Operating Theatre Fire Safety Protocol

Surgical Burns Action Group

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Operating Theatre Fire Safety Protocol (Quick Reference for Surgical Teams)

Purpose: Provide *all surgical theatre staff* with a concise, role-specific protocol for preventing surgical fires and responding rapidly if a fire occurs on or in a patient. This quick-reference guide covers both airway fires (e.g. tracheal tube fires) and non-airway fires (e.g. drapes or equipment fires on the patient), defining key responsibilities for the anaesthetist, surgeon, scrub nurse, and ODP.

Fire Risk Awareness and Prevention Measures

The "Fire Triangle": Surgical fires require three elements – an ignition source, fuel, and an oxidiser. All team members must work to minimise these risks:



- **Pre-operative Fire Risk Assessment:** During the team briefing (NatSSIPs checklist), assess fire risk for each case. *High-risk indicators* include surgery above the xiphoid (chest/neck/head), an open oxygen source (e.g. face mask, nasal cannula), and use of an ignition device (electrocautery, laser, fibre-optic light). If all three factors are present, treat as High Risk – plan additional precautions and emergency readiness.
- **Team Communication:** The operating team should **discuss fire risk** and prevention steps before incision. Everyone must know their role if a fire occurs.
- **Equipment Checks:** The ODP or technician must inspect electrosurgical units (ESU), cables, lasers, light cords, etc., for integrity prior to use. Do not use any device with insulation damage or faults; remove and report it immediately. Ensure fibre-optic light cables and endoscope lights are in standby or secured when not in use – uncovered light cables can ignite drapes.
- **Alcohol-Based Skin Preps:** Avoid pooling of flammable skin antiseptics (e.g. alcohol-based chlorhexidine) and allow full drying time before draping. Use the *minimal necessary volume* to prevent excess runoff. Do not use alcohol prep on head/neck or other high-risk areas if an ignition source will be used. Remember: alcoholic vapours *can ignite* and flames may be nearly invisible under surgical lights.
- **Draping and Fuel Control:** Prevent oxygen buildup under drapes. For head/neck surgery, use draping techniques (e.g. "tenting" or air evacuation) to vent oxygen. Keep surgical sponges, gauze, and linens moist as appropriate (especially for airway or oropharyngeal surgery). Avoid paraffin-based ointments on patient's skin or hair; they are flammable fuel sources. If the patient has applied emollient creams or hair products, cleanse these before surgery.
- **Oxidiser Management:** The anaesthetist should use a closed oxygen delivery system (e.g. LMA or ETT with cuff) whenever possible. If open oxygen (nasal cannula or mask) is needed, deliver the lowest effective O_2 concentration to maintain saturation. Avoid nitrous oxide if possible, as it supports combustion. In high-risk cases, consider delivering <30% oxygen or use alternatives to open delivery.
- **Readiness:** Have a CO_2 fire extinguisher readily available in theatre and ensure staff know its location and use. For high-risk cases (e.g. airway surgery), keep a bowl of sterile saline or water and a 50 mL syringe on the sterile field to douse flames immediately. The entire team should rehearse fire drills and evacuation procedures regularly.

Roles and Responsibilities

All Staff: Remain vigilant for fire risks throughout the case. If anyone observes pooling prep, O_2 buildup, device malfunctions, or smell of smoke, speak up and intervene immediately. Know the location of alarms, extinguishers, gas shut-offs, and exits. In the event of *any* fire, anyone can loudly call out "Fire!" to alert the team.

