

COVID-19 Hospitals Afire: Ishikawa Analysis Calls for Prompt Action

History is replete with incidents of fire disasters occurring in hospitals across the globe. Despite explicitly laid out fire safety guidelines, yet tragedies continue to occur unabated, revealing deep lacunae in regulatory processes. Recently, a fire broke out in the COVID-19 ward of Bharuch Welfare Hospital, Gujarat, killing at least 16 COVID-19 patients and 2 nurses.¹ Not even a week ago, 14 casualties were reported following a fire in a private COVID-19 facility in Virar, Mumbai.² In both cases, the fire broke out following an electrical short circuit.

Literature has repeatedly attributed hospital fires to three elements of the “Fire Triangle” which are *Ignitors, Fuel, and Oxidants, all of them are necessary for fire.*³ Excess of any one element leads to an increased likelihood of fire. Therefore, regulation of all three aspects is crucial for prevention.

Since the pandemic, major fire accidents have happened with alarming frequency, mostly in COVID-19 facilities. We performed a Google search for news articles and found 35 incidents of hospital fires all over the world between January 1, 2020 and May 1, 2021. Twenty-four of the total were in India alone, followed by two each in Bangladesh, Egypt, Russia, and Romania and one each in Chile, Turkey, and Ukraine. Among these, 28 hospitals were COVID-19 care facilities and a total of 129 deaths were recorded. The most heartbreaking and unfortunate event was a fatal fire at Bhandara General Hospital (non-COVID-19) in Maharashtra, killing 10 newborn babies.⁴ Regardless of the cause of the fire, almost all accidents showed callous neglect toward making fire safety imperative for public buildings and a lack of preparedness by hospital authorities.

Each harrowing tragedy leads to a set pattern of grief and condolence messages by politicians followed by investigations and blame games. Even more distressing is the announcement of a meager compensation for the victims or their relatives, not realizing the fact that the treatment of acute burns and its complications is long and expensive. As the probes and court

proceedings go on at a snail’s pace, the public’s attention and pressure eventually dissipate. The media and public alike forget the incident, only till the outrage erupts again during the next accident.

This situation cannot be allowed to continue, hence performing root-cause evaluation is preemptory. Undoubtedly, fires have broken out because of the violation of safety protocols by hospital authorities hand in hand with dilly-dallying over implementing rules and regulations by the civic bodies.

Specifically, we believe the following causes need immediate attention (Figure 1):

1. Electrical equipment like air conditioners and ventilators is likely to be the chief igniters as they are usually overworked, and the sockets are overloaded especially if daisy-chained using extension cords. Electrical short circuit was reported to be inciting event in 18 incidents of hospital fire during the said period. Three incidents were due to the ventilator machine bursting into flames. In one peculiar episode, a short circuit in a syringe pump triggered a fire, killing 10 and injuring 4 others, including two doctors.⁵ Basically hospital ICUs did not function up to 100% capacity in the pre-COVID-19 times, but now the ventilators, equipment, and air conditioners are working 24×7 putting pressure on the entire electrical system.
2. Due to staff restriction, it is likely that regular monitoring of electrical load and maintenance of equipment was neglected, resulting in increased chances of overheating of appliances and electrical short circuits.
3. The COVID-19 situation saw an escalation of oxygen use in ICUs and wards, especially from devices like High-Flow Nasal Cannulas. A substantial amount of oxygen gas may leak out, creating an oxygen suffused environment. Thus, even an insignificant spark may lead to a devastating explosion. In the Sanko University Hospital, Turkey, catering to COVID-19 patients, it was an explosion of a high-pressure oxygen cylinder that set off a massive fire, killing nine patients.⁶
4. Inadvertent use of flammable chemicals (alcohol rubs) on heat-dissipating appliances for infection control can cause easy ignition. Increased stocking of chemical supplies can lead to snowballing of fire.
5. Patient medical records and stationery, laundry, plastic containers all act as potential fuel for spreading minor fires.
6. All COVID-19 facilities are closed spaces with a serious lack of ventilation. The entry and exit points are also restricted, making evacuation tedious. Smokes from even small fires can cause higher deaths from asphyxiation.

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Address correspondence to Maneesh Singhal, MCh, Department of Plastic, Reconstructive and Burns Surgery, Room no. 223, JPNATC, All India Institute of Medical Sciences, Safdarjung Enclave, New Delhi, Delhi 110029, India. Email: drmaneesb@gmail.com

The address is the same for all authors.

