Update on Internet and Advanced Telecommunications in Telemedicine

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WITHIN the past 5 years the World Wide Web (WWW) has become the most explosive application on the Internet; it is second only to electronic mail. As of early this year more than 50 million users existed on the Internet. Correspondingly, Web sites have grown from 100,000 in August of 1995 to more than 450,000 now and are continuing to grow exponentially. As a result, the Internet and its Web applications, once used primarily by experienced computer scientists, engineers, and hackers, are now becoming household words.

Within the radiology community, as well as within all of the professional medical disciplines, a change in the paradigm of how medicine of the future will be practiced is foreseen as inevitable. The distributed intelligence offered by a high speed WWW offering is expected to allow multibillions of characters of information (voice, video, and high resolution imaging and data) to be processed rapidly through individual channels among a diverse set of user facilities. To accommodate the future that is foreseen, high speed, multimedia transmission systems, coupled with enhanced processing capabilities of Pentium-speed desktop computers, all at low cost to the users, are needed.

This tutorial examines the current status of the Internet and its popular application, the WWW, and reviews advances in telecommunications and information processing technologies that are expected to impact both everyday medical practice as well as the specialized field of radiology and its corresponding information dissemination.

The tutorial will focus on the changes that are occurring in the Internet and how these, in turn, are

being viewed as positive factors related to the processing of high resolution radiological images. A brief review will be given of the Internet design and of the corresponding broadband design being used by the National Science Foundation to interface their national laboratories across the nation. Terms will be defined such as asynchronous transfer mode (ATM) and synchronous optical network so that open discussion and relationships of these new technologies can be discussed. Collaborative computing tools, now available to support the high resolution image transfers at giga-bit per second transmission rates offered through ATM applications, will be illustrated. Information will be provided on data requirements needed to represent a variety of commonly used medical data ranging from the basic ultrasound signaling that requires but a few thousands of characters (bytes) to mammography images which require more than 24 million characters per image to be accurately represented. A relationship between image size and transmission speed requirements will be developed.

Given the security and privacy issues being raised within the Internet users community, a discussion will be presented on the design and use of firewalls and their application relative to protecting information carried across the Internet onto new enterprise network structures (local Intranets). Encryption processes that can be applied to protect the privacy of vulnerable patient information will be reviewed and related methods of introducing digital signatures in the transmission of information will be described. The application of encryption processes and use of a legal digital signature procedures are vital to the success of using the Internet as a media for handling medical information dissemination in the near future.

Finally, highlights of ongoing interactive trials using the Internet and a review of proposed broadband experiments that are in process and aimed at validating the benefits of using advances in telecommunications technology will be discussed.

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