The Revolution Will Be Televised

High definition technology and HDTV is increasingly finding its way into operating rooms around the world. Is this the next revolution in minimally invasive surgery?

High definition. HDTV. Aspect ratio. High resolution. These terms have become increasingly prevalent in the past few years, especially in regards to Cable and Dish television programming and home entertainment systems. For some people high definition television (HDTV) and HD technology as a whole does little more than confuse them and increase their technophobia. For others it represents the latest gadget du jour to add to their collection. Nonetheless, this technology is carving out a strong foothold in the consumer market.

While HDTV is gaining in popularity with the public at large, though, the technology and equipment is not confined entirely to the home theater. It is showing up more and more in medical settings and surgical suites. And, essentially, that makes sense. As so many procedures are now being performed laparoscopically and endoscopically, which necessitates the use of cameras and video monitors, it follows that technology related to that type of equipment may benefit the surgeon as it does the broader TV viewing audience. Of course, the viewing that is done on Sunday afternoons in the living rooms of suburbia differs greatly from what is being watched on the video monitor in the operating room. So this bears the question: Is HDTV in the OR simply technology for technology’s sake?

In a word, the answer is no. When one looks at the technology behind HDTV, the potential for improved surgical site visibility and other benefits to the surgeons quickly become obvious. In fact, if the full potential of HD technology can be understood and applied to the surgical field, it could well revolutionize minimally invasive surgery.

In the most basic terms, HDTV provides the highest available resolution, thereby delivering a crisper and cleaner picture. This means that on an HD television set receiving an HD digital signal, viewers will experience a sharpness and detail closer to real life.

The two primary differences between HDTV and standard definition television (SDTV) are the aspect ratio and the resolution of the picture. The aspect ratio is the displayed width divided by the height of the image. This refers to the actual dimensions in which the image is displayed. For SDTV the standard ratio that has been used since television was invented is 4:3 (or 1.33:1). This aspect ratio is still the standard in non-HD digital television. In HDTV the aspect ratio is 16:9 (or 1.78:1), which is the same ratio as a movie screen. This translates into a significantly wider picture than SDTV.

Resolution refers to the number of individual pixels that make up the image appearing on the television screen or video monitor and is represented as the number of columns and rows of pixels (ie. 640 x 480). The more pixels a picture contains, the higher the resolution. The most common resolution in SDTV is 640 x 480. This means that regardless of the actual size of the television screen or monitor, the image that appears on it will be made up of 640 vertical lines and 480

horizontal lines of pixels. This conforms to 4:3 aspect ratio of SDTV.
As each pixel is a small part or piece of information that makes up a picture, it is easy to extrapolate that the more pixels that go into a picture, the more detailed and clear that picture will be. HDTV utilizes a far higher resolution than SDTV; either 1280 x 720 or, more commonly now, 1920 x 1080, conforming to the 16:9 aspect ratio. So, whereas the picture in SDTV would be made up of just over 307,000 individual parts, an HDTV picture would consist of well over two million.
But what does this all mean to the scrubbed surgeon standing before a prepped patient preparing to introduce the first trocar?
Among the benefits for surgeons is the 16:9 aspect ratio offered by HDTV. This aspect ratio provides a greater lateral field of vision which translates to a more natural, panoramic view. This improved view of the periphery can assist the surgeon in placing the instruments more quickly and efficiently, provide a better view of surrounding tissue and organs and reduce the risk of injuries and accidents caused by instruments that stray out of the field of vision provided by SD monitors.
The higher resolution video images supplied by HDTV deliver other broad benefits for the surgeon. With more pixels comprising the picture, a more lifelike and intricate image is produced. The higher resolution also improves the depth-of-field, providing a far more three dimensional depiction of the surgical site than is provided by SDTV. Plus, the crisper, cleaner image can reveal smaller structures and more delicate tissue and textures than lower resolution renderings.
These advantages all add up to a better view of the surgical site for the surgeon, which can help avoid accidents, eliminate the need to continually reposition cameras and instruments, shorten procedure time and reduce eye fatigue in longer procedures. In addition, the better image provided by HDTV may also provide the opportunity for other procedures and techniques to be performed minimally invasively. Certain procedures are now performed as open surgeries simply because the existing technology makes a minimally invasive approach impractical. With clearer images, wider field of view and greater depth perception, HD technology may be able to remedy that.
While the overall benefits of HDTV in the OR are abundantly clear, there are a few important things to keep in mind before running out and purchasing a 1080i surgical display system. Upgrading to a full HD imaging platform is a big step. Just because the OR may have an HD monitor does not mean it will provide an HD image. If the camera being used in a procedure is a standard definition device it cannot provide the signal required to display an HD picture. In other words, the entire imaging system (camera, CCU, cables, video documentation equipment and even telesurgery systems) must be HD or HD compatible in order for the surgical team to realize the benefits of the technology.
As HDTV and the subsequent technology continue to develop and become more wide spread, the benefits to the surgical field will become increasingly evident. And the advantages the systems provide not just to the surgeon, but to medical facilities as a whole should definitely be taken into consideration when thought must be given to upgrading OR equipment. Surgeons and OR Planners looking to take advantage of the benefits of HD technology should speak to their imaging equipment suppliers. They are often very well versed in the technology and can offer solutions that will allow for the facility to get the best performance out of their ORs.

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