

Seven Steps to Ensure Your Operating Room is 4K UHD Ready

What is 4K UHD Surgery?

4K UHD Surgery utilizes a revolutionary new surgical camera head with four times the resolution of HD. It also produces a wider color gamut than HD, which reproduces more subtle differences in reds and yellows, allowing surgeons to view fine patterns and structures in high precision. This increase in color and resolution is dramatic and is best viewed on a 55-inch operative monitor in the surgical field.

What are the Critical Elements that You Must be Aware of to Realize 4K UHD Operating Rooms?

1. Monitor Resolution & Color Specifications

To take advantage of all the 4K resolution you must have a full 4K display that supports the wider color gamut. This color specification is essential to display the wide range of whites, reds and yellows in critical anatomy.

2. Monitor Size and Positioning

4K is best viewed on a 55-inch operative monitor. At this size, a surgeon is able to view the image up close with little or no pixelation. The 55-inch monitor helps provide an immersive experience for the surgeon and can allow all O.R. personnel to view the same image. At first, positioning the 55-inch monitor can be a unique challenge. There are several options for mounting. The most cost effective and flexible is a roll stand. This allows the monitor to be manipulated around the sterile field while remaining portable for use in other rooms or easily stored.

3. Telescopes & Optics

Rigid rod lens telescopes are often viewed as a commodity item, which is a mistake. Optics are a critical element to the overall image quality. Rather like using a pro SLR camera versus a point and shoot, the lens is critical to providing the right amount of undistorted light to the sensor. As you increase resolution, you must increase the amount of light passing through the telescope and the amount of contrast. A lack of light will result in a noisy image while a lack of contrast will appear as blur. Standard laparoscopes used with HD systems will function, but will typically have a 30–40% reduction in light and color performance. It is recommended that you upgrade to Ultra High Definition (UHD) telescopes.

4. Full 4K Camera Sensor

There are several methods to create a 4K image. The easiest and most inexpensive way is to use two HD sensors in what is called "Pixel Shifting." Although this creates an image with 4K resolution, it requires several sacrifices including lack of

contrast, brightness, and clarity when zoomed in or shown on a big screen monitor. Through the Sony and Olympus partnership, the Olympus system is the only one to use a single True 4K sensor. This specialized sensor collects more light than any other sensors on the market while also capturing twice the color range of standard sensors.

5. Processor

A 4K camera captures four times the resolution and twice the color information of HD. This means that a large amount of data needs to be processed in real time to prevent a lag in the surgical image. In addition, every device that the image passes through will add some level of lag. With Sony proprietary image processing, we are able to process a full 4K image with 10-bit color through an optical cable in real time. This means fast performance and a crisp clean full 4K image. Sony has also developed a proprietary algorithm to capture and process more light than most other technologies.

6. Light Source

The move toward LED technology is driven by both industry and consumer demand. Although LED technology provides longer lifespan, it requires stacking many LEDs into a “light engine” in order to approach the light output required for laparoscopic surgery. Xenon technology provides consistent bright light output across the entire color spectrum. This full spectrum light source allows the sensor to pick up all colors of light equally across the entire image.

7. Boom Infrastructure

Due to current practices with HD, most O.R.s would have 55-inch monitors mounted on the wall. This is driven by the need to be a certain distance from the monitor or you would see extreme pixelation. Due to the resolution of 4K, you are able to stand very close to a 55-inch 4K UHD monitor without seeing pixelation. The optimum distance is 1.5 times the vertical height of the monitor (1.5 m for the 55 inch). This means mounting this monitor on a boom in the sterile field is now possible.

One other consideration is the signal type you will run for 4K. The film and broadcast standard is quad SDI, which is four SDI signals that each carry one fourth of the image. This can be run in a similar fashion to an RGB S cable used in previous generation systems, but the cabling has specific shielding requirements.

For more information, please contact your local Olympus representative to walk you through the process of designing your 4K OR.