

Original article

Study of Laboratory and hospital safety program with reference to OSHA(Occupational Safety and Health Administration) guidelines in a tertiary care hospital

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Abstract:

Introduction: Laboratory safety is of paramount importance for any hospital setup worldwide. Many laboratories contain significant risks and the prevention of laboratory accidents requires great care and constant vigilance. Examples of risk factors include high voltages, high and low pressures and temperatures, corrosive and toxic chemicals and biohazards including infective organisms and their toxins to name a few.

Methodology: The study was conducted in the hospital premises of our tertiary care hospital. Two standard questionnaires related to OSHA were selected and applied in our study to find out the efficiency of safety measurements in our hospital. For the laboratory setup, one standard questionnaire was analyzed.

Results: After proper analysis through the questionnaires, we found out that our hospital set up was quite efficient and mostly under the OSHA guidelines. Those areas where some deficiencies were noticed, were analyzed properly and adequate steps were discussed to correct them.

Conclusion: OSHA was passed to prevent workers from being killed or seriously harmed at work. The law requires that employers provide their employees with working conditions that are free of known dangers. The Act created the Occupational Safety and Health Administration (OSHA), which sets and enforces protective workplace safety and health standards. OSHA also provides information, training and assistance to workers and employers.

Introduction

Laboratory safety is of paramount importance for any hospital setup worldwide. Many laboratories contain significant risks and the prevention of laboratory accidents requires great care and constant vigilance. Examples of risk factors include high voltages, high and low pressures and temperatures, corrosive and toxic chemicals and biohazards including infective organisms and their toxins to name a few.

Measures to protect against laboratory accidents include safety training and enforcement of laboratory safety policies, safety review of experimental designs, the use of personal protective equipment and the use of the buddy system for particularly risky operations.

The Occupational Safety and Health Administration (OSHA) is an agency of the Department of Labor in the United States. OSHA's mission is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance"[1].

The Occupational Safety and Health Act grants OSHA the authority to issue workplace health and safety regulations. These regulations include limits on hazardous chemical exposure, employee access to hazard information, requirements for the use of personal protective equipment and requirements to prevent falls and hazards from operating dangerous equipment.

OSHA's current Construction, General Industry, Maritime and Agriculture standard [2] are designed to protect workers from a wide range of serious hazards. Examples of OSHA standards include requirements for employers to: provide fall protection such as a safety harness/line or guardrails; prevent trenching cave-ins; prevent exposure to some infectious diseases; ensure the safety of workers who enter confined spaces; prevent exposure to harmful chemicals; put guards on dangerous machines; provide respirators or other safety equipment; and provide training for certain dangerous jobs in a language and vocabulary, which the workers can understand.

Methodology

The study was conducted in the hospital premises of our tertiary care hospital. Two standard questionnaires related to OSHA were selected and applied in our study to find out the efficiency of safety measurements in our hospital. For the laboratory setup, one standard questionnaire was analyzed.

Results

- After proper analysis through the questionnaires, we found out that our hospital set up was quite efficient and mostly under the OSHA guidelines.
- Those areas where some deficiencies were noticed, were analyzed properly and adequate steps were discussed to correct them.
- A meeting was conducted for the formulation of the safe patient handling committee.
- The concept of "Safety Users, Safety coaches and Champions" were analyzed properly and studied. Posts were created for better control of the safety measures.
- A nurse manager was also appointed as per the OSHA guidelines, which was found to be a necessity.
- Departments like Laundry, maintenance and engineering were taught about safe patient handling concepts.
- Adequate steps were started on the establishment of "Satellite Accumulation Area".
- Study and use of Safety showers and eye washes in the laboratory was considered as priority.
- Adequate measures were discussed for the decontamination of solid and liquid biological materials before discarding.

Discussion and Conclusion

The occupational health scenario has undergone a paradigm shift due to rapid industrialization. Productivity at work is directly influenced by the health status of workers. An unhealthy workforce is a drag on workplace productivity; affecting overall national productivity. Poor occupational health and reduced working capacity of the workers may cause an economic loss of up to 10–20% of GNP. WHO estimates that only 10–15% of workers have access to basic occupational health services. The burden of disease attributed to occupational diseases is high and it is estimated to be about 11 million cases annually, with about 7,00,000 deaths. One of the major causes for occupational dissatisfaction are the occupational hazards. They include;

Types of Hazards

- **Chemical hazards**
- **Biological hazards**
- **Physical hazards**
- **Safety hazards**

I Chemical hazards

- Hazardous chemicals present physical and/or health threats to workers in clinical, industrial, and academic laboratories. Laboratory chemicals include cancer-causing agents (carcinogens), toxins (e.g., those affecting the liver, kidney, and nervous system), irritants, corrosives, sensitizers, as well as agents that act on the blood system or damage the lungs, skin, eyes, or mucous membranes[6].

