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Current Medical Situation in Kazakhstan, the Necessity of Support, and Importance of Telemedicine

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***Abstract*—In this paper the medical problems in Kazakhstan are indicated and the solutions including technological assistance by Japan are discussed. Especially telemedicine is situated in one of the important methods in order to solve the problems, and then we have started an experiment of telemedicine between Kazakhstan and Japan. In this experiment we have produced good results using the teleconsultation system.**

***Index Terms*—telemedicine, teleconsultation, support, pathology.**

I. Introduction

There were 456 nuclear tests at former Semipalatinsk test site in Kazakhstan as a member of USSR from 1949 to 1989. The radiation caused by the nuclear tests has affected the residents around the test site for a long time. Radiation Effects Association in Tokyo financially supported by Ministry of Education, Culture, Sports, Science and Technology in Japan has conducted the Semipalatinsk health effects study for more than 7 years. The main purpose of the study is to examine the relationship between incidence of cancer and radiation exposure. We have investigated the situation of cancer incidence in oblast oncology centers (cancer center). Oncology center undertakes a main role for treatment of cancer in the oblast (administrative unit such as state).

Through this study we have found that the medical situation in rural areas is outdated as same as about 50 years ago in Japan. The cities in Kazakhstan are dotted in the vast extent of land and the means of transportation and communication are not developed sufficiently, then it takes a long time to transfer between cities. This is one the reason that there are big regional differences in medicine.

Fig. 1. MAP OF KAZAKHSTAN

II. The Situation of Kazakhstan

A. Situation of Land

Kazakhstan have an area of 2,724,900 km^2 and population of 15,100,000. The map (Figure 1) shows that the distances between cities are a few hundred km, and transfer between cities takes a long time as development of transportation such as flight, railroad, road etc. is not enough.

B. Medical situation of cancer

The country is cantonized to 14 oblasts, and there is usually one oncology center in each oblast. The health effect study is conducted in East Kazakhstan oblast and Pavlodar oblast, these oblasts are situated in the northeast of the country and at the east and the west of test site..

In the health effects study we have visited oncology centers and diagnosis centers in Semipalatinsk and Pavlodar many times, and examined the technical level of diagnosis for cancers and the accuracy of cancer statistics

Semipalatinsk oncology center has modern technologies for tissue dehidration and paraffin embedding. Besides, they have modern microscopes including those for educational purposes when several doctors can see and discuss the same glass. They have equipment and reagent kits for immunohistochemistry. All these differences are connected with the fact that all over the World knows Semipalatinsk region as the area situated near the Semipalatinsk Nuclear Test Site. Thus, they have aid from the whole World and many scientists are coming there together with new technologies. Many experts from Semipalatinsk had training in the best oncology centers abroad.

Pavlodar situated on the northern border of the same test site is not known anywhere and the situation with equipment and technologies is dramatically different. But the situations of oncology centers other than Semipalatinsk oncology center are almost as same as Pavlodar.

As for accuracy and the efficiency of the diagnosis of cancer, there is a plethora of complex issues due to the insufficiency of the following situations at the Oncology Center. The Oncology Centre acts as a key structure for all patient information collected in Pavlodar oblast. Firstly, a resident of Pavlodar oblast visits a physician in the "community primary medicine" for a consultation. If a further examination at the Pavlodar Diagnosis Centre is necessary, a letter of recommendation is prepared. There are x-ray machines, computed tomography unit (CT), and Magnetic Resonance Imaging unit (MRI). Based on the results of Diagnostic Center, the treatment is started in Pavlodar Oncology Center. Consequently the patient information and figures at both centres accurately indicates the current status of cancer in Pavlodar oblast.

