

**A STUDY ON HAZARD
IDENTIFICATION AND RISK
ANALYSIS IN LABORATORY
DEPARTMENT**

HAZARD VS RISK



INTRODUCTION

- Risk management is the identification, assessment, and prioritization of risks (defined in ISO 31000 as the effect of uncertainty on objectives, whether positive or negative) followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities
- A hazard is defined as a "Condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event." It can be any event or because that has led to such an incident that is not desired. However, the occurrence of any hazard is rare and often undesired incidents/accidents are caused due to multiple hazards.



Hazard Identification and Risk Assessment Framework

Hazard identification

Risk Identification

Risk rating - Consequences
and severity

Identify existing safeguards

Control measures and
recommendations



➤ **Hazard Identification**

- Recognizing the existence of hazards performing a complete analysis. Simply put, a hazard is a possibility of harm. The term is often associated with an agent, condition, or activity (a natural phenomenon, a chemical substance, a mixture of substances, a process involving substances, a source of energy, or a situation or event) that, if left unchecked, could result in injury, illness, loss of property, or damage to the environment. It is often easier to identify the agents or conditions that cause a hazard, but more difficult to identify the hazards associated with an activity..

➤ **Risk identification**

- Risk identification is the process of determining risks that could potentially prevent the program, enterprise, or investment from achieving its objectives. It includes documenting and communicating the concern

HIERARCHY OF RISK CONTROL

ELIMINATION

Elimination of hazard is the most effective means of hazard control. It involves the physical removal of the hazard

SUBSTITUTION

The second most effective way to control hazards is substitution. Replace the hazard with a lesser hazard.

ENGINEERING CONTROLS

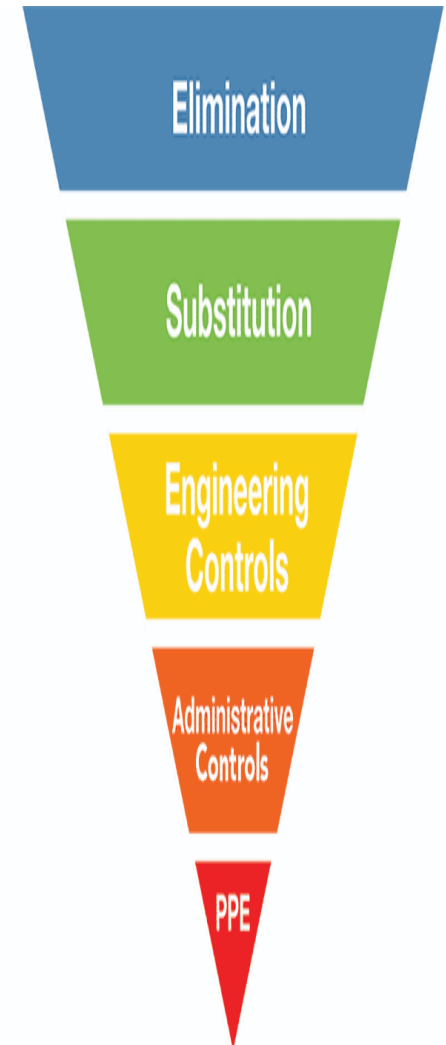
The third most effective means of controlling hazards is engineering controls. Engineering controls do not eliminate the hazards, but rather keep people isolated from the hazard.

ADMINISTRATIVE CONTROLS:

Establishing policies, procedures and work practices designed to reduce worker's exposure to risk. It can also include provision of specific training and supervision.

Personal protective equipment (PPE)

Covering and protecting a worker's body from hazards. It can be used as a short-term control measure until a higher order control has been provided, or to supplement it. The employer would also have to provide training for workers required to use it, and the employees would have a responsibility to use it properly.



INTRODUCTION OF HOSPITAL

- ASIAN INSTITUTE OF MEDICAL SCIENCES, a 425 bedded super speciality tertiary care hospital is truly futuristic in its services and technology and brings some of the talented medical professionals in India. The hospital has been accredited with NABH and NABL accreditations and is equipped with state-of-the-art technology. ASIAN INSTITUTE OF MEDICAL SCIENCES, has been rated seventh best hospital in Delhi NCR by “THE Week” magazine as per the “A C Nielson Survey”. The hospital is the vision of Palmistry Awardee Dr. Narendra Kumar Pandey, FRCS (Edinburgh), FRCS (Glasgow) FACS, FICS.

