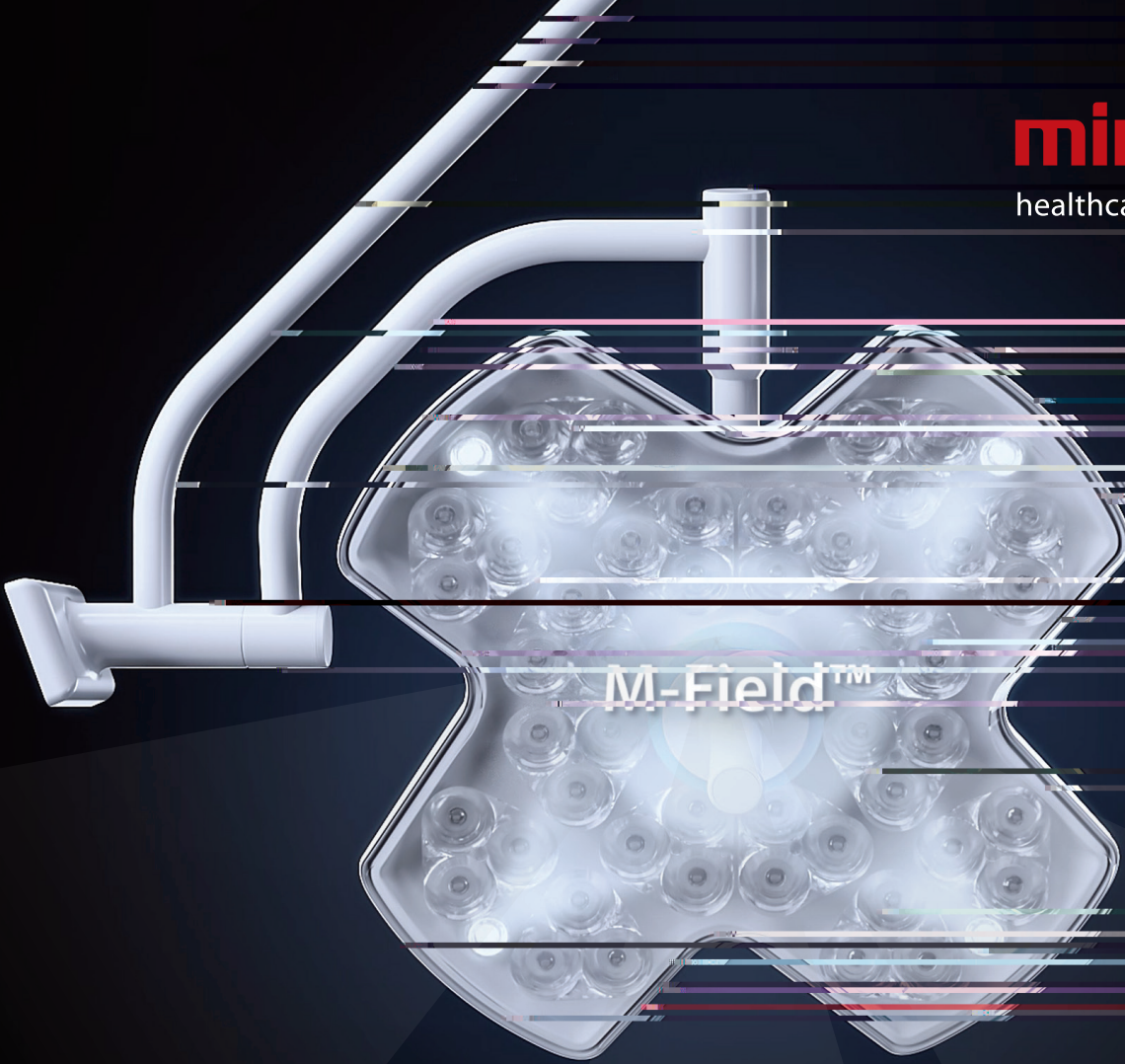


mindray
healthcare within reach



Technical White Paper

Widen Your Vision for Minimally Invasive Surgery

The ambient light mode of traditional-style operating lights can no longer meet the needs of modern MIS.

