned for the near future. (Sri Lanka Telecom, <http://www.sltnew.slt.lk>).

6.2.1.3 IP based transmission

The ICT project aims to extend the infrastructure to more hospitals and to strengthen the existing structure. It is highly recommended that at least 256 Kbits should be used wherever possible. This will provide sufficient bandwidth for both data transfer and for an acceptable quality of transmission for video conferencing. One of the advantages of using leased lines for video transmission is that the cost of the lines is independent of the traffic. The disadvantage of this solution is that it may be difficult to maintain the bandwidths.

Independent of the solution chosen for video conferencing, it may be possible for one of the hospitals to serve as a hub for video distribution. This hospital will then receive the incoming audio and video, and will use IP streaming techniques to distribute the lectures to other hospitals. A streaming server may be required for this purpose. The advantage of this is that the bandwidth needed for the hospitals receiving the video streams may be reduced, thus lowering the costs. A typical video stream can be distributed with sufficient quality over a 128 Kbits line. The disadvantage is that the students will not be able to interact with their teacher due to the one-way distribution of signals.

7 Summary of recommendations

The success of developing and implementing an "eHealth Emergency Hospital" project proposal in Sri Lanka is to a large extent dependent on not making the implementation too complicated. The tasks needed are multiple and time consuming and the assessment also revealed that one of the key issues, the need for training of the users, is substantial. All available training resources should be directed into the ongoing teleHealth project, and the introduction of a system requiring separate and different training is not recommended. With this background it is not presently advisable to introduce the proposed "eHealth Emergency Hospital" project as a separate system.

The emergency hospital concept is more likely to be a success if the concept is integrated in the existing activities taking place in the country. However, there are a few criteria that must be met in order to fulfil the proposed objectives:

1. Infrastructure expansion.

- a. To ensure an efficient connectivity between the hospitals, the wide area networks between the hospitals (interconnectivity) must be expanded with higher bandwidths and leased lines installed wherever possible.
- b. Bandwidth for Internet access should be increased.
- c. Local area networks within the hospitals must be established.

2. The availability of electronic equipment.

- a. The in-house availability of computers and necessary peripherals should be extended to the different hospital departments.
- b. At least one department should be equipped with a laptop computer identified for use for the emergency hospital.

3. Develop training programs.

- a. The training methodology should be established and training programs developed.
- b. The recommended solution is to use a combination of on-site and off-site training.
- c. Create CD-ROMs with training programs for local use.

4. Appoint a local eHealth and training representative

- a. This person should have the technical knowledge necessary to act as the local eHealth and training manager.
- b. This person will be the local "super-user"

5. Ensure sustainability.

- a. Arrangements should be made to ensure future funding of the installed services.
- b. The ICT project may consider investing in a selection of spare parts to be distributed to the hospitals.

The success factors are closely linked together. One feature will not work properly without the others being in place.

8 Appendices:

8.1 Appendix 1 - What is eHealth??

The concept of eHealth is not clearly defined. The various environments use their own ways of defining the concept. The general idea is that as long as it has to do with health services and involves the use of electronic equipment, the term eHealth may apply. The following examples both illustrate that the definition of the term can be tailored to any need.

“eHealth means applying new low-cost technologies, such as "web-enabled" transactions, advanced networks and new design approaches, to healthcare delivery. In practice, it implies not only the application of new technologies, but also a fundamental rethinking of healthcare processes based on using electronic communication and computer-based support at all levels and for all functions, both within the healthcare service itself and in its dealings with outside suppliers. eHealth is a term which implies a way of working rather than a specific technology of application (*"Understanding the market for eHealth", Silicon Bridge Research Limited*)”

“eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology. (*Journal of Medical Internet Research*)”.

8.1.1 The 10 e's in "eHealth"

1. **Efficiency** - one of the promises of eHealth is to increase efficiency in health care, thereby decreasing costs. One possible way of decreasing costs would be by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement.
2. **Enhancing quality** of care - increasing efficiency involves not only reducing costs, but at the same time improving quality. EHealth may enhance the quality of health care for example by allowing comparisons between different providers, involving consumers as additional power for quality assurance, and directing patient streams to the best quality providers.
3. **Evidence based** - eHealth interventions should be evidence-based in a sense that their effectiveness and efficiency should not be assumed but proven by rigorous scientific evaluation. Much work still has to be done in this area.
4. **Empowerment** of consumers and patients - by making the knowledge bases of medicine and personal electronic records accessible to consumers over the Internet, eHealth opens new avenues for patient-centred medicine, and enables evidence-based patient choice.
5. **Encouragement** of a new relationship between the patient and health professional, towards a true partnership, where decisions are made in a shared manner.
6. **Education** of physicians through online sources (continuing medical education) and consumers (health education, tailored preventive information for consumers)

7. **Enabling** information exchange and communication in a standardized way between health care establishments.
8. **Extending** the scope of health care beyond its conventional boundaries. This is meant in both a geographical sense as well as in a conceptual sense. eHealth enables consumers to easily obtain health services online from global providers. These services can range from simple advice to more complex interventions or products such as pharmaceuticals.
9. **Ethics** - eHealth involves new forms of patient-physician interaction and poses new challenges and threats to ethical issues such as online professional practice, informed consent, privacy and equity issues.
10. **Equity** - to make health care more equitable is one of the promises of eHealth, but at the same time there is a considerable threat that eHealth may deepen the gap between the "haves" and "have-nots". People, who do not have the money, skills, and access to computers and networks, cannot use computers effectively. As a result, these patient populations (which would actually benefit the most from health information) are those who are the least likely to benefit from advances in information technology, unless political measures ensure equitable access for all. The digital divide currently runs between rural vs. urban populations, rich vs. poor, young vs. old, male vs. female people, and between neglected/rare vs. common diseases. (*Gunther Eysenbach, Editor, Journal of Medical Internet Research*).

8.1.2 Abbreviations used in this document

WHO	-	World Health Organization
WR	-	WHO Regional Office
EHT	-	Essential Health Technologies
SEARO	-	WHO South East Asia Regional Office
NST	-	Norwegian Centre for Telemedicine
SiH	-	Centre for International Health
UiTø	-	University of Tromsø, Norway
UNN	-	University Hospital of North Norway, located in Tromsø
IP	-	Internet Protocol
VOIP	-	Voice over IP
LAN	-	Local Area Network
WAN	-	Wide Area Network
ICT	-	Information and Communication Technology
GDLN	-	Global Development Learning Network
SLIDA	-	Sri Lanka Institute of Development Administration

8.1.3 References

Project group for establishing the Faculty of Health Care Sciences at Eastern University, Batticaloa, Report on Study Tour of Sri Lanka, 26 April to 20 May 2004

SEARO memorandum, "Health Telematics Project proposed in WR Sri Lanka", 18 July 2002

Journal of Medical Internet Research, <http://www.jmir.org/>

WHO, 8 January 2005 , "Establishment of an eHealth based consultation service for the strengthening of primary health in areas affected by the tsunami in India, the Maldives, Sri Lanka, Northern Sumatra and Thailand"

"Understanding the market for eHealth", [Silicon Bridge Research Limited](#)

Sri Lanka Telecom, <http://www.sltnew.slt.lk>

8.1.4 Map of Sri Lanka



UN Map No. 4172 Rev. 1, January 2004 1