Asian Institute of Medical Sciences provides comprehensive multi-speciality tertiary care facilities through its thirteen centres of excellence



AIM & OBJECTIVE

**To assess and study
Hazard identification
and risk analysis
(HIRA) in laboratory
department**

To examine the process carried in the biochemistry, histopathology, microbiology and hematology departments.

To evaluate the hazards and risk associated with the processes or methods, materials and equipment used to perform work.

To analyze the probability and severity of the identified risks and give appropriate scoring and rating

To identify control measures sufficient to eliminate or reduce risk to an acceptable level.

1 Scope of the Study

This Project takes into account for the vulnerabilities of a specific hazard, consequences if a hazard is realized and means to prevent those hazards

2 Research question

Hazard identification and risk assessment (HIRA) influences the safety of the employees in the laboratory department in context of Asian Hospital.

3 Sampling Technique: Convenience Sampling



4 Study Size

A Daily visit of the department for 1.5 month and taking a sample size of 4 per day i.e., total 120 samples and then tracking the whole process finding the hazard and associated risk and combining the results and come to the conclusions.

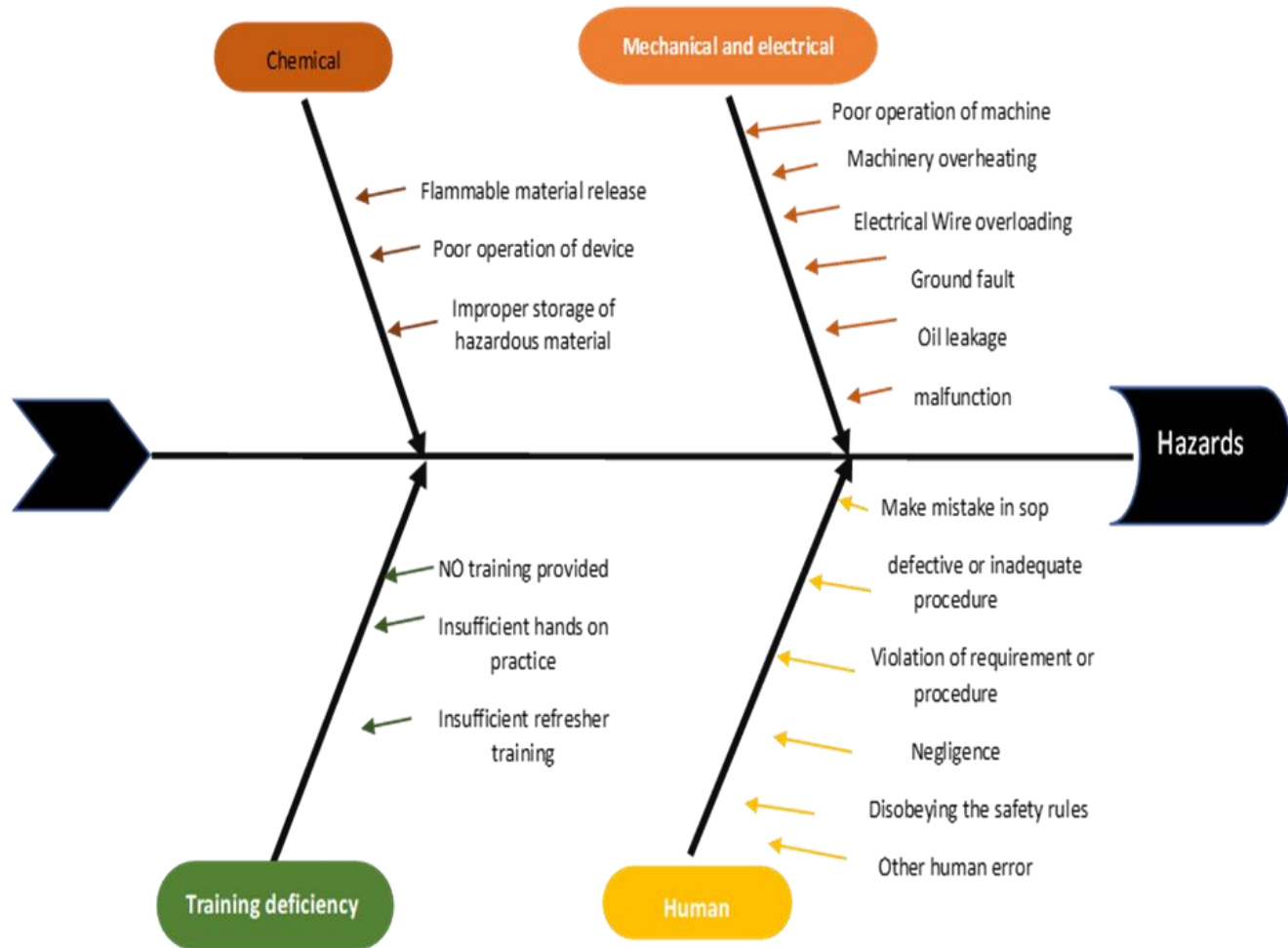
5 Study Tools

1. Table
2. Self prepared Checklist
3. Cause & Effect Diagram

The image features a white, textured background that resembles torn paper. At the top and bottom edges, there are decorative borders consisting of diagonal stripes in bright yellow and black. The text "Result and discussion" is centered in the middle of the page in a bold, orange, sans-serif font.

Result and discussion

Fishbone Diagram



SCORING METHODOLOGY

Consequences/ severity	Likelihood/ probability	Risk
1. NEGLIGIBLE: First Aid needed at scene, minor supportive medical treatment, minor system impairment, No man-day lost	Unlikely: Can assume will not occur	1-5: Low risk: Acceptable , no further action needed
2. MARGINAL: Hospital treatment needed, minor injury, lost workday accident, compensable injury or illness, minor property damage, man day lost (Patient/ attendant/ staff)	2. Seldom: unlikely, but could occur at some time	6-10: MODERATE RISK: Adequate, look to improve at next review