Anaesthetist (Anaesthesiologist)

- **Prevention:** Use closed circuit oxygen delivery when possible; avoid open oxygen/N_2O or reduce concentrations. Communicate with surgeons about oxygen timing – e.g. pause supplemental O_2 or allow venting before use of diathermy/laser if feasible. Secure airway devices (ETT or LMA cuffs properly inflated with saline if indicated for laser surgery). If doing throat surgery, coordinate placement of wet throat packs with the surgical team to reduce oxygen leaking into the oropharynx.
- **If Fire Occurs:** Stop gas flow immediately and disconnect circuit if fire is in or near airway. If an airway fire is suspected (e.g. laser ignites an ETT):
    - **Airway Fire:** *Simultaneously*: Extubate the patient at once (remove the tracheal tube even if on fire), and stop all ventilation and oxygen. Assist the surgeon with flooding the airway with saline (e.g. pour saline into the airway/oral cavity). Once the fire is out, re-establish ventilation with room air first (avoid high O_2 until certain fire is extinguished). Examine the airway (visual inspection or bronchoscopy) for any residual burning embers or damage. After cooling, re-intubate the patient or provide alternate airway support, and then ventilate with 100% O_2 if needed for patient oxygenation. Be prepared to manage bronchospasm or airway edema; consider bronchoscopy to assess injury.
    - **Non-Airway Fire:** If the fire is on the patient or drapes (not in the airway), stop gases flow to avoid feeding the fire. Assist by temporarily stopping ventilation if instructed (to prevent oxygen blowing onto flames). Once fire is extinguished, resume ventilation cautiously, using minimal oxygen needed. Monitor the patient for smoke inhalation injury if they were not intubated at the time; intubation may be needed after to protect airway.
- **Post-Fire Patient Care:** For any fire, once immediate danger is over, assess the patient for burns (airway burns, skin burns). Administer 100% O_2 if the fire is out and patient needs oxygen. Plan for further care (e.g. transfer to ICU, involve burns/airway specialists). Ensure all removed airway devices or burnt materials are saved for investigation.

Surgeon (Operating Surgeon)

- **Prevention:** Lead the team in conducting the fire risk briefing. Utilise technique to minimise ignition risks: use the lowest effective power on energy devices (diathermy, laser) and activate them only when in view and in contact with target tissue. Do not activate diathermy in proximity to pooled alcohol or in an oxygen-enriched environment. Allow skin prep to dry completely; do not drape the patient until drying time (per manufacturer, usually ~3 minutes) has elapsed. Ensure no alcohol prep is used on or near mucous membranes or hair in head/neck cases (use aqueous alternatives if needed)afpp.org.uk. Keep surgical drapes clear of heat sources (e.g. keep fiber-optic light cables off drapes) and consider flame-retardant drapes for high-risk cases. If using laser, use wet towels around the field and protect exposed combustible material.
- **If Fire Occurs: Call out "Fire!"** and take immediate action:

- **Non-Airway Fire:** *Extinguish flames on the patient*. Stop the procedure and de-activate energy devices (laser, cautery). Remove burning materials: quickly pull off burning drapes, gowns, or equipment from the patient (throw them to the floor** away from oxygen sources). If the surgical site itself is on fire, flood the area with saline (pour saline or use saline-soaked gauze to smother). If fire persists or is spreading, use a CO_2 extinguisher held by a team member, at a safe distance, aimed at the base of flames.

- **Airway Fire:** If a tracheal tube or airway device is on fire, assist the anaesthetist: for example, help cut or remove the burning tube if needed and pack saline-soaked gauze into the airway once the tube is out to help extinguish flames. Have syringes of saline ready to irrigate the airway. Once the fire is out, be prepared to resume the procedure only if and when it's safe; otherwise, stop surgery and focus on the fire emergency.

- **Aftermath:** Once the fire is out, *assess for bleeding or damage* at the surgical site (fire may destroy tissue or instruments). If the patient is not already intubated and has any burns or smoke inhalation, coordinate with anaesthetist to secure the airway. Do not resume surgery until safety is assured. Preserve any involved instrument or material (e.g. the electrosurgery unit, laser fibres, drapes) for investigation.

Scrub Nurse/Practitioner (Scrub Tech)

- **Prevention:** Verify prep solution is fully dried before applying drapes (communicate with anaesthetist and surgeon). Use wet swabs for packing around the surgical site if appropriate (especially in airway or oropharyngeal cases, hand wet swabs/throat packs to surgeon). Keep a bowl of sterile water or saline on your table for emergency use, plus large saline syringes (e.g. 50 mL) readily available. Ensure electrosurgical pencils are in holsters when not actively in use. Hand instruments safely: remind surgeon to deactivate before removing from field. If you notice any equipment malfunctions (sparks, frayed cords), alert the team immediately and swap out the device.

