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Abstract

In order to promote exchange of knowledge and standardization of the medical technique, social medical systems, medical ethics, new medical items, medical science, and medical education in Asia-Pacific area, we have established a medical network with high-quality moving image over broad-banded Internet lines since February 2003. Broadcasting real-time teleconference and live demonstration with medical-quality videos using Digital Video Transport System (DVTS) were so useful to learn advanced medical techniques and equipments including electronic medical record (EMR) / picture archiving and communication system (PACS) beyond borders. We have done 58 events until March 2006. In this project, we conducted a virtual site visit at Seoul National University Bundang Hospital from Yokohama venue of 25th Joint Conference of Medical Informatics to see the advanced EMR/PACS by the network in November 2005. A remote lecture about Korean medical insurance system was transmitted from Seoul. The session was given by Japanese language. Over than 260 participants, including medical doctors, medical engineers, hospital office workers, vender company staffs, and students, in Yokohama venue enjoyed and learned the system remotely for 2 hours. The result of questionnaire survey suggested high satisfaction on the session.

We concluded that the medical informatics is one of suitable fields for the broad-banded telemedicine network as the content.

1. Introduction

Level of medical care is varied among the countries because of a disparity in economic power and differentials in policies, religions and customs. The medical information does not distribute easily beyond the borders, and medical staffs usually are not aware of the existence of these differentials among countries. We may resolve part of the problem by teleconference system with high quality moving image (1).

A new network communication system, digital video (DV) over Internet protocol (IP), can transmit a real-time high quality moving image by low cost. Recently, we can use international submarine optic fiber cable networks in the Asia-Pacific area for broad-banded transmission. We have thought that we could visit at a lot of hospitals abroad virtually, and inspect variety of medical techniques and equipments easily by this network system. We have mainly transmitted the contents of surgical field so far (2). In this time, we conducted "virtual site visit at Korea for medical informatics system" in the biggest annual meeting for medical informatics in Japan. Here we report the record of the Asia-Pacific medical network project we have established, and the virtual site visit session including network configuration and the effect of the achievement.

2. Material and Methods

2.1 Organization

The Hyeonhae/ Genkai project was established to use the Korea-Japan Cable Network (KJCN) for development of informatics research and friendship between Korea and Japan in 2002. As a subproject of the Hyunhae/ Genkai project in medical field, we joined it to use KJCN for medical purpose in February 2003 (2, 3).

2.2 Network

We connected the venue in Pacifico Yokohama to Otemachi AP of NTT communications Co. in Tokyo by Gigastream (<http://www.gigast.com/en/index.html>). We used Japan Gigabit Network (JGN2: <http://www.jgn.nict.go.jp/index.html>) from Otemachi AP to Nagahama AP of KDDI (<http://www.kddi.com/english/index.html>), and connected to Asia-Pacific information infrastructure (APII) test bed through KJCN. We used Korea Advanced Research Network (KOREN, <http://www.koren21.net/eng/index.php>) in Korea (1Gbps) up to SNU Bundang hospital.

2.3. Terminal systems organization for moving image transmission

We used Digital Video Transfer System (DVTS) over Internet protocol for mutual communication. DVTS is open sourced free ware and we can download it from Web site (<http://www.dvts.jp/>). We also used AREL Spotlight (<http://www.arelcom.com/products.html>) for image sharing on display of EMR /PACS in the Yokohama venue and SNU Bundang hospital.

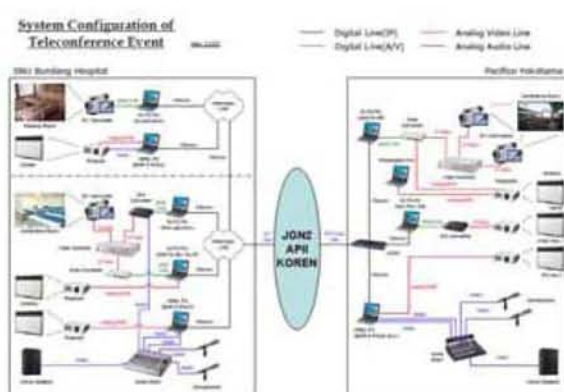


Figure 1 Network configuration of the event.

2.4. Security system

We usually use a security system by VPN for high speed transmission, when we transmit patient's live image in the case of project to protect patient's privacy (4). However, we asked a student in SNU to be a faked patient for demonstration in this event, thus, we did not used security system.

2.5. EMR and PACS system

EMR system in SNU Bundang hospital was developed by ezCaretech Co. (<http://www.ezcaretech.com/>), and PACS was purchased from Agfa Co. (<http://www.agfa.com/en/co/index.jsp>). High resolution displays attached to PACS was from WIDE Co. (<http://www.wideusa.com/>).