3. CRITICAL: Major injury, temporary or total disability in excess of 3 months, major system damage, significant property damage, critical to personal (patient/attendant/staff) health	3. Possible/Occasional: occurs sporadically	11-15: HIGH RISK: Tolerable , look to reduce
4. CATASTROPHIC: Death or permanent disability, system loss, major property damage	4. Likely: Occurs several times	16-20: EXTREMELY HIGH RISK: Unacceptable, stop activity and make immediate improvements
	5. Very Likely/ Frequent: occurs often, continuously experienced	

		FREQUENT (5)	LIKELY (4)	OCCASIONAL (3)	SELDOM (2)	UNLIKELY (1)
S E V E R I T Y	CATASTROPHIC (4)	E (20)	E (16)	H (12)	M (8)	L (4)
	CRITICAL (3)	H (15)	H (12)	M (9)	M (6)	L (3)
	MARGINAL (4)	H (10)	M (8)	M (6)	L (4)	L (2)
	NEGLIGIBLE (5)	M (5)	L (4)	L (3)	L (2)	L (1)

HIRA : Laboratory

S.No	Activities of Laboratory	Hazards	Risk	Likelihood of Occurrence	Severity	Risk Score	Risk Rating	Recommendations/Controls
1	Doctor's order	illegible handwriting of doctors	Misinterpretation of test	2	2	4	L	1) Training to doctors on improving hand writing and to write in capital letters. 2) Top management evaluation / audits should be done.
2	Handling of Electrical	Improper maintenance of equipment/Faulty equipment	Risk of Fire of Fire /explosion	1	2	2	L	In house Bio Medical Engineering team is in place to take care of routine equipment breakdown 2. training of staff regarding management of handling faulty equipments 3. periodic facility management round
		Electrical shock due to contact with high power / Voltage equipments	Electrocution/ Burn	2	2	4	M	Work specific gloves,training of staff
		faulty equipment	Risk of Fire / Short circuit	1	2	2	L	In house Bio Medical Engineering team is in place to take care of routine equipment breakdown 2. training of staff regarding management of handling faulty equipments 3. periodic facility management round 4.
		Over plugging in extension cords	Short circuit due to overloading	3	3	9	M	cords should be plugged in within the range to avoid overloading
		Entangled wire/cords in the path ways	slip and trip which can cause sprain , strain and cuts	3	2	6	M	electrical pendants used to keep cords out of the way
3	Handling of Chemicals	skin absorption of chemicals	allergic reactions or other skin problems if absorbed by the skin	2	2	4	L	appropriate personal protective equipment, lab coat are worn
		inhalation of toxic fumes due to Improper storage	certain chemicals can cause irritation in the eyes, nose, throat and lungs	2	2	4	L	appropriate personal protective equipment and proper ventilation

