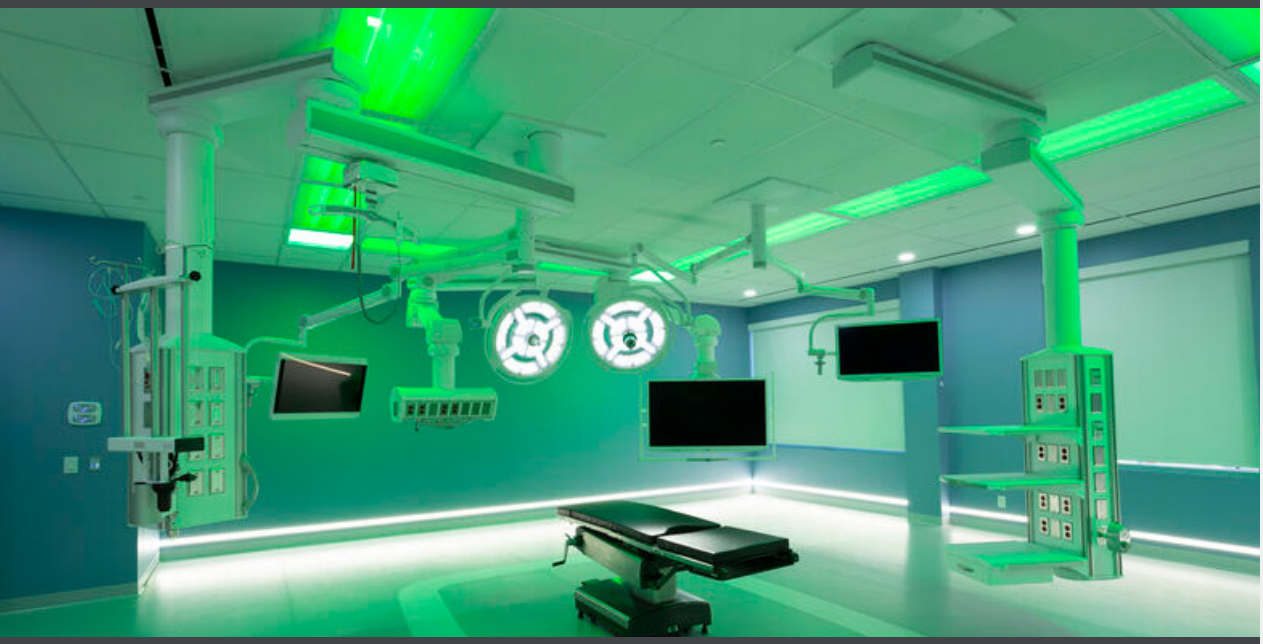
PACO

Green Lighting

for Operating Rooms



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Optimizing the Operating Room Lighting

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Selecting appropriate lighting presents a challenge for hospitals, particularly in the operating room. In a surgery suite, both the surgeon and support staff require enough light to see what they're doing to accurately and safely perform their tasks. However, this is easier said than done. If the lighting is adjusted to optimize visibility for the surgeon, this may come at the cost of reduced lighting for others in the operating room. This may lead to accidents or mistakes, such as the inability to quickly find an instrument the surgeon has requested, which can have disastrous consequences for patients undergoing surgery because time is critical.

For minimally-invasive surgeries and other endoscopic procedures, the surgeon looks at a screen to track the movements inside a patient, so screen glare and fatigue are major problems to consider. To increase the visibility of monitors, the surrounding lights in an operating room are typically dimmed during endoscopic procedures. However, low lighting in the surrounding area can cause drowsiness and reduce the visibility of support staff, both of which may lead to errors or accidents. Increasing the level of surrounding lighting isn't necessarily the answer either, as this can create glare on the screens, the surgeon uses to guide them during surgery, which can decrease a surgeon's speed.[1] This can also lead to eye strain, which has been known for many years to cause diagnostic inaccuracies.[2] A careful balance must be struck during endoscopic procedures: the light must be bright enough so that the surgeon and support staff can accurately and safely perform their respective tasks, but not so bright that it creates screen glare and affects a surgeon's performance.[3]