- **If Fire Occurs: Stay calm and assist:**

    - **Non-Airway Fire:** Immediately help the surgeon remove burning drapes or instruments from the sterile field (use instrument clamps or gloved hands if safe). Use the sterile water/saline you prepared to douse flames on the patient or surgical site. If drapes are on fire, smother flames with wet towels or drapes if available. *Do not hesitate to flood the field with saline* – patient safety comes first. If a fire cannot be controlled in seconds, back away when CO_2 extinguisher is used by another team member.

    - **Airway Fire:** Assist the surgeon and anaesthetist. For example, hand saline syringes or wet sponges to help flood the airway once the tube is out. Be prepared with new sterile ETT or airway devices for re-intubation after the fire (open them quickly on request). Maintain the sterile field if possible in case surgery must continue, but be ready to abandon sterility if it conflicts with fire response.

- **Aftermath:** Account for all gauze and instruments (to ensure none ignited unnoticed). Prepare to collect any charred materials that have been removed (e.g. remnants of the ETT, burned drape pieces) and pass them off the field for investigation and reporting. You should also be ready to assist with wound care for any burns on the patient.

Circulating Nurse / ODP (Operating Department Practitioner)

- **Prevention:** Ensure fire safety equipment is in place: check that a CO_2 extinguisher is present in theatre and functional (pressure gauge in green) at the start of the list. Confirm the theatre's fire alarm pull or button is accessible. During the case, monitor equipment from the periphery (e.g. *avoid overloading electrical outlets*, make sure fiber-optic light sources on standby when not in use). If using volatile solvents (alcohol prep, degreasers), manage and dispose of them safely. Also, be cautious with any flammable materials in the theatre (e.g. alcohol-soaked materials, packaging).
- **If Fire Occurs:** Announce the fire if not already done. Activate the fire alarm (or delegate someone) if the fire is beyond immediate small control. Dial the hospital emergency number to report location and "operating theatre fire" if the situation is not instantly contained. Retrieve the CO_2 extinguisher into the theatre or hand it to the person closest to the fire. Shut off wall gas supply if the fire is significant and spreading. Ensure doors are closed to contain smoke, and be ready to assist evacuation of the patient if ordered.
    - If the fire was quickly extinguished on the patient, you may not need to call a full alarm *if* the team leader says it's controlled; however, always follow local fire policy – significant fires or any that produce smoke likely require alarm activation and notification.
- **After the surgical fire:** Help ventilate the room if there is smoke (e.g. use portable fans or ensure HVAC is on maximum). *Do not reset* any alarms – wait for fire response team to arrive if they were summoned. Coordinate post-incident tasks: for example, bring burn dressings or coordinate transfer to burns/ICU care as needed. Assist in securing all equipment involved (the ESU, laser, etc. should be taken out of service) and ensure a Datix incident report is initiated once the patient is safe.

Emergency Response Algorithm (Airway vs Non-Airway Fires)

All theatre staff should be familiar with the standard steps to manage a surgical fire on a patient:

- **If a fire is on or around the patient (non-airway fire)** – Stop surgery and call out "Fire!". Stop all energy devices (electrocautery, laser). Remove burning drapes/material from patient. Smother flames with saline or wet towels; use a CO_2 extinguisher if needed. Once fire is out, resume oxygen to patient and assess injuries.
- **If a fire is in the airway (airway fire)** – Disconnect/stop oxygen flow. Extubate the patient immediately (remove ETT). Extinguish flames in airway by flooding with saline/water. Once fire is out, re-establish the airway (ventilate with air first). When safe, provide 100% O_2 and ventilate, and assess airway damage (consider bronchoscopy).

After any surgical fire: Treat the patient's injuries (burns to skin, airway injury, smoke inhalation). If the fire was significant, prepare to transfer the patient to a higher level of care (ICU). All fires must be reported (hospital incident system and to external bodies as required) and investigated to prevent recurrence.