4	Physical	Poor lightening	Sprains , Strains and Bruises	1	1	1	L	porper signages for wet areas , Proper lightining
		Sharp tools	Cut / Bruise	2	2	4	L	gloves and training of staff about usuage/ handling of the sharps
		Heat released form equipments	hastily or improper handling can cause serious burns	3	2	6	M	gloves, trining of staff as per manufacturer's manual to avoid such cases
		movement of machinery	Breakage	3	1	3	L	training to staff regarding maintenance handling of equipments as per manugfacturer's manual
		blocked passages/ emergency exits	slip and trip can occurs and also moving heavy materials along passage can be difficult 2. blocked emergency exits	4	3	12	H	no controls
		spills and breaks	cuts and scrapes	3	2	6	M	spillage management training
5	Biological	body fluids	infection	1	2	2	L	appropriate use of personal propective equipment
6	Ergonomics	Repetition of work, awkward posture, lifting or handling loads	Poor ergonomics can cause musculoskeletal disorders (MSDs). These include numbness, tingling, and sharp pain	2	2	4	L	1. Adjust the height of working surfaces to reduce long reaches and awkward postures 2. using mechanical lifting equipment for lifting heavy loads
7	Occupational	Improper handling of hazardous materials	Spillage	2	2	4	L	training of staff about spill management

Processes

BIOCHEMISTRY

8	Centrifugation	speed not monitored	breakage & aerosolization can occur	3	1	3	L	Speed monitoring, balance monitoring, daily log. If breakage occurs: 1:10 dilution of bleach or a non-corrosive disinfectant into canister to decontaminate, after it gets soaked for 20 min. Use forceps & dispose in sharp container.
		caps or parafils not used	Centrifugation creates a vacuum & volatilizes liquids 1) Contaminated items become aerosols 2) flammable liquids may explode	3	1	3	L	Use caps or parafilm
		maintenance not properly done	Inaccurate lab results can occur	3	1	3	L	Calibration schedule & preventive maintenance schedule is in place with bio-medical engineering department
		not knowing hand hygiene	Risk of contamination	3	1	3	L	1) Use hand hygiene technique 2) Hand hygiene posters above the sinks. 3) Lab coat & gloves to be worn in every procedure.
		ingestion	Ingestion of reagents can whole mouth pipetting and can cause serious health hazard	4	1	4	L	1) Autopipets are used 2) Training of MSDS (Material safety data sheet) to staffs working in labs 3) MSDS in place

