

# 1 Problem

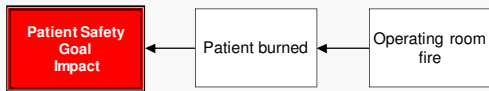
What	Problem(s)	Surgical fire
Where	Unit, area, equipment	Operating room
	Task being performed	Patient surgical operation

## Impact to the Goals

Patient Safety	Risk of death, disfigurement
Employee Impact	Risk of death, disfigurement
Property, Equip, Mtls	Risk of damage to property
Frequency	550-650 operating room fires in US each year (according to ECRI Institute)

# 2 Analysis

**Basic Level Cause Map** - Start with simple Why questions.



### Basic Cause-and-Effect

A standard operating room setup contains all the elements necessary for a fire: heat, fuel, and oxygen. Removing just one of these elements prevents a fire. However, removing an element is not easily achievable in an operating room. Instead, every effort must be made to reduce each of the elements - and staff should be prepared for the potential of a fire - in order to protect

### More Detailed Cause-and-Effect

A surgical fire, like any fire, requires the presence of three elements: a heat (or ignition) source, fuel, and an oxidizing agent. Oxygen is necessarily present for breathing; however, additional oxygen supplied to the patient increases the risk of a fire. Additionally, nitrous oxide produces oxygen from thermal decomposition. An increased level of oxygen increases the risk of a surgical fire. Like oxygen, fuel will always be present in a surgical room. Prep agents, drapes, and even a patient's hair are fuel sources. Vapors from insufficiently dry prep agents are extremely flammable. Although some drapes are advertised as flame-resistant, the ECRI has determined that all types of drapes burn in oxygen.

Surgical equipment, such as electro-cautery devices and lasers, are believed to provide the ignition source for many surgical fires. The increased use of such devices is believed to contribute to the increase in surgical fires. Although these devices can provide benefits during surgery, a non-ignition source tool should be considered for surgery performed near the oxygen supply of a patient requiring oxygen.

The best way to protect patients from surgical fires is to prevent them by reducing the use of oxygen, decreasing the flammability of potential fuel sources in the operating room (by allowing prep agents to dry and coating hair or other flammable objects with water-based lubricant) and ensuring that heat sources are monitored carefully to reduce the risk of ignition. In addition, operating teams should be prepared in the case of fire to minimize effects on patient and staff safety by taking steps to extinguish the fire and evacuate if necessary.

# 3 Solutions

## Prior to procedure:

Evaluate the risk of fire and implement safeguards  
 Coat hair with water based lubricant  
 Allow flammable skin preps to dry fully  
 Consider alternatives to ignition source tools for surgery near O<sub>2</sub> supply

## During procedure:

Ensure all cables are connected before activating equipment  
 Deactivate any surgical equipment before tip leaves surgery site  
 Holster and/or place on standby equipment not in active use  
 Deliver the minimum O<sub>2</sub> needed to maintain adequate blood saturation  
 If patient requires O<sub>2</sub>, secure airway  
 Moisten any sponges used

## In case of fire:

Stop flow of airway gases  
 Remove burning materials

# PATIENT BURNS Cause Map

## Only YOU can prevent surgical fires

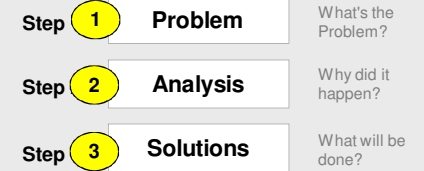
"They're rare but when they happen, they can be devastating," says Karen Weiss, M.D., M.P.H., program director of the Safe Use Initiative in FDA's Center for Drug Evaluation and Research. "And they're preventable if the surgical team works together to reduce the risk of fires."

"The basic elements of a fire are always present during surgery."  
 - Mark Bruley, Vice President, Accident and Forensic Investigation, ECRI

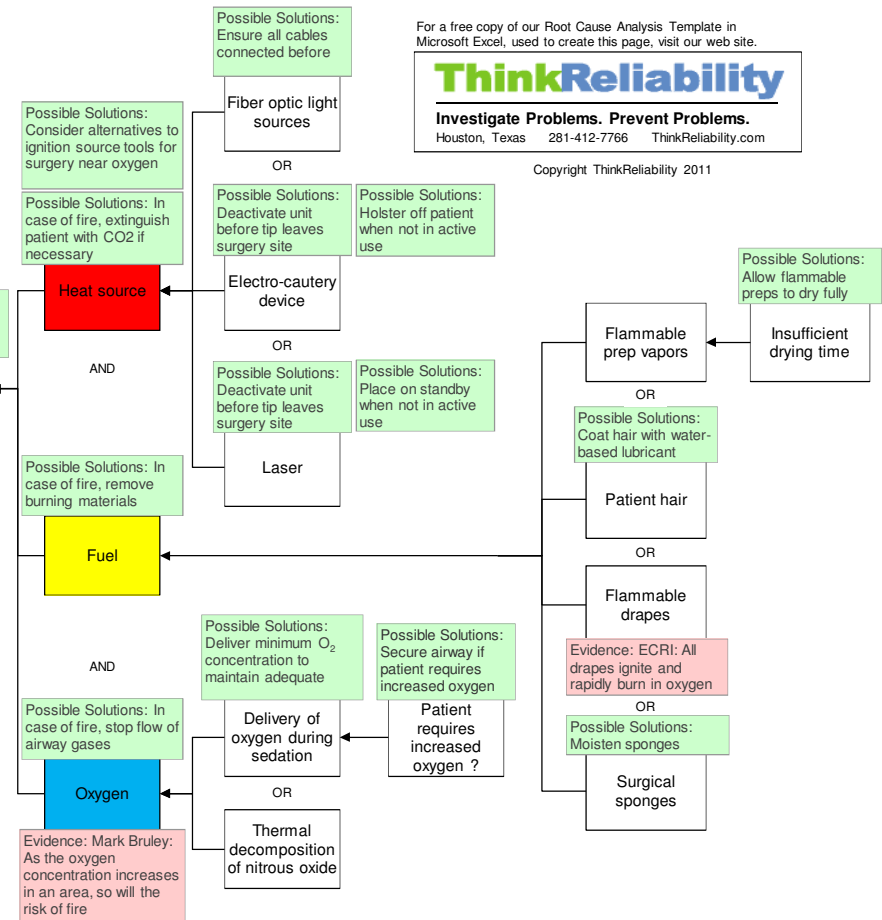
Cause Mapping is a Root Cause Analysis method that captures basic cause-and-effect relationships supported with evidence.

## CAUSE MAPPING

Problem Solving • Incident Investigation • Root Cause Analysis



**More Detailed Cause Map** - Add detail as information becomes available.



For a free copy of our Root Cause Analysis Template in Microsoft Excel, used to create this page, visit our web site.



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