More attention is now focused on surgeon comfort, image quality, and efficiency during laparoscopic and endoscopic procedures. Eye discomfort and excessive illumination have come to be important factors when considering safe, efficient, and effective minimally invasive surgery.

1. Surgical lights & surgical efficiency

Due to the relatively larger working surface area when compared to open surgery, MIS requirements for field lighting can differ from those when compared to open surgical procedures. On bariatric patients, field illumination is even more paramount to ensure all working areas are uniformly illuminated when inserting ports and trocars. The need for a surgeon to continuously adjust the surgical light when working on different port insertion sites can affect the efficiency of the procedure. As an average cost-per-minute exceeding over \$100 for operating room time, time-saving techniques and reduction in downtime can be beneficial to facility profitability.

Research shows that after one interruption, it can take an individual an average of 23 minutes to fully regain their concentration to the original task at hand.^[1]

2. Surgical light & visual fatigue

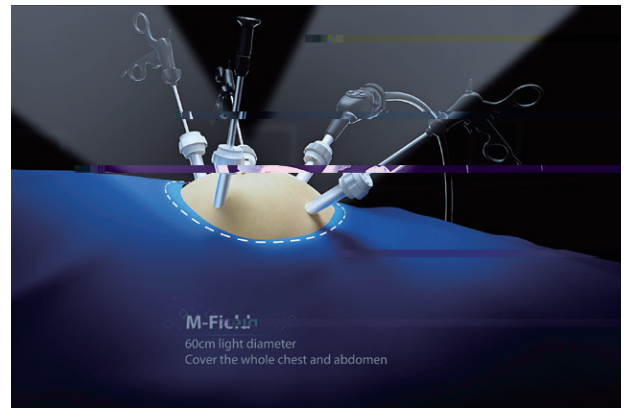
Today's surgeons often use the same operating light brightness as open surgery when performing laparoscopic surgery to place a trocar or suture. As the surgeon will be converting the procedure to looking at a surgical monitor when the laparoscopic camera is inserted, the initial stages of the MIS procedure do not require surgical field illumination as bright as a comparative open procedure. The high brightness and glare associated with the initial stages of field illumination during preparation of the site for MIS can therefore create undesirable eye fatigue resulting in poor posture and physical fatigue, which can then affect the surgeon's performance.

In one meta-analysis of over 5,000 surgeons, a survey found that over 25% of surgeons reported eye strain as an occupational health hazard.^[2]

References

- [1]. Jahnvi Curlin, Current State of Surgical Lighting, 2020
- [2]. Esser AC, Koshy JG, Randle HW. Ergonomics in office-based surgery: a survey-guided observational study. PubMed—NCBI. Available. Accessed February 19, 2019
- [3]. The Lighting Handbook, 10th ed. New York: Illuminating Engineering Society, 2011

Our innovative optical design for minimally invasive surgery M-Field: Widen your Vision, beyond ambient light



Eodo Mode Comparison

	Tradition ambient light mode	M-Field™
Light field diameter (1m)	About 30cm	60cm cover the whole chest and abdomen
Max. illuminance (Ec) (1m)	>8,000 lux or <500 lux	3,000 lux
Light field uniformity (D50/D10)	<50%	>60%

To solve the current problem of ambient lighting in minimally invasive surgery, Mindray refers to IESNA lighting recommendation: the surrounding operating field lighting should be 3,000 lux for medical staff between 25 to 65 years of age. In addition to this recommendation, Mindray is further enhancing the illumination that meets the needs of both the procedure and surgeon comfort through extensive clinical research. M-Field ambient lighting produces a field illumination focal point of 60cm diameter that can simultaneously cover both chest and abdomen, negating the need for constant repositioning of traditional surgical lights when preparing the field for MIS. This M-Field technology provides the optimal 3,000 lux of lighting in a 60cm diameter patch and utilizes Mindray's advanced "Compound Eye Structure" lens technology which produces a clear and homogenous light field (D50/D10 > 60%) all while reducing glare and discomfort to the staff in the operating field.