MICROBIOLOGY								
9	Preparing culture media	not prepring media in laminar flow	Contamination of the media by microorganisms that are in the environment	3	2	6	M	Sop should be followed for Preparing the media in laminar air flow bench To Maintain Sterility
		Burns from molten agar (sterilizing& melting solidified agar media in the autoclave)can occur while pouring in the agar plate	Burns	3	1	3	L	1)Training to lab technicians on pouring in the plates safely 2)Cloths or tissues can be used to hold hot flask 3) wearing PPE
	10	Specimen processing	streilization not done properly	Inoculation loop can contaminate the samples and therefore false reading of the samples can occur	3	1	3	L
11	Handling of microscope	long examination time	Excessive Strain In The Eyes While Looking In Microscope	1	3	3	L	Taking breaks in between while examining the slides.
		Cuts from slides	Cuts from sharp edges on glass slides or broken slides	2	2	4	L	1)Training to lab technicians on handling slides carefully. 2) wearing PPE
		Working with stains/ gram	Can cause eye/skin irritation and if inhaled can cause respiratory tract infection & in chronic cases kidney and liver damage.	3	2	6	M	1)Training to lab personnel on handling strain with care 2)Wearing gloves and eye protectors throughout procedure 3)MSDS if any incidence occur
HISTOPATHOLOGY								
12	Grossing process	Working with blades / sharps	Injury (cuts) From Blades Used In Grossing	2	3	6	M	1)Training to lab personnel to be vigilant while grossing the samples 2) use PPE 3) keep it in a safe position after use. 4) Incident reporting if injury occurs.
		Working with infected tissues and body fluids	infection	2	2	4	L	Gloves & PPE to be used, Hoods That Prevents Fumes To get inhaled
13	Handling Solvents	Exposure with solvents	Constant Exposure To Solvent Leads To Reynolds Phenomenon (color change of the skin especially fingers to white or blue color,numbness and tingling sensation,throbbing pain &in severe condition ulceration can occur)	3	2	6	M	wearing gloves (PPE) when working with solvents
14	Disposal	BMW not segregated	Organs and tissues disposal can cause biohazards	3	1	3	L	BMW rule 2016 needed to be followed for disposal of bio-hazardous waste

HEMATOLOGY

15	Slide preparation	Get Contacted With Blood While Preparing Slides	infection	3	1	3	L	1)Gloves Should Be Worn 2)Slides Should Be Kept For Drying Aside Rather Waving And Drying
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MISCELLANEOUS

16	Others	Transport of Specimens	Breakage and Aerosolization	2	2	4	L	
		Storage of Specimens		2	2	4	L	storage room is ventilated and have exhaust fans
		Disposal of Specimens		2	2	4	L	Proper BMW segregation, autoclaving

INTERPRETATION

High Risk

1. While grossing in the histopathology lab
2. Handling of the formalin and various other harmful chemicals.
3. Improper handling of hazardous materials from lab
4. Electrical short circuit.
5. Improper handling of inflammable materials.
6. Blocked evacuation pathways.

Moderate Risk

1. Electrical shock due to contact with high power / Voltage equipment
2. Over plugging in extension cords
Entangled wire/cords in the pathways
3. Heat released from equipment
4. Not preparing media in laminar flow
5. Spills while transportation
6. Risks while preparing samples in the microbiology lab
7. Preparing the culture media
8. Gram staining
9. Blood culture preparation
10. Risk from bacterial plates
11. Risk of equipment breakdown

Low risk

1. Untrained billing executives
2. Illegible handwriting of doctors in prescription form
3. skin absorption of chemicals
4. Poor lightening
5. Repetition of work, awkward posture, lifting or handling loads
6. "Burns from molten agar
7. (sterilizing& melting solidified agar media in the autoclave) can occur while
8. pouring in the agar plate
9. Storage and disposal of samples
10. Infection from microscope
11. Breakages and leakages



RECOMMENDATION

- Computerized physician order entry (CPOE) can be implemented for reducing the risk of illegible handwriting and wrong interpretation of doctors' orders.
- Audits can be done by the top management to reduce the risk of hazards
- Rubber hand protectors can be used while preparing culture media to protect themselves from burns from molten agar.
- SOP's should be revised periodically
- Hazards assessment task force should be formed
- All laboratory personnel must at a minimum completed safety training on an annual basis. Additionally, laboratory personnel who handle or use the High Hazard Substance must demonstrate specific competency and familiarity regarding the safe handling protocols
- Proper training record should be maintained, with proper checklist



CONCLUSION

Hazard identification and risk analysis in hospitals is one of the most important works that would help to increase safety of patients employee and property and therefore increasing productivity. It will also help in identify, analyse and prioritize all hazards in laboratory department. This study considers for the vulnerabilities of a specific hazard, consequences if a hazard is realized and means to prevent those hazards.

The staffs of the laboratory department are getting trained for proper technique of patient care and usage of the equipment's to avoid hazards in the department. Equipment are timely calibrated to avoid failure during procedure. This study illustrated what are the types of hazards that can happen in the department and how to prevent them.

Thank
you.