

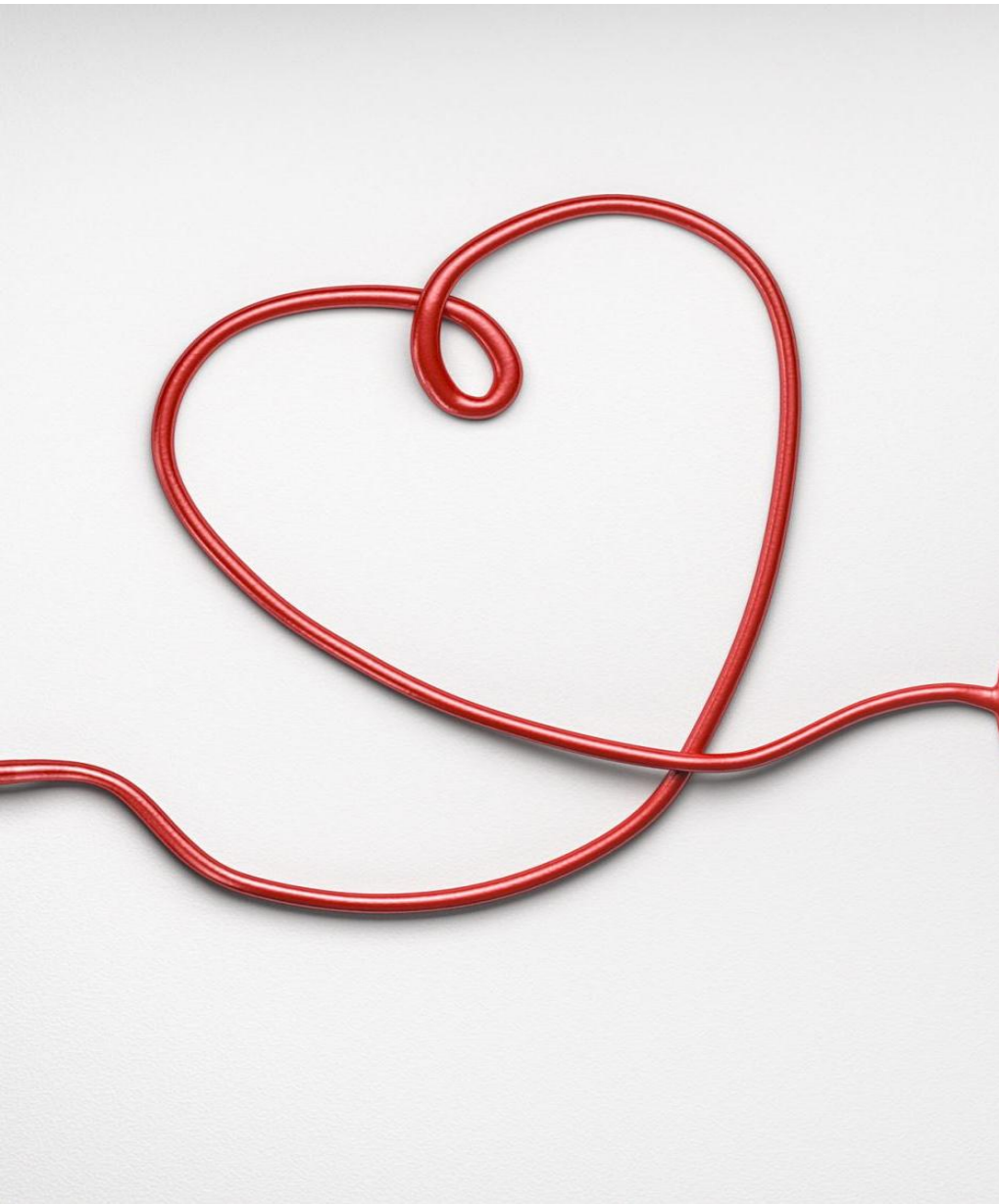
A Multi-Departmental Risk Evaluation Using Heat Mapping and Score Matrix Asian Heart Institute, Mumbai.

