Sir, We have developed a prototype of a distance patient information system, named the Tele-Healthcare Information System (THIS), which has been designed especially for health-care professionals. The development effort has been undertaken by the Information Engineering Department of the Chinese University of Hong Kong (CUHK) in conjunction with the telemedicine project of the Medical Faculty of the CUHK. We are now beginning work with the Hospital Authority of Hong Kong, in the expectation that the THIS project will eventually be implemented in the Authority's hospitals.

The system is based on Internet technologies, and uses standard Web servers and browsers such as Navigator (Netscape) and Internet Explorer (Microsoft). With appropriate security measures, THIS therefore allows global access to patient information. This intentional global-access capability has several advantages. First, discussions between medical experts, or between general practitioner and experts who are separated by large distances, can be immediate and cost-effective. Second, immediate retrieval of personal health records provides proper health care in emergencies. This is particularly important when travelling abroad. Given the patient's security key, vital information such as allergies, current health condition and drugs being prescribed can be retrieved immediately. Third, digital archiving and retrieval of medical information are much better than traditional filing systems. All these factors will produce a better-quality health-care system at lower cost.

We have concentrated on the Internet technologies of the system, and other important aspects such as security, accessibility, and so on will not be addressed here. The prototype has been built upon several essential applications which are shared by other systems. The service applications which contributed to the realization of the THIS project are those for handling stored video, text, data, images and videoconferencing (see Fig 1). The processing of the very different data modalities required different protocols designed for packet (TCP/IP) and video streams on top of the communication network.

The prototype system assumes that doctors and patients have different types of security keys: the doctors can access their patients' data, while the patients can access only their own files. Records are maintained indicating when and from whom data access has been initiated. The patient data can be accessed by more than one medical doctor, simply because there can be multiple episodes and different

diagram

doctors will be responsible for the patient's wellbeing. Once the patient's file has been selected, the system will access relevant databases and collect the previous medical records in text, image and stored video. This essentially forms the home page of the patient (Fig 2), displaying his or her personal information, medical images, diagnosis and so on. In Hong Kong, the patients are identified only by their Hong Kong identification number and hospital number (related to each episode) so that filing of and access to patient information can easily be achieved.

Several special features have been added to the existing Web platform, including data processing at the client site and shared applications between different platforms. The data processing includes magnification of the medical images, distance and angular measurements, flipping of images, contrast and brightness controls, and pseudocolouring, as required. The processing program is JAVA-based and runs on the client platform. Shared applications include identifiable shared pointers among multiple workstations. Prognostic and diagnostic data can be entered and stored as read-only files. Again, the input requires authentication from the attending medical officer. Additional service is provided for description of the drugs taken by the patient; drug composition, allergic reactions and the like are displayed with information obtained from the server. Short video clips in MPEG format can also be displayed, showing, for example, dynamic images of the heart. The video clips are linked to the Internet but operated on a separate platform from the Web. Similarly, we have installed commercial videoconferencing equipment (Live100, PictureTel) operated at 384 kbit/s on top of TCP/IP, linking the offices (which are about 10 km apart) of the Information Engineering Department and the Chemical Pathology Department of the CUHK.

In summary, we have developed a prototype patient information system using Internet technologies. The next phase of our development will be a collaboration with the Hospital Authority, mainly focusing on security, file management, Internet technologies and image processing.
Fig 2. THIS prototype screen display.

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