Iterative Development of a Web Application to Support Teleconferencing of a Distributed Tumor Board
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ABSTRACT
We have developed a web-based information system to support a distributed tumor conference held in multiple locations via videoconferencing over high-speed Internet connections. The information system stores images, and other objects such as Word documents, PowerPoint presentations, and URLs, which are pertinent to the conference presentations, as well as patient and conference metadata. A web-based interface allows clinicians to directly organize conference data, and display that information during a clinical conference. We implemented the system using open source software. It has been deployed since January 2001, and is the subject of an ongoing iterative development and evaluation process.

BACKGROUND
Traditional teleconferencing tools have many limitations. First, conference organizers must expend great efforts to prepare for the conference by converting material to the correct formats and copying the material to different participating sites. Additionally, commercially available teleconferencing products often do not integrate well with information systems. The quality of transmitted monitor data through video is often poor due to compression artifacts, and the emphasis placed on frame rate over resolution. Another disadvantage is the lack of sustained eye contact between conference participants due to switching of the video display between presentation materials and video of conference participants.

SYSTEM DESCRIPTION
In order to address these limitations of traditional teleconferencing, we have implemented a clinical case teleconferencing system allowing us to deliver different types of information in a variety of formats. Using a maximum projection resolution of 1024x768 via a high bandwidth Internet connection preserves image quality. We have also developed a web-based information management system with a database backend to support the teleconferences. Using this system, conference participants can manipulate the same set of data and images in real time from several conference locations. We applied an iterative development process methodology where the clinician end users and developers maintained consistent communication, and collaborated in the development evolution of the product. Features of our information management system include: utilization of ubiquitous web server and web browser technology; reflecting user workflow for tumor conferences; portability and accessibility of the data from anywhere at the point of need; support of a means to manage, store and retrieve multi-modality data such as clinical images, presentations, and documents; “HIPAA-compliant” secure auditing, data transfer, and storage.

EVALUATION
Each tumor conference session has been video taped, with information artifacts identified, and their usage characterized. The entire group of involved clinicians are surveyed quarterly to assess the impact of the information system on their professional practice, specifically concerning the tumor conference. We are studying the impact of our technology using both subjective and objective measures, including how teleconferencing has changed presentation of clinical material, perceived educational value, willingness to speak during conferences, and other issues. These measures are compared to the traditional “in-person” conferences.

CONCLUSION
We have achieved success in developing a novel image-based, information system to supplement videoconferencing over high-speed networks. Furthermore, we have integrated the development process into an active clinical setting, creating an ongoing laboratory to introduce and evaluate new ideas. Our system has helped clinicians in managing and presenting clinical data in all hematology-oncology tumor conferences at our medical center since January 2001. We believe that our infrastructure may provide a useful platform for further development of clinical teleconferencing information systems.

FURTHER INFORMATION
www.eirg.washington.edu

1 Chun J, Hanjoon K, Sang-Goo L, Jinwook C, Hanik C. A DBMS-based medical teleconferencing system. JAMIA, 2001; 8:460-467