Abstract – Teleconsultation and telemedicine are the application and development of the telecommunication networks. Health experts can solve problems by using the electronic and communication technologies without distance limitation. In this study, we try to develop the teleconsultation and telemedicine system between earthquake local site and consulting experts site. The system at each site has a workstation including a cable modem or ADSL connection, a monitor, a web camera, speakers, a microphone for communication, and NetMeeting application software. In addition, this study intends to develop a school-based intervention program by using this system for high-risk school-age children in one of the earthquake-struck areas. The preliminary result of this study is that the teleconsultation and telemedicine system is more effective than traditional consultation and supervision. Moreover, we can apply this system in training local volunteers, educators, and welfare workers. Meanwhile, we can save lots of cost and time since we don’t need to travel between the local site and the expert site. In the end of this study, the application of this system in SARS case treatment and the network application of this system in psychiatric counseling were also discussed.

I. Introduction

The popular application and development of the telecommunication networks are teleconsultation and telemedicine. Health experts can solve problems by using the electronic and communication technologies without distance limitation. Telemedicine can provide a cost-saving healthcare mode and can be applied in clinics by using electronic information and communication technologies. The telemedicine is an effective way for distant consultation and for discussion conference. Telemedicine can not only improve the accessibility and the quality of healthcare delivery but also lower costs [1-3].

Teleconsultation is a means of telecommunication through networks; it is one of the most important application in telemedicine. Real-time consultations use the videoconferencing technology and permit the interaction between medical experts and clients. During consultation, both sites need to communicate with each other and synchronously manipulate images and documents [4-5].

This study will present discuss the preliminary results of the application of the teleconsultation and telemedicine system in clinical medicine. One intends to develop a school-based intervention program by using the teleconsultation and telemedicine system for high-risk school-age children in one of the earthquake-struck areas. Another is to apply the teleconsultation and telemedicine system in dealing with quarantined clients of Severe Acute Respiratory Syndrome (SARS).

On September 21, 1999, an earthquake measuring 7.3 on the Richter scale struck central Taiwan. Childhood trauma literature has indicated that the long-lasting effects of trauma need to be addressed and evaluated. It is suggested that a developmental approach to post-disaster mental rehabilitation for traumatized youths can help prevent further delay or abnormality in their development [6-12]. Three years after the 921 earthquake, both research evidence and clinical documents have suggested that some child survivors are still experiencing the aftermath of the earthquake and their developmental progresses have been hindered by the impact of earthquake. It has been suggested that a school-based intervention program can be very effective in helping traumatized children or children at high-risk. School provides a natural environment for mental health professionals to work with children in need to promote their development without stigmatizing them. It is also easier to identify PTSD or related problems in children at school. Therefore, a long-term school-based intervention program is not only necessary but also can be very effective [13-14].

In addition, we try to develop the teleconsultation
and telemedicine system between earthquake local site and consulting experts site. The system at each site includes a workstation linked with a cable modem or ADSL connection, a monitor, a web camera, a telephone for communication, and NetMeeting application software. The purpose of this study is to build a web-based meaningful communication system for integrating and exchanging healthcare and consulting data between the district local site and the expert site. The preliminary result of this study is that the teleconsultation and telemedicine system is more effective than traditional consultation and supervision. Moreover, we can apply this system in training local volunteers, educators, and welfare workers. We can save lots of cost and time due to we do not travel between the local site and the expert site.

Recently, we try to apply the teleconsultation and telemedicine system in dealing with quarantined clients of Severe Acute Respiratory Syndrome (SARS) and we want to see if it is also applicable in this disease. In addition, we would discuss the network application of this system in psychiatric counseling.

II. Methods

In this study, we try to develop the teleconsultation and telemedicine system between local site and experts site. The need and function of this system include:

1) Synchronous and real-time teleconsultation and telemedicine between local site and expert site.
2) Web-based telecommunication can be used in both LAN and WAN environment with TCP/IP protocol.
3) Cost-effective and easy operation.

Fig. 1. The diagram and equipments of the teleconsultation and telemedicine system.

The teleconsultation and telemedicine system involves a local site and an expert site. Between the two sites, the communications are required like image transmission, synchronization and voice conversation. The basic equipments at each site are as follows:

1) A workstation linked with cable modem or ADSL connection,
2) A monitor or display,
3) A web camera or digital camera,
4) Speakers and a telephone or an earphone for voice communication,
5) NetMeeting or MSN communication application software.

Fig. 1 shows the diagram of the teleconsultation and telemedicine system.

After the teleconsultation and telemedicine system was developed in our laboratory, we will apply this system in the following two clinical medicine programs: children rehabilitation at earthquake-struck areas and SARS treatment in quarantined clients.

For the first application, at first, we need to spend more than 6 hours to travel between the earthquake-struck areas and the consulting school, and only less time left for the intervention and rehabilitation programs. It is very inconvenience to us, but not cost-effective. That's why we try to apply the teleconsultation and telemedicine system in earthquake-struck areas rehabilitation. For the second application, doctors and nurses need to take care of their SARS patients safer without contacting with patients directly. By using the consultation and telemedicine system, we would like to see if it is also applicable in this SARS disease treatment. For the third application, we will apply this system in clients with depression or anxiety. For this application, doctors and psychologists need to do counseling of those clients through the internet.

Fig. 2 shows the application of the teleconsultation and telemedicine system.