All pathology diagnoses are processed by the Oncology Centre including the extraction and processing of the patient's tissue, specimen mapping and diagnosis. A wooden frame is used for the block several times and the equipment and the technology of the specimen making process on the slide glass, such as materials, mounting medium, stain solutions and techniques, quality of glass covers etc., are of low quality and are outdated. At present, there are two outdated microscopes at the centre which use natural light as the source of light. Furthermore, the Russian diagnosis standard has been adopted in the diagnosis of cancer, and the search and description concerning the metastasis condition etc, is incomplete for each histological type and tumor depth, even if it is diagnosed as "cancer". The review and the standardization of the diagnosis based on the global standard of the WHO diagnosis is extremely important in order to accumulate particular cases of the inveteracy/frequency of low dosage exposure of radiation within the same regions. The standardization of information regarding health effects will be vital for scientific knowledge sent throughout the world in the near future.

Furthermore the storage and administration of medical records, X-ray pictures, laboratory data, pathological samples and so on are not computerized Figures.

III. Necessity of Support

The support focusing on technological development and education by the developed countries is necessary, because it is difficult to solve the above problems by Kazakhstan itself. Considering of specific situation in Kazakhstan the support based on IT technology is the most efficient solution

TABLE I Activity of Oncology Centers in 2004

	Pavlodar	East Kazakhstan	Entire Kazakhstan
Newly registered cases of cancer	2031	4053	28583
Total number of registered cancer patient on 01.01.2005	7722	16010	114628
Number of beds	150	435	3260
Number of oncologists	21	51	363
Number of radiologists	5	17	111

The following items are fundamental framework.

(1) Development of human resources through education/training and personnel exchange.
   Development of core human resources.
   Personnel (expert) exchange between Japan and Kazakhstan--Technological transfer by mutual visits of doctors and technologists.
   Development of educational environment for expert training.
   Development of educational program by introduction of Japanese program where applicable.
   Installation of training equipments for pathology.

(2) Storing fundamental information into database.
   Storing pathological images, patient information and diagnostic information into database, and utilizing it for education and medical practice.
   Storing relational information between pathological images, diagnosis and treatment, e.g., comparing pathological diagnosis and phenotype in order to examine the effectiveness of chemotherapy.

(3) Networking of information using latest IT technology.
   Storing and retrieval of information through network in order to make avail the effective utilization for education and diagnostic practices.
   Development of the easy-to-use system for education and question-answer consultation on diagnosis of cancer by linking with tele-communication system.

(4) Education and support for diagnosis through tele-communication between the core hospitals and the hospitals at distant places within Kazakhstan by introducing latest IT technology.
   Distant learning by tele-consultation and distant image delivery system linking to the database and diagnostic support.
   Education and diagnostic support between Japan and Kazakhstan, and between the core hospitals and hospitals located at distant places within Kazakhstan.

(5) Improving fundamental pathological equipments/procedures in hospitals.
   Introduction of new equipments/techniques for modernization of pathological examination.
      Introduction of microscopes and electronic systems for pathological imaging.
      Improving the procedure and techniques for preparation of pathological specimens and for pathological diagnostic technology.
   Standardization of the diagnosis/classification of cancers based on the global standard of WHO.
   Improving storage methods and techniques for pathological specimens and for linking information in database.

IV. Experiment of Telemedicine

Since more than 1 year ago we have approached JICA to make the support which is described before. Telemedicine is expected to fulfill the important role of the support in order to reduce the regional differences in medicine. Oncology Centers and Diagnosis Centers in Semipalatinsk and Pavlodar cooperate with our health effect study. Recently we have developed a teleconsultation system, and started to experiment between Japan and Kazakhstan. We are now evaluating in what way this system will contribute to improve medical technology in Kazakhstan.