2.6. Content of remote lecture

We used power point (Microsoft) on Ariel Spotlight for presentation in the remote lecture.

2.7. Questionnaire survey for attendants in the venue

We conducted a questionnaire survey to evaluate the event by a paper after the event. We could recover 26 from the attendants.

3. Results

3.1. Record of the network project

We have conducted 58 times of telemedical event in Asia-Pacific area since February 2003 until March 2006.

We conducted a cross-strait teleconference session in the APAMI2003 in Daegu, Korea (2). That was 5th event in the history of our project. This time was 50th event in it (figure 2).

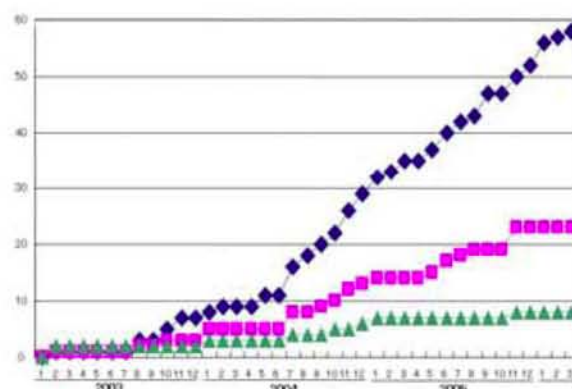


Figure 2 The events record in our project for three years (2/2003-3/2006). Diamonds show event number, squares show number of connected institutes, and triangles show number of connected countries.

3.2. The virtual site visit at the SNU Bundang hospital from the Yokohama venue by the network

We conducted the session for 2 hours from 4pm on 25th November, 2005, which was sponsored by the standardization committee in the Japanese association of Medical Informatics (JAMI) after several rehearsals. Every greeting and presentation was given with Japanese translation by subtitle on the screen or a translator.



Figure 3a View of the Yokohama venue of the event in 25th Joint Conference of Medical Informatics.

Over than 260 attendants had an experience as users for EMR/PACS in SNU Bundang hospital by the network.

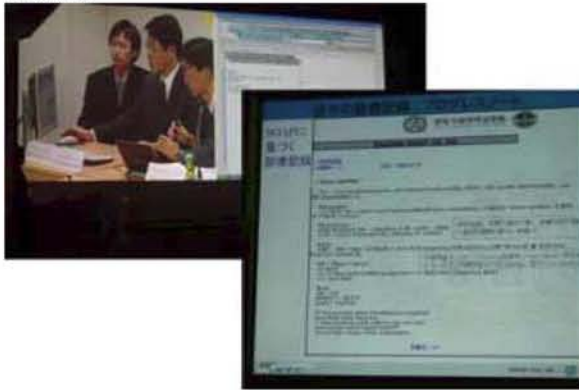


Figure 3b Explanation with operation on the progress note in EMR by medical doctors in SNU Bundang hospital. Usually, they use dual monitor in EMR system in Bundang hospital.

We had dual screens in the front of the venue. The left screen showed the DVTS image for Korean side medical staffs. The right screen presented the Ariel Spotlight image for EMR/PACS system. We had the third small screen for explanation of the system or translation on the front-left side.

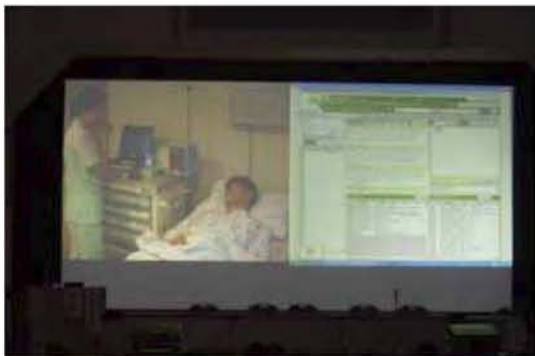


Figure 3c Live Demonstration of nursing care system in EMR in an inpatient room on a faked patient (a SNU student).

After the explanation of the operation of EMR in the conference room in Bundang hospital, they switched the image from an inpatient room to present a nursing care system on a faked patient.



Figure 3d Presentation of PACS on the network. They use 5M monochrome high resolution display in PACS in Bundang hospital.

PACS demonstration was done on CT and MRI still images. They operated 3D reconstruction and analysis with the images in Bundang hospital.

3.3. Remote lecture

Prof. Sang-Yo Nam (Institute of Health & Welfare, Yuhan College) gave a remote lecture for the Yokohama venue about Korean medical insurance system including reimbursement for PACS installation in Japanese language. He answered a remote question from the venue.

3.4. Questionnaire survey

Although the recovery ratio of the questionnaire paper was low (10%), the results of the survey was meaningful. As shown in figure 4a, we had 260 attendants from a variety of the field in the Yokohama venue. Unfortunately, there was another big session for nurses in other room in the same time, nurse attendants were few in the event.

