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 in 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 in invasive endoscopic surgeries. Several different light sources and cords are currently used at Michigan Medicine.

Methods

(1) Temperature Profiling

- The temperature probe was placed at the distal end light tip (Figure 2) and on the outside barrel (Figure 3)
- Temperatures 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
- 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

- The new Integra LX9 cord reached the maximum temperature of 177.1°C above the melting temperature of polypropylene drapes.
- The new Integra LX9 cord reached the maximum temperature of 246°C above the melting temperature of polypropylene drapes.

(2) Drape Burn Testing

- At 100% light intensity, all source and cord combinations melted the surgical drape within 10 seconds. No cords operated 30% light intensity melted a hole in the surgical drape.

(3) Chicken Burn Testing

- At 100% light intensity through drape only. Only the Integra cords caused chicken burns at 50% light intensity. No combination caused burns at 30% light intensity.

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

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