The system was developed for medical teleconsultation through the internet, with the following functions. A medical worker as a client registers patient information and symptoms, and data from laboratory examination, ECG, echocardiography, X-ray, CT and histopathology into the system and then requests a consultation. A consultant indicates the necessary tests and provides a diagnosis and treatment recommendations. The client may ask different opinions from more than one consultant. The information, test data an image data are recorded in

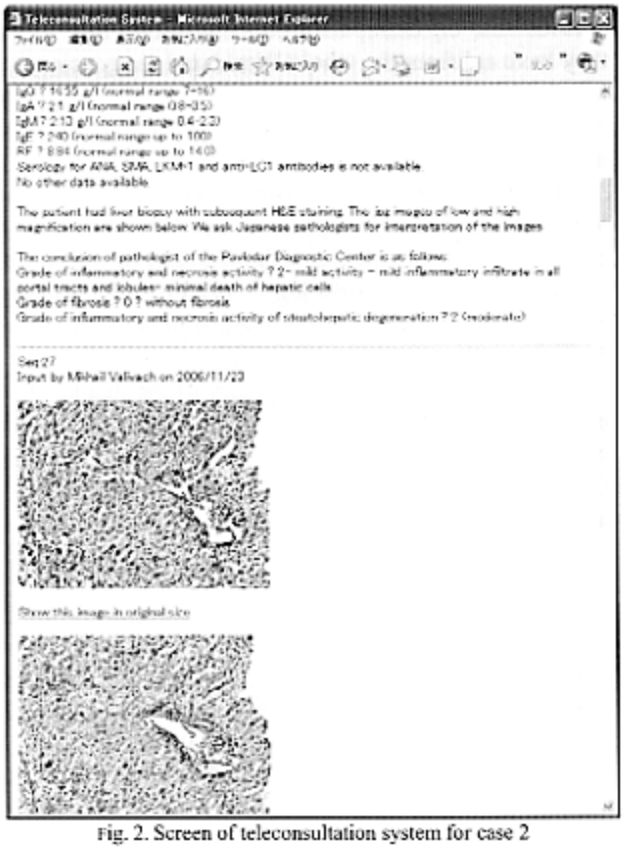

Fig. 2. Screen of teleconsultation system for case 2

database, and then these are referenced as a case study.

We have already performed a couple of teleconsultations using this novel system. In case 1, a 25-year-old male case was conferred who refered to the Pavlodar Oblast Diagnostic Center, complaining nasal and oral ulcers. The client doctor registered patient's symptoms, serological data, CT and histological images of nasal mucosa into the system. Then, several discussions were made with the Japanese consultant doctors, and they reached a consensus on the diagnosis as Wegener's granulomatosis. In case 2, a 45-year-old female case was conferred who visited to the center, complaining liver dysfunction. The client doctor inputted a dozen of histological images of liver biopsy, suspicious of autoimmune hepatitis. After that, the both sides were debating in detail, and concluded that this case was the chronic mild hepatitis unknown etiology, not compatible with autoimmune hepatitis. The figure 1 shows the screen of the system for case 2. The figure 2 shows the screen for inputting information of patient.

V. Conclusion

We now continue the health effects study and are making an effort to realize a new medical support to Kazakhstan. In this process we have started medical assistance by using the new teleconsultation system and proved the effectiveness of the system between Kazakhstan and Japan. At this time the system is focused on pathology, but it will be used in the other fields and be improved in the near future.

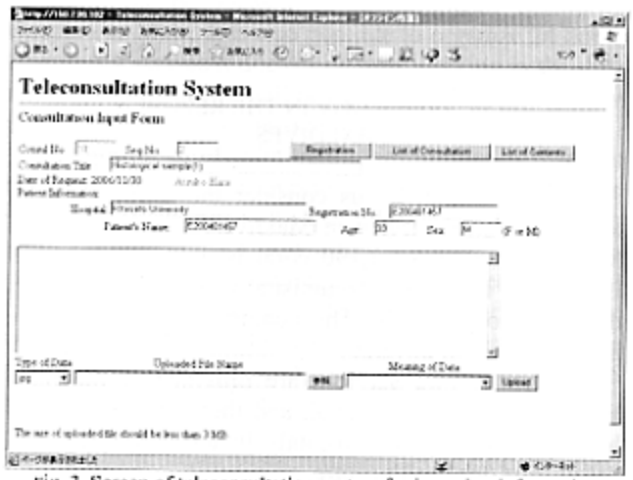

Fig. 3. Screen of teleconsultation system for inputting information

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