
Digital Video in the ICU: Pulling It All Together

In 1927 Warner Brothers released a film entitled *The Jazz Singer* starring Al Jolson, May McAvoy, and Warner Oland. The film featured a revolutionary process called Vita phone, which allowed for synchronized sound and film. The movie was a hit earning more than \$3.5 million at the box office (approximately \$7 billion in today's money) and vaulting Warner Brothers to the top of the Hollywood food chain. Although the film was only about 25% "talkie" (The first full-length "talkie" *Lights of New York* would not be released until 1928), it marked a departure from which there could be no going back.

Well, if you've been to enough Powerpoint presentations using blurry graphics, busy charts, and indecipherable tables in order to demonstrate a dynamic process (don't even start me on The Far Side cartoons . . .), then you probably agree that we are in need of evolutionary change. In addition, demonstrating to your colleagues during sign-out what a patient looked like, or looks like during an event, using hand gestures and weird body contortions may not only be less than adequate for patient care, it may also result in difficult-to-explain muscle strains.

ICU video can ameliorate both problems. Adding video to your presentations can make them easier to follow and understand (in addition to helping keep your audience awake for such thrilling ICU talks as "Borborigmy, The Thunder from Down Under?" or "Inaccurate ICU Urine Charting: More Than Just Water under the Bridge?"). Video can bring immediacy to presentations that allow your audience to see exactly what you saw and creates a mutual experience that can facilitate education. The addition of video to a presentation allows for dynamic activity to be present dynamically. In addition, by keeping videos of patient exam points, patient care can be enhanced, as all parties have the same baseline examination from which to proceed. Has the seizure activity changed? Have the unusual movements become more or less pronounced? Has the breathing pattern altered substantially aside from rate? For these answers and more, let's go to the video tape. Video also allows for improved follow-up by following findings over time, and some diagnostic tests are best transmitted

in motion; consider echocardiography, and bronchoscopy looking at dynamic obstruction.

In the previous article, we discussed how to obtain video in the ICU, now let us take a look at how to incorporate video into your education and practice.

Now that you have your shiny new DV camera, and have shot some video, we need to get it into a computer. One of the wonders of the DV (or most likely mini DV) format is the ability to transmit video to the computer via means of a very fast connection, called IEEE1394, or alternately Firewire (Mac) or I-Link (Sony, others). Using this connection, video and audio can be brought directly into a computer synchronously.

Once in the computer, we need to manipulate the video in several different ways. The first thing we need to do is edit the video. Just as no one but your mother can stand to sit through hours of video of you and the kids at Happy Peach Log Place (note, not a real place, just made up for this example), the same is true of your clinical video. Brevity may be the soul of wit, but it is even more important in clinical video.

There are 2 reasons for this. The first is that video takes up an enormous amount of space on your hard disk. The more footage, the more memory usage. It makes sense to use as little video as makes your point. The second reason is that even excellent video can become repetitive and boring; using short clips to make your points keeps your audience interested and attentive.

The program where you edit video is called a nonlinear editor (NLE). These range from the very simple and inexpensive such as Apple's iMovie, which comes free as part of the software bundle with each new Macintosh, to very complex and expensive such as Avid's Express Pro and assorted hardware that can run thousands of dollars. There are excellent low-end products on both the PC and the Mac, and excellent information can be found on the Internet (http://www.macdevcenter.com/pub/a/mac/2003/06/13/dv_tips.html). An entry-level NLE will allow you to edit your video, and even add titles, labels, and do basic audio editing. When you have created your final video segment, it is time to move to compression.

Just as in still graphics, where compression allowed us to display large images with a minimum amount of storage, compression plays an even larger role in video display. First, let's do a little math. When you watch your television, you are getting an amazing amount of data. Television flies by your eyes at 29.97 frames per second. It is this rapid change of pictures that simulates motion. Moreover, within each frame are 2 separate fields, which contain basically the same information but which are scanned to increase clarity. Digital video contains 720 horizontal pixels and 480 vertical pixels. Some quick math shows us that for each frame of digital video, we show 345,600 pixels multiplied by 29.97 frames per second to give us 10,357,632 pixels per second, and multiplied by 2 (the number of fields) gives us 20,715,264 pixels, each of which can vary in terms of color and luminosity (brightness). As you can see, that's a lot of data for each second of video. (In terms of bytes of computer memory needed, it's about 7 cojillion bytes.) To allow display, as well as storage, we need to compress this video.

What video compression does is take like elements and make them even more similar, thus giving the computer less to "remember." The process is similar to compressing data for a still graphic but much more data intensive and processor dependant. It is for this reason that it is best to obtain the fastest computer your budget allows if you plan on working with a lot of video.

Although most NLE's will also compress video, there are excellent programs that just handle this

task. Once again, if you plan on working with a lot of video, an investment in one of these compression programs can save a considerable amount of time and improve the quality of your video as well.

Finally we need a way to display our video. Many NLE's will allow a user to export the edited video back to a camera or video deck. Using cables and a projector, or a video monitor, the edited video can then be displayed. This allows the highest level of display quality, as it eliminates the compression stage. However, it is difficult to archive your video in this manner, as DV tape is cumbersome and expensive. A much better solution is to compress the video, and then display it on a computer, either from a DVD one can create or within Powerpoint. To display video from within Powerpoint, create a new slide, go to the insert menu, scroll to Insert>Movie from file, locate your movie, and click on it. Powerpoint has options for optimal size and automatic playback.

Well, I hope this has whetted your appetite to get started in the world of video. For examples of some of these concepts, surf over to <http://www.ohsu.edu/doernbecher-picu/medialab/>, and feel free to e-mail me with questions.

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