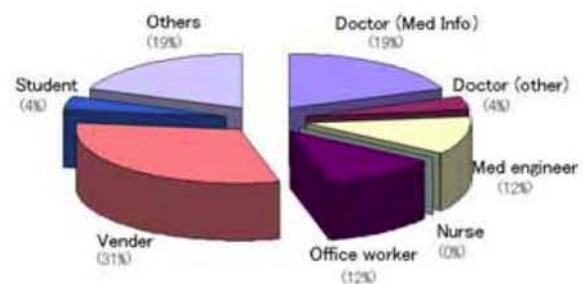


Figure 4a Occupation of Participants (n=26).

Major part of the attendants felt interest in the Internet teleconference after the session as shown in figure 4b.

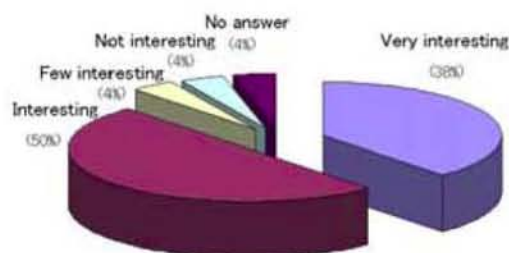


Figure 4b Interest for Internet Conference (n=26)

We could get a high evaluation from the attendants as shown in figure 4c.

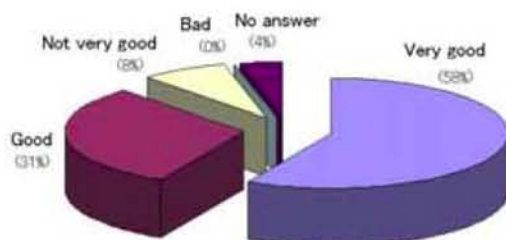


Figure 4c Evaluation of the event (n=26)

The Japanese attendants in the venue might feel strong interest in the medical system in Korea including medical informatics and medical insurance system as shown in figure 4d.

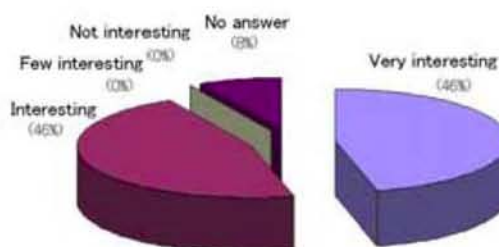


Figure 4d Interest for Korean Med Info (n=26)

4. Discussion

The knowledge of medical science is uniform and can easily spread via one-way transmission by scientific journals. In contrast, medical information about new techniques, equipments, medicines, policy, ethics, so on are often unique in local regions and vary in areas and areas. The present system will help to remove a barrier of medical communications and help to standardize them using high quality moving images. We can communicate mutually and exchange medical information over the national border with minimum stresses.

Our main contents in the project have been surgical subjects including endoscopic surgery and microsurgery so far. In the event this time, we showed we could extend the project contents to medical informatics and social medical system fields.

In this event, we used Japanese language in all presentation, because the major parts of the attendants were not familiar with English. The language problems should be cared in international conference. Additionally, we always think about voice quality in the teleconference, especially for strong echo and howling to proper communication. DVTS has no compression process. Thus the time delay is enough small (about 0.3 sec between Yokohama and Seoul) to make a smooth conversation, although we need to have at least 30 Mbps bandwidth by full frame DVTS transmission.

Along with a recent spread of the service of international optic fiber cable network in Asia-Pacific area, we have connected 8 countries (Japan-Korea; 2/2003, -Unite States; 1/2004, -Australia; 7/2004, China; 10/2004, -Taiwan; 12/2004, -Thailand; 1/2005, and -Singapore; 11/2005) by broad-banded network for 3 years in the project. We believe the network promotes the standardization of medical information in this area by both online and offline site visit at abroad institution.

We have established high-quality video transmission system over Internet protocol among Asia-Pacific countries, which is easy to perform, reliable and economical. In this time, we could use medical informatics and social medical system as contents in the network infrastructure. This will be a promising and very helpful tool of network for the regional and worldwide standardization of medical information system, medical techniques and social medical system.

5. Footnotes

We express our sincere appreciation to Prof. Heung-Sik Kang, the president of SNU Bundang hospital and Prof. Chul-Hee Lee, the CEO of ezCaretech Co., Prof. Sang-Yo Nam and Prof. Takayuki Nishiyama, Yuhan College, and the committee members of standardization in JAMI for great cooperation for the event. We also deeply thanks to Network NOC members of JGN2, APII, and KOREN. We also thank to Mr. Jun-Hun Lee and other staffs in Bundang hospital. We also appreciate the engineering staffs from QIC for continuous support for the project. The ezCaretech Co., WIDE Co., NTT communication Co., and National Institute of

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