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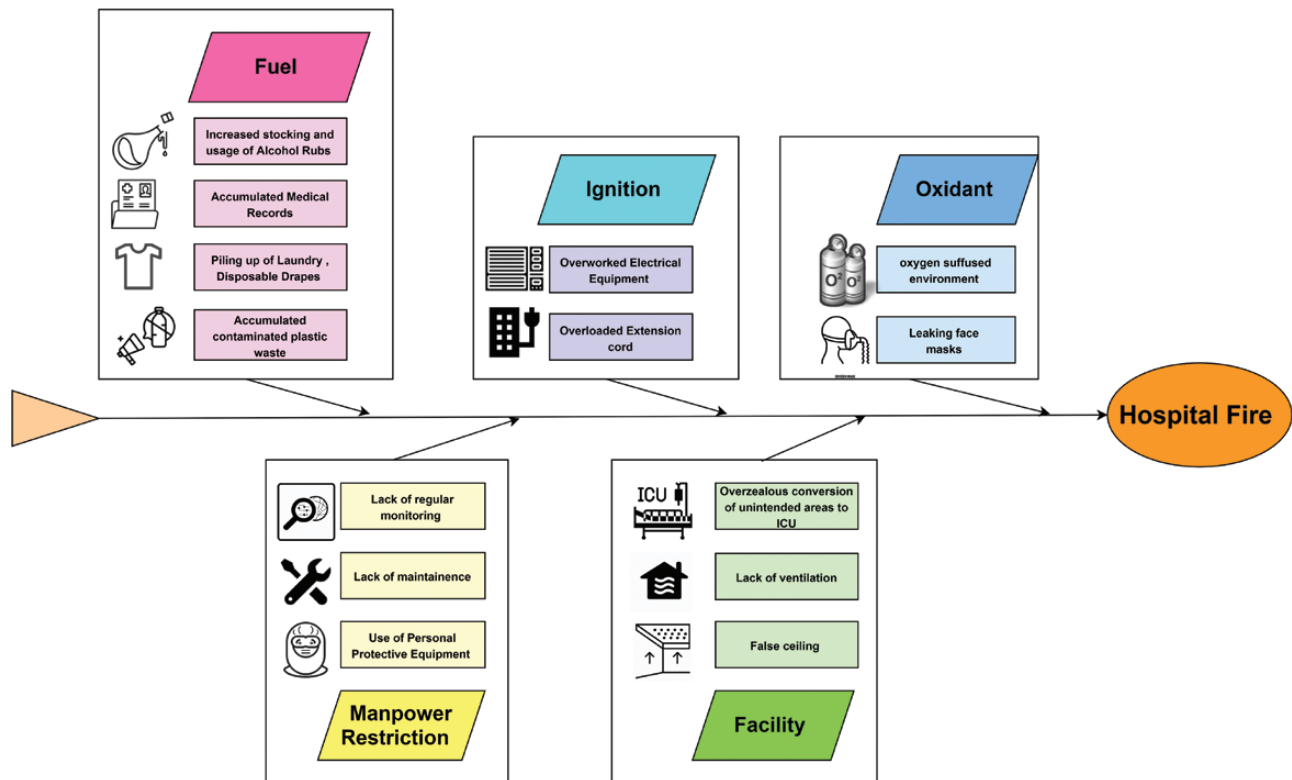


Figure 1. Ishikawa diagram showing causes of hospital fires.

7. False ceilings also leave less space for smoke from fires to rise upward, trapping it at a low level aggravating the problem.
8. Due to personal protective equipment, it is reasonable to believe that on-duty hospital personnel cannot react swiftly and effectively because of late detection of burning smell due to masks, and the unconscious or incapacitated patients may not raise any alarm. Moreover, they are already overwhelmed by clinical challenges such that loose connections, overloading, naked wires, and even minor sparking, either go unnoticed or attention is postponed.
9. Lastly, many COVID-19 centers were either makeshift or in the existing hospitals, those areas not intended for critical care (have low electrical load capacity) were converted into ICUs. Hence, overzealous attempts and hasty plans are other causes behind these ghastly mishaps.

Fire safety is essential in all situations. But due to the vulnerability of patients and hospital staff, it is arguably more important here compared to other workplaces. The danger is compounded because some patients would be on life-saving infusions or connected to machines that they rely on to survive such as ventilators and dialysis machines. These will have to be carried with the patient making evacuation challenging and tedious. Therefore, all the stakeholders—civil engineers, hospital management, fire authorities, and auditors—must be held liable.

Recommendations:

1. Every hospital must have well-designed exit paths and well-maintained firefighting equipment. The apparently monotonous routine of maintaining medical equipment, electrical wiring, oxygen tanks, and fire extinguishing device can make a significant difference between life and death. Electrical engineering staff should make mandatory inspections to guarantee optimal equipment operation and to detect potential sources of hazard in a timely manner.
2. Both the hospital staff and nearest fire stations should be well versed with fire safety and evacuation plans. Fire drills should be mandatory for all employees because they are always the first responders.
3. There is a pressing need for complete and honest fire safety and electrical wiring audits at the earliest.
4. A policy needs to be devised to sequentially rotate or replace ventilators and other critical care medical equipment that are used nonstop on patient after patient in ICUs.
5. Similarly, all the centers that need immediate renovation like installing fire-resistant doors, using fire-resistant paint, rewiring, or electrical load division need to be identified by civic authorities.
6. A plan needs to be formulated with the government's support because no renovation is possible as long as COVID-19 patients are admitted to the facility.

The COVID-19 resurgence beckons a swift response as we cannot let tragedy after tragedy culminating in a similar pattern of investigations, criticism, assurances, and compensations. Thus, fire safety standards of healthcare centers must be addressed urgently.

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*Maneesh Singhal, MCh, * Amiteshwar Singh, MS, *[✉]
Shivangi Saha, MCh, * and Seema Singhal, MCh[†]*

**Department of Plastic, Reconstructive and Burns Surgery,
All India Institute of Medical Sciences, New Delhi, India;*

*†Department of Obstetrics and Gynaecology & Member of Quality
Improvement Team, All India Institute of Medical Sciences, New
Delhi, India.*