Evaluating Fire and Burn Risk Posed by Fiberoptic Cords
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Introduction

Fiberoptic cords (FOCs) can cause surgical fires, posing significant risk to patients and providers in the operating room (OR). FOCs are used to transmit light in minimally-invasive endoscopic surgeries. Several different light sources and cords are currently used at Michigan Medicine. The Hospital has clear fire safety protocols requiring FOCs to be put into standby mode and placed in holsters when disconnected. However, these protocols are not consistently followed. No protocol currently exists regarding the intensity at which light sources are operated which leads to inconsistencies in how clinicians mitigate fire risk. Our goal was to assess the fire risk posed by commonly used FOCs and to evaluate the Stryker Safelight system, which has additional safety features that force the light source into standby when the adapter is disconnected.

Methods

(1) Temperature Profiling
• The temperature probe was placed at the distal end light tip (Figure 2) and on the outside barrel (Figure 3)
• Temperature readings were recorded every 20s for 8 minutes
• Cool-down temperatures were recorded until constant for 1 min
• For the Stryker Safelight system, the adapter was used to permit testing (without the adapter, the system automatically shuts off)

(2) Drape Burn Testing
• The cord was allowed to heat up for 8 minutes at 100% light intensity
• The distal end was held perpendicular to the drape for 10 seconds
• The process was repeated with the light source at 30% and 50% light intensity
• A photo of the drape was captured

(3) Chicken Burn Testing
• The cord was allowed to heat up for 8 minutes at 100% light intensity
• The drape was placed directly over a raw chicken thigh or with a cotton towel piece between the chicken and drape
• The light tip was held directly over the drape for 5 minutes
• A photo of the drape, towel and chicken was captured at 30s, 2 min, and 5 min
• The process was repeated with the light source at 30% and 50% light intensity

Results

(1) Temperature Profiling
Figure 4: The Stryker Safelight cable reached the maximum temperature of 177.1 °C.
Figure 5: The new Integra LX9 cord reached the maximum temperature of 246 °C.

(2) Drape Burn Testing
Figure 6: Maximum temperature of the light tip increases as the light intensity increases. All cord and system combinations cause a significant burn risk when operated at 100% intensity.

(3) Chicken Burn Testing
Figure 7: At 100% light intensity, all source and cord combinations melted the surgical drape within 10 seconds. No cords operated at 30% light intensity melted a hole in the surgical drape.

Conclusions

• Fiberoptic light cords and sources pose burn risks at 100% light intensity
• Burns result from radiation and conduction at the cord’s distal end
• The Stryker Safelight enters standby mode immediately after adapter detachment
• This risk reduction is automatic, does not depend upon operator diligence, and significantly reduces burn risk by eliminating heat from light radiation
• Operation of fiberoptic light cords and sources at lower light intensities also significantly decreases patient burn risk, but requires operator compliance

Recommendations

• Conduct a cost-benefit analysis of the Stryker Safelight system
• Perform testing to determine minimum light intensity needed for safe surgical operation
• Establish OR light intensity guidelines and physically modify the light sources to prevent this intensity from being exceeded
• Enforce standby safety protocols in the operating room

Acknowledgements

The CHEPS team would like to thank Corey Bialkowski, Chris Peters, Randy Ramsey, Roger Wobig, Justin Daniels, Logan Wagner and Shawn Murphy.