II Biological hazards:

Biological agents and biological toxins

Many laboratory workers encounter daily exposure to biological hazards. These hazards are present in various sources throughout the laboratory such as blood and body fluids, culture specimens, body tissue and cadavers, and laboratory animals, as well as other workers.

These are federally regulated biological agents (e.g., viruses, bacteria, fungi, and prions) and toxins that have the potential to pose a severe threat to public health and safety, to animal or plant health, or to animal or plant products[7,8] e.g

1. **Anthrax** - Anthrax is an acute infectious disease caused by a spore-forming bacterium called *Bacillus anthracis*.
2. **Avian Flu** - Avian influenza is caused by *Influenza A viruses*.

III Physical hazards

Besides exposure to chemicals and biological agents, laboratory workers can also be exposed to a number of physical hazards. Some of the common physical hazards that they may encounter include the following: ergonomic, ionizing radiation, non-ionizing radiation and noise hazards.

Ergonomic Hazards

Laboratory workers are at risk for repetitive motion injuries during routine laboratory procedures such as pipetting, working at microscopes, operating microtomes, using cell counters and keyboarding at computer workstations. Standing and working in awkward positions in front of laboratory hoods/biological safety cabinets can also present ergonomic problems[9,10]

Ionizing Radiation

Ionizing radiation sources are found in a wide range of occupational settings, including laboratories. These radiation sources can pose a considerable health risk to affected workers if not properly controlled. Any laboratory possessing or using radioactive isotopes must be licensed by the Nuclear Regulatory Commission (NRC) and/or by a state agency that has been approved by the NRC, 10 CFR 31.11 and 10 CFR 35.12 [11]

IV Safety hazards

Autoclaves and sterilizers

Workers should be trained to recognize the potential for exposure to burns or cuts that can occur from handling or sorting hot sterilized items or sharp instruments when removing them from autoclaves/sterilizers or from steam lines that service the autoclaves[12].

Centrifuges

Centrifuges, due to the high speed at which they operate, have great potential for injuring users if not operated properly. Unbalanced centrifuge rotors can result in injury, even death. Sample container breakage can generate aerosols that may be harmful if inhaled. The majority of all centrifuge accidents are the result of user error.

Compressed gases

Laboratory standard for **compressed gas**

1. Is a gas or mixture of gases in a container having an absolute pressure exceeding 40 pounds per square inch (psi) at 70 °F (21.1 °C); [13]
2. Is a gas or mixture of gases having an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C);
3. Is a liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM (American Society for Testing and Materials)

Within laboratories, compressed gases are usually supplied either through fixed piped gas systems or individual cylinders of gases. Compressed gases can be toxic, flammable, oxidizing, corrosive, or inert. Leakage of any of these gases can be hazardous

Store, handle, and use compressed gases

- All cylinders whether empty or full must be stored upright.
- Secure cylinders of compressed gases. Cylinders should never be dropped or allowed to strike each other with force.
- Transport compressed gas cylinders with protective caps in place and do not roll or drag the cylinders.

Electrical

In the laboratory, there is the potential for workers to be exposed to electrical hazards including electric shock, electrocutions, fires and explosions. Damaged electrical cords can lead to possible shocks or electrocutions. A flexible electrical cord may be damaged by door or window edges, by staples and fastenings, by equipment rolling over it, or simply by aging[14]

The potential for possible electrocution or electric shock or contact with electrical hazards can result from a number of factors, including the following:

- Faulty electrical equipment/instrumentation or wiring
- Damaged receptacles and connectors; and
- Unsafe work practices.

Fire

Fire is the most common serious hazard that one faces in a typical laboratory. While proper procedures and training can minimize the chances of an accidental fire, laboratory workers should still be prepared to deal with a fire emergency if it occur. In dealing with a laboratory fire, all containers of infectious materials should be placed into autoclaves, incubators, refrigerators, or freezers for containment.[15]

Occupational Safety and Health Administration(OSHA)

The **Occupational Safety and Health Administration (OSHA)** is an agency of the United States Department of Labor. Congress established the agency under the Occupational Safety and Health Act, which President Richard M. Nixon signed into law on December 29, 1970. OSHA's mission is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance"^[1]The agency is also charged with enforcing a variety of whistleblower statutes and regulations. OSHA is currently headed by Assistant Secretary of Labor David Michaels. OSHA's workplace safety inspections have been shown to reduce injury rates and injury costs without adverse effects to employment, sales, credit ratings, or firm survival[15,16]

Employers have the responsibility to provide a safe workplace.