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MBA HOSPITAL AND HEALTH
MANAGEMENT

ROLL NO. 1772

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Introduction

- **Asian Heart Institute**, located in Mumbai, is a 240-bedded NABH and JCI-accredited single-specialty cardiac hospital known for high-risk cardiac surgeries and interventional procedures.
- In such a high-acuity setting, **patient safety** is critical due to the vulnerability of cardiac patients, the complexity of clinical workflows, and the involvement of high-alert medications and invasive technologies.
- Despite standardized protocols, **operational risks remain** due to human factors, equipment reliance, and procedural variations. Hence, **systematic risk assessment** becomes essential to identify gaps, reduce adverse events, and ensure compliance with **NABH and JCI standards**.

RESEARCH QUESTION

- What are the department-specific operational and patient safety risks in a single-specialty cardiac hospital, and how can they be measured, visualized, and mitigated using structured risk assessment tools?



PROBLEM STATEMENT



Despite having SOPs and quality protocols, ICU, Cath Lab, and OT at Asian Heart Institute face recurring operational risks that need evidence-based assessment and alignment with NABH and JCI standards for continuous quality improvement.



Non-clinical areas such as the Cafeteria are often overlooked in formal risk assessments, posing indirect but significant threats to patient safety.



The absence of visual tools like heat maps and risk matrices makes it difficult for hospital leadership to prioritize and monitor safety risks systematically.

Objectives of the Study

Aim

- To identify, categorize, and assess risks in key clinical and non-clinical departments of Asian Heart Institute using a structured risk scoring matrix and heat map.

Objectives:

- To evaluate department-wise variation in risk profiles.
- To recommend control measures aligned with NABH and JCI standards.
- To support continuous quality improvement (CQI) through evidence-based risk prioritization.

Literature Review

S. No.	Theme	Key Points	Sources / Insights
1	Evolution of Risk Assessment	- Shift post-1999 IOM report from passive safety to structured risk management- Adoption of aviation/manufacturing safety models- WHO, JCI, NABH promoted proactive risk culture via audits, scoring	Institute of Medicine (1999); Reason (2000); WHO (2009); NABH Standards (2020)
2	Key Risk Management Frameworks	FMEA : Preventive, severity-occurrence-detection- RCA : Reactive, post-incident root cause analysis- Bowtie : Visualizes hazards, controls, mitigations	DeRosier et al. (2002); Anderson & Jackson (2000); Sklet (2006); JCI Manual (2023)
3	Department-Wise Risks	ICU : HAIs, med errors, equipment failures- Cath Lab : Radiation, emergencies, contrast nephropathy- OT : Wrong-site surgery, sterilization failures- ED : Triage, handoff errors- Pharmacy : LASA drugs, expiry, cold chain- Cafeteria : Contamination, allergens, pests	WHO (2009); Pronovost et al. (2006); Bates et al. (1995); NABH Hospital Audit Reports
4	Risk Score Matrices & Heat Maps	- Use severity vs. likelihood (1–25)- Heat maps visualize critical zones- Required in NABH/JCI audits	JCI Accreditation Manual (2023); NABH 6th Edition (2020); Reason (1997)
5	Research Gaps Identified	Lack of integrated multi-departmental risk studies - Limited attention to non-clinical risk areas - Underutilization of visual tools in tier 2/3 hospitals - Inconsistent risk documentation culture - Scarcity of matrix-based studies in Indian accredited hospitals	Sharma & Gupta (2018); Thomas et al. (2020); Mukherjee (2021); Internal hospital audits

METHODOLOGY

Study Design & Setting

- **Type:** Descriptive Observational and Qualitative study
- **Location:** Mumbai
- **Hospital:** Asian Heart Institute, Mumbai

Study Population

- **Participants:** Clinical & support staff
- No. of Staffs included: 2-4 staffs per department

Inclusion:

- Department heads / quality reps
- Staff with ≥ 1 year experience

Exclusion:

- Interns / staff with <3 months
- Non-patient care departments

Study Tools

- Observation checklists
- Semi-structured interview schedules
- SOP audit forms
- Incident/near-miss report data
- Risk matrix template

Study Duration & Sampling

- **Duration:** 3 months (Mar 10 – Jun 10, 2025)
- **Sampling:**
 - *Purposive* for interviews
 - *Complete enumeration* of risks
 - **Sample Size:** 24 risks across 6 departments

