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Position Paper

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Medical Uses of Video

Video has become progressively more important in the health world as a method of capturing, transferring, and storing information. The ability to more easily share these high-quality videos in synchronous or asynchronous time – and to be better able to analyze them – would help physicians and patients around the world, particularly as electronic medical records become the standard (a trend well on its way).

Some areas of medicine use video extensively and routinely – anywhere that the capture and analysis of motion is important (such as in cardiology, radiology, or obstetrics) or where cameras can go but the human eye can't (such as within the intestine, lungs, joints, or the bladder via scopes). The data collected through video are very intensive and the files often huge – many Mb. These images are later reviewed, shared locally or at a distance (by emailing the large files) and stored for further reference later. Searching through these videos usually means fast forwarding, stopping the frame, and/or reversing with typical video controls.

The ability to annotate video could be very useful, in some circumstances – perhaps in the form of hidden or visible tagging, with the ability to search by tags. Currently, looking for pathology requires an human eye and brain experienced through looking at hundreds of normal and abnormal examples. Conceivably, this could be done, at least in part, though a more automated fashion if there are enough data stored and annotated to allow comparisons (and the appropriate complex programs for pattern recognition are developed). Perhaps this would require a *medical mark-up language* of some sort.

Color fidelity is an important quality issue for all transmitted medical imagery. Color in medicine makes a difference when we need to make a diagnosis. It helps us distinguish between the range of normal and the pathologic. Given a good light source, our brains automatically white balance, adjusting for ambient light. We're not even aware of it. Broadcast color is different though; we don't adjust for it so much – we interpret what we're given. If it's a little too blue, too yellow, or too red, that's a big deal.

Would video in the *nonvisible light spectra* be useful? I suspect it might be someday, though that would not necessarily be a high priority now.

Image resolution is important, too. For example, depending on the image being read, radiologists require high-resolution imagery for reliable interpretation – and generally, in every specialty, the better the image, the more confident the interpretation.

Perhaps there could be something built in that allows one to navigate video in "normal" resolution – and then go to higher resolution as needed in specific segments.

Security and *authenticity* are critically important when considering the use of medical video – not just ethically, but legally, since health privacy laws have a number of big implications. We don't want such personal information stolen, altered, or exploited. Hacking into images of someone's colonoscopy could not be allowed to happen. Data watermarking or some sort of authentication that images are from the source they purport to be is also vital.

Telemedicine is an important use of video media – and a huge potential market. This general concept refers to the sharing of data by health professionals in order to get the advice or assistance of colleagues at a distance. This often involves physicians or nurses consulting with a more specialized medical facility hundreds of miles away, if not more. Until recently, telemedicine units were often prohibitively expensive proprietary and dedicated codec systems with a number of medical gadgets attached (such as EEG, ECGs, scopes, or simple video cameras). Image quality varied hugely.

Linking emergency vehicles (or ship/aircraft) to home bases or distant experts can have a video component.   Currently, it is not necessarily easy, high quality, or low cost.

Other imaging and communications that have uses related to health are medical webinars, webcasts, video podcasts, blogs, wikis, and the like. Recently, the concept of Web 2.0 with its underpinnings of user-generated and user-manipulated content, has been applied to health (Health 2.0). All of these modes of communication are being used by consumers who are looking for health

information, or by health care professionals/educators in communicating health information to consumers or to each other.

A discussion of this can be found in the following paper:
http://www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pubmed&pubmedid=16911779

Examples of medical podcasts:
http://www.newmediamedicine.com/blog/2006/08/05/medical-podcasts/

Learning and training games and *simulations* are other potential uses of video in the medical field for physicians, nurses, EMTs, and others seeking training and continuing education (much as the DOD does already). In a related vein, the use of *multipoint teleconferenced networks* (Emergency Departments in given regions, for example) could be of great use in regional or national disasters of various kinds.

Video on KidsHealth.org
 On a slightly different note, at KidsHealth.org, the most-visited site on the Web about children's health and development – and the 7th largest health information site of any type – we are enthusiastic about the potential ability to add improved video in a way that does not explode our bandwidth costs. Most of our site is text-based – and we need to have a lot more high-quality video available in our consumer-oriented libraries. Video holds interest, aids in demonstration, and can be important when there are issues of literacy.

But we need to be able to afford to create it. Networks need to be able to handle more and more video. And users need to be able to receive it, store it, and manipulate it.

A Personal Note
From a personal perspective, a very simple, very high-quality (IP) video phone (that could do conference calls) would will help me connect with family members around the world – particularly with my mother a continent away who needs a device that is easy to use and dedicated simply to that task. There would be great call for that. Yes, a number of computer applications can provide IP videoconferencing – but they're not simple enough for my mother (and for tens of millions of others). Keep this application in mind for new standards.