Advantages of Green Light

Green light provides the best visibility and color rendition for the surgeon and can reduce the contrast between the surgical site and surrounding areas, helping limit the adjustment that a surgeon's eyes must undergo when switching between various tasks and screens. A high contrast between the surgical site and the rest of the operating room can increase strain on a surgeon's eyes due to continuous readaptation.[4] Green light is used in operating rooms because its wavelength is close to the wavelength where the human eye has the highest sensitivity, allowing a lower brightness to be used while allowing the surgeon to see screens.

Similar to narrow-band imaging, in which blue and green light are used to enhance imaging contrast between blood vessels and muscle, the use of green light during an open-body surgery can also help increase contrast to improve a surgeon's visibility.5 The improved contrast is because green light has a penetration depth that reaches submucosal veins, helping to visualize them against a muscle background.

Operational Advantages of Using LED Lights

Performing surgery under a hot light can be an uncomfortable experience, which is one reason for the growing interest in LEDs, which generate less heat and help ensure surgeon comfort. The lower heat generated by surgical LED suits can also help reduce the formation of stagnant air that is rich with bacteria-carrying particles, which poses a risk to patients.6 LEDs emit less than incandescent and fluorescent bulbs due to the different light generation mechanisms. Incandescent bulbs are incredibly inefficient and generate light by passing a current through a metal filament until it glows. However, about 90% of the input electrical power is lost as heat. In contrast, LEDs have a different light generation mechanism that allows them to have a conversion efficiency that is three times as high.

Green light spans the visible spectrum from about 500–570 nm, but even a small change in the wavelength of light within this region can have a noticeable effect on the quality of light. For example, green light near 520 nm provides better contrast than 555 nm green light. Compared with fluorescent lighting, green LEDs produce a much purer color, making it easier to obtain the desired wavelength of light for use in an OR.

Cost Advantages of LEDs

Although cost considerations do not directly affect patient outcomes, they can be important factors for hospital operations management when choosing lighting options. Due to their more efficient light generation mechanism, LEDs use less energy than fluorescent and incandescent bulbs. Other cost factors include the initial costs of the lights, as well as maintenance costs. Since LEDs have much longer lifetimes than incandescent or fluorescent bulbs, there are additional cost savings associated with not having to replace LEDs as often.

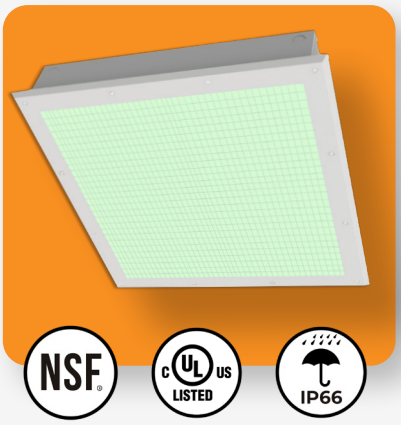
As mentioned previously, screen glare can slow down a surgeon. A slower speed means increased costs, and time spent in an operating room has been estimated to cost $100 per minute.7 The use of green LEDs in the operating room can help improve a surgeon's efficiency and potentially further reduce costs.

Pa-Co Lighting Green LED Options

Green LEDs provide several advantages during both endoscopic procedures and open-body surgeries, especially compared with traditional fluorescent and incandescent lighting. Pa-Co Lighting provides custom LED lighting solutions for the OR that can help reduce visual fatigue and improve the concentration of surgeons and operating room support staff. With its narrow spectrum of only 10 nanometers (525–535 nm), our **PRCLS_PRCLO (GREEN)** LED operating room suite provides a pure spectrum of green light, with an L85 of more than 50,000 hours.

For more information about our green LED options, please visit our website, https://www.pacolighting.com/contact/.