By law, employers must provide their workers with a workplace that does not have serious hazards and must follow all OSHA safety and health standards. Employers must find and correct safety and health problems. OSHA further requires that employers must first try to eliminate or reduce hazards by making feasible changes in working conditions rather than relying on personal protective equipment such as masks, gloves, or earplugs. Switching to safer chemicals, enclosing processes to trap harmful fumes, or using ventilation systems to clean the air are examples of effective ways to eliminate or reduce risks.

Employers must also:

- Inform workers about chemical hazards through training, labels, alarms, color-coded systems, chemical information sheets and other methods.
- Provide safety training to workers in a language and vocabulary they can understand.
- Keep accurate records of work-related injuries and illnesses.
- Perform tests in the workplace, such as air sampling, required by some OSHA standards.
- Provide required personal protective equipment at no cost to workers. (Employers must pay for most types of required personal protective equipment.)
- Provide hearing exams or other medical tests when required by OSHA standards.
- Post OSHA citations and annually post injury and illness summary data where workers can see them.
- Notify OSHA within eight hours of a workplace fatality. Notify OSHA within 24 hours of all work-related inpatient hospitalizations, all amputations, and all losses of an eye (1-800-321-OSHA [6742]).
- Prominently display the official OSHA Job Safety and Health – It's the Law poster that describes rights and responsibilities under the OSH Act.
- Not retaliate or discriminate against workers for using their rights under the law, including their right to report a work-related injury or illness.

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- File a confidential complaint with OSHA to have their workplace inspected.
- Receive information and training about hazards, methods to prevent harm, and the OSHA standards that apply to their workplace. The training must be done in a language and vocabulary workers can understand.
- Receive copies of records of work-related injuries and illnesses that occur in their workplace.

- Receive copies of the results from tests and monitoring done to find and measure hazards in their workplace.
- Receive copies of their workplace medical records.
- Participate in an OSHA inspection and speak in private with the inspector.
- File a complaint with OSHA if they have been retaliated or discriminated against by their employer as the result of requesting an inspection or using any of their other rights under the OSH Act.

File a complaint if punished or retaliated against for acting as a “whistleblower” under the 21 additional federal laws for which OSHA has jurisdiction.

With over 40 million belonging to the working population, India has a very large population base engaged in industrial activity. The health needs of these populations also differ according to the industry of work. The knowledge and orientation for diagnosing such occupation-specific conditions are evolving globally in the form of speciality health care. However, for changing the mindset of the leaders in different sectors, it would be necessary to integrate various tasks involved into a single multi-disciplinary authority that would be capable of multi-tasking across all the sectors. Structural changes have been brought about in the UK, way back in 1974 when that country enacted The Health and Safety at Work etc. Act 1974 (HSWA 1974). Through this Act, an attempt was made to rationalize the then existing complex and confused system of legislation in this area.

The UK Act of 1974 provided that the provisions relating to the making of health and safety regulations and agricultural health and safety regulations and the preparation and approval of codes of practice shall in particular have effect with a view to enabling the enactments as specified in its schedule to be governed by such regulations and codes. Thus, the Act of 1974 became the Principle Act to govern the health and safety at work across the sectors. The Act has since created statutory instruments in the form of codes of practices for specific areas. Such examples are: Control of Substances Hazardous to Health Regulations 2002; Management of Health and Safety at Work Regulations 1999; Personal Protective Equipment at Work Regulations 1992 and the Health and Safety (First Aid) Regulations 1981. Such statutory instruments have laid down detailed requirements in fulfilment of the objective of rationalizing the existing complex and confused system of legislation .

OSHA was passed to prevent workers from being killed or seriously harmed at work. The law requires that employers provide their employees with working conditions that are free of known dangers. The Act created the Occupational Safety and Health Administration (OSHA), which sets and enforces protective workplace safety and health standards. OSHA also provides information, training and assistance to workers and employers. To help assure a safe and healthful workplace, OSHA also provides workers with the right to:

- Receive information and training about hazards, methods to prevent harm, and the OSHA standards that apply to their workplace. The training must be in a language you can understand;
- Observe testing that is done to find hazards in the workplace and get test results;
- Review records of work-related injuries and illnesses;
- Get copies of their medical records;
- Request OSHA to inspect their workplace; and
- Use their rights under the law free from retaliation and discrimination.

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