III. Results

The procedure and protocol of this teleconsultation and telemedicine system includes data preparing, data exchanging, and data discussion, but those are still under development. Therefore, now the results of this project are still speculative. As the development of the
teleconsultation and telemedicine system in our laboratory, we try to apply different communication software to our experiment system. Finally, Windows NetMeeting communication software was selected in our system in the future clinical medical application. The comparison of these communication software tests in a laboratory environment are shown in Table I.

### Table I

<table>
<thead>
<tr>
<th>Function Comparison</th>
<th>Windows NetMeeting</th>
<th>MSN Messenger</th>
<th>YAHOO Messenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Free</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Version</td>
<td>3.0 Chinese/ English</td>
<td>6.0 Chinese/ English</td>
<td>Chinese/ 5.6 English</td>
</tr>
<tr>
<td>Video</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Voice</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Chat</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>File transfer</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Whiteboard</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Program share</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Easy Operation</td>
<td>Good</td>
<td>Average</td>
<td>Average</td>
</tr>
</tbody>
</table>

Table II shows the comparison of different video conferencing model tests in a laboratory environment. During the point-to-point conference, the web-cam also can provide more economic and choice in this study.

### Table II

<table>
<thead>
<tr>
<th>Item Comparison</th>
<th>View Station FX</th>
<th>Via Video</th>
<th>Web-Cam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Audio in / out</td>
<td>64 / 64</td>
<td>64 / 64</td>
<td>0 / 64</td>
</tr>
<tr>
<td>Video in / out</td>
<td>280 / 224.5</td>
<td>16 / 168</td>
<td>8 / 176</td>
</tr>
<tr>
<td>Frame in / out rate</td>
<td>29 / 21</td>
<td>10 / 29</td>
<td>0 / 29</td>
</tr>
</tbody>
</table>

The preliminary result of this study is that the teleconsultation and telemedicine system can help us to save lots of cost and time because we do not need to travel between the local site and the expert site.

In the first application of children rehabilitation at earthquake-struck areas, each person can save about 30 US dollars one time. Our team in this project is about ten persons, and we do consult with school-based intervention program for high-risk school-age children in one of the earthquake-struck areas every two weeks. By using this teleconsultation and telemedicine system, we can also save at least seven thousand US dollars per year in this project. However, if we don’t use this system, in fact, traveling between the local site and the expert site takes at least 6 hours and there is only 3 to 4 hours left for the intervention and rehabilitation programs. Therefore, this teleconsultation and telemedicine system in this project can benefit us a lot. The comparison and results between the traditional and the new method are shown in Table III, and more detail findings will be presented soon.

### Table III

<table>
<thead>
<tr>
<th></th>
<th>Traditional method Without this system</th>
<th>New method by using telecommunication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>7,000 per year</td>
<td>2,000 per year (including workstation &amp; cable modem)</td>
</tr>
<tr>
<td>Traveling time</td>
<td>At least 6 hours</td>
<td>No</td>
</tr>
<tr>
<td>Intervention time</td>
<td>3 to 4 hours left per day</td>
<td>All day available</td>
</tr>
<tr>
<td>Effects feedback from local site</td>
<td>Good</td>
<td>Average</td>
</tr>
</tbody>
</table>

The advantages of this teleconsultation and telemedicine system are no longer limited by time and places, and meanwhile cost can be reduced. This system can provide not only a very economical and effective link but also immediate interaction between the local site (disaster rehabilitation) and the expert site (doctors or therapists). In addition, this system can fit any computer, which is connected to the Internet.

The disadvantages of this teleconsultation and telemedicine system are image and voice delay during teleconsultation communication. We still try to get higher quality cameras and T1 connection to approach synchronously and real-time teleconsultation.

The preliminary result of this study is that the teleconsultation and telemedicine system is more effective than traditional consultation and supervision. Moreover, we can apply this system in training local volunteers, educators, and welfare workers. We can save lots of cost and time because we do not travel between the local site and the expert site.

In the second application of this study, we try to apply the teleconsultation and telemedicine system in dealing with quarantined clients of Severe Acute Respiratory Syndrome (SARS) and we want to see if it is also applicable in this disease. Probable or suspected SARS clients are isolated treatment or rehabilitation. For doctors and nurses, using this system to take care of their patients is safer, because there is no need for them to contact with patients directly.

In this study, a 25-year-old male suffered from SARS and got isolated treatment in a medical center. We applied the same teleconsultation and telemedicine system in the isolated treatment ward between the SARS case site and the doctor site. The preliminary results of this SARS case treatment showed that the psychosocial change of the SARS case was improved after our psychotherapy through the teleconsultation and telemedicine system, and at the same time the rate of being affected by SARS for the medical team was reduced.

The advantages of this system developed in the third application of this study include:

1) Providing private that may solve the fear of labeled psychosis.
2) Providing the convenience that may allow the populace to contact psychiatric medical service in a more convenient way without time and...
distance limitation.

3) Providing the multimedia specialized psychiatric counseling news that may allow the populace to derive the knowledge easily.

4) Providing the information sharing that may allow the same domain staffs or the students to exchanges new knowledge.

IV. Conclusions

In this study, we presented the application of teleconsultation and telemedicine system in clinical medicine. The application of this system is still under development. The purpose of the teleconsultation and telemedicine system is to provide immediate medical teleconsultation without distance limitation. We hope that the system can do good to not only earthquake but also SARS related clinical medicine and psychiatric rehabilitation.

References