PRCLS_PRCLO (GREEN)



Spec Sheets & IES Files:

PRCLS

MDS4 (GREEN)

Spec Sheets & IES Files:

MDS4

MDS6 (GREEN)

Spec Sheets & IES Files:

MDS6

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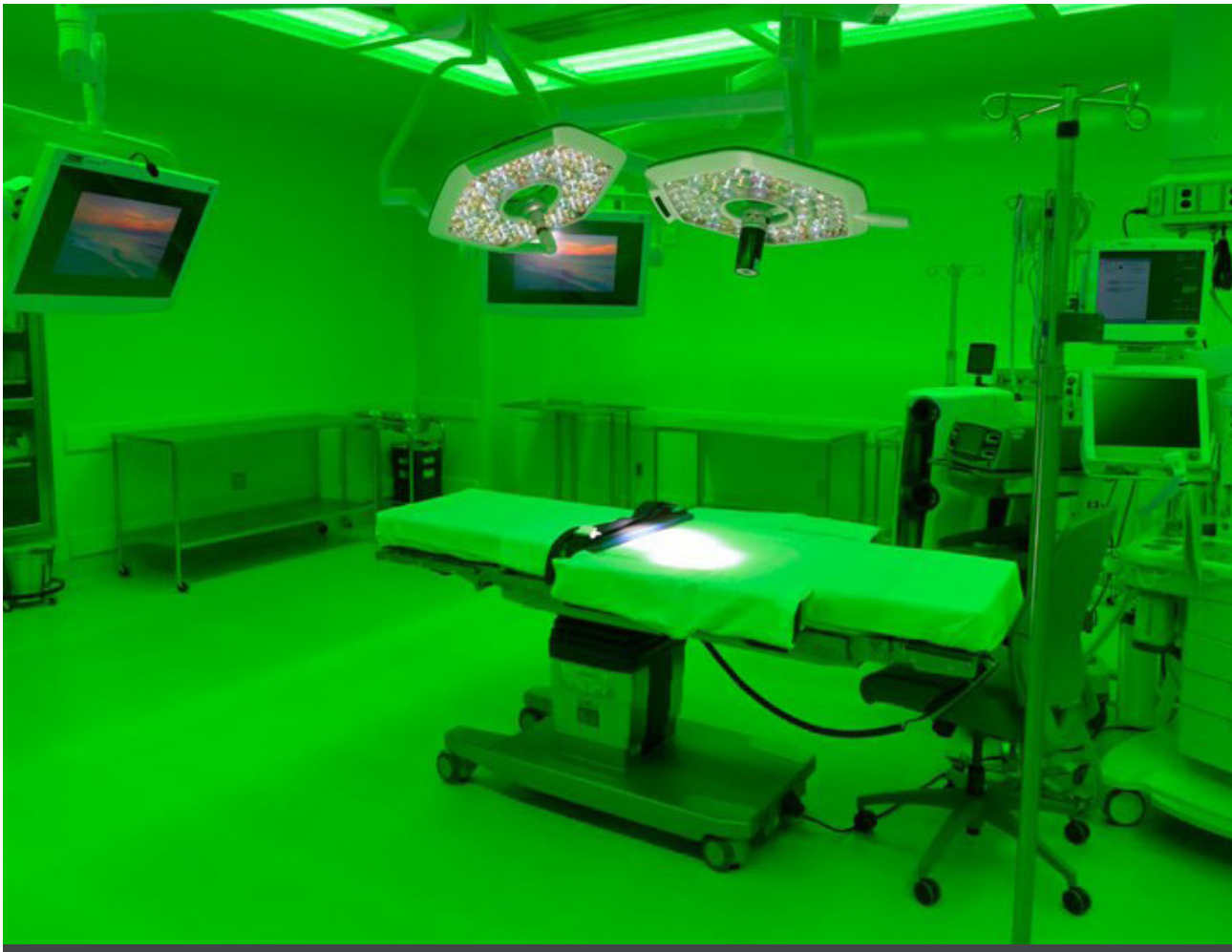

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