Humidity and Enriched Oxygen on the Flammability of Non-woven Disposable Surgical Drapes

Miller, Danielle (School: East Pennsboro Area Senior High School)

Surgical fires pose a major threat in the operating room (OR) to patients, personal, and to facility. Surgical Drapes served fuel for 85% of fires and 81% of fires involve electrocautery, with 74% having an oxygen enriched environment. This experiment examined the effects of relative humidity (RH), in concentrations of 30%, 40%, and 60%, and measured the time to ignition (TTI) and total burn time (TBT) of surgical drapes in oxygen concentrations of 20% and 30%. Piezoelectric ignition emulated Code of Federal Regulation flammability testing and plasma ignition simulated electrocautery. Non-woven polypropylene disposable drapes were cut into 10cm squares, with one side torn, to simulate surgical conditions. Benzoin and Collodion were painted to 1cm depth on the torn side. Plain drapes, drape with Benzoin and drape with Collodion were tested at specified humidity for TTI and TBT at 20% and 30% oxygen. Drierite was used as a desiccate. Experiments were performed in a Plexiglas cube with inputs for RH, oxygen sensors, water vapor, oxygen, and ignition sources. Control features included testing apparatus and environment, drapes, sensors, oxygen, and testing mechanisms. Forty percent RH provided the longest TTI and TBT on average for all samples. Increased oxygen decreased TTI and TBT for all drapes regardless of use of Benzoin or Collodion. Drape flammability testing procedures need to be updated to reflect current surgical procedures. OR personnel need to be aware of how to respond to fires to decrease the chance of harm to the patient, staff, or facility.