Benchmarking with NABH/JCI Risk Priorities



Standard	Relevant Study Findings
NABH 6 th Edition– Infection Control (CH.5)	ICU and OT risks related to aseptic technique, Cafeteria hygiene gaps
NABH 6 th Edition – Medication Management	Pharmacy dispensing errors, cold storage compliance
NABH 6 th Edition – Facility Management	Pest control and food safety in Cafeteria, equipment checks in Cath Lab
JCI 8 th edition – International Patient Safety Goals (IPSG)	Identification, communication, infection control, and medication accuracy highlighted across departments
JCI 8 th edition – Quality Improvement and Patient Safety (QPS)	Heat maps and risk matrices serve as evidence of proactive risk identification

Departments Covered

1. Intensive Care Unit (ICU)
2. Cath Lab
3. Operation Theatre (OT)
4. Emergency Department / Day Care
5. Pharmacy
6. Cafeteria

Risk Level Categories

Score Range	Risk Level
1–5	Low
6–10	Moderate
11–14	High
15–25	Critical

Risk Matrix Model

A 5×5 Risk Matrix was used to quantify and prioritize risks across departments.

Scoring Formula:

Risk Score = Likelihood (1–5) × Severity (1–5)

Score range: 1 (Low Risk) to 25 (Critical Risk)

Department- wise Risk Score And Heat Map

Intensive Care Unit (ICU)

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Medication administration error	2	4	8	Moderate
2	Ventilator equipment malfunction	2	5	10	Moderate
3	Infection due to breach in aseptic technique	4	4	16	Critical
4	Failure in monitoring equipment	2	4	8	Moderate

Observation

High and Critical Risk Observations:

- The infection risk from a breach in aseptic technique scores 16, categorizing it as Critical
- Medication errors also pose a Moderate risk, given their impact on critical patients.





Current Controls And Gaps

Current Controls in Place

- Availability of medication administration protocols and double-check systems
- Daily equipment checks and preventive maintenance of ventilators and monitors
- Use of infection control bundles (VAP, CLABSI, CAUTI,SSI)
- Nurse-to-patient ratios are maintained as per NABH standards
- SOPs for medication dilution, labelling, and IV push procedures

Gaps Identified

- Partial compliance to Aseptic procedures
- Variations in staff competency across shifts, especially night duty
- Lack of real-time monitoring alerts when equipment shows minor failures

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Recommendations



Conduct frequent infection control audits, including random swab tests and hand hygiene monitoring.



Introduce barcode medication administration systems (BCMA) to reduce drug errors.



Standardize checklists for ventilator and monitor use, integrated into the electronic medical record (EMR).



Upskill nursing staff through competency-based training modules, focusing on emergency protocols and asepsis.



Automate alert systems for equipment servicing and malfunction tracking.



Develop a real-time digital dashboard for ICU safety indicators.

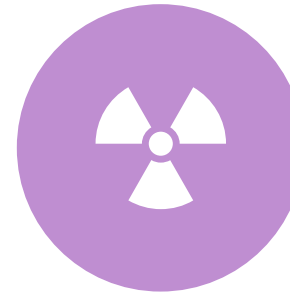
Catheterization Laboratory (Cath Lab)

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Radiation overexposure to staff	3	4	12	High
2	Equipment calibration errors	2	4	8	Moderate
3	Emergency preparedness during procedure	3	5	15	Critical
4	Cross-contamination due to improper handling	2	5	10	Moderate

Observation



Emergency unpreparedness during an invasive procedure poses a Critical risk (score: 15).



Radiation exposure and improper handling are high to moderate risks that affect both patient and staff safety.



Current Controls And Gaps

- Use of lead aprons, thyroid shields, and radiation badges
- Daily **calibration logs** maintained by biomedical engineering team
- Emergency resuscitation carts available in the lab
- SOPs for sterilization and handling of catheters and guidewires
- Trained Cath Lab nurses and cardiologists certified in ACLS/BLS
- Coordination with the ICU and emergency response teams

Gaps Identified

- Emergency drills are infrequent.
- High patient load occasionally compromises turnover time sterilization.

Recommendations



Mandatory enforcement of personal protective equipment (PPE) compliance, especially radiation badges and shielding.



Digitally monitor calibration schedules with alerts to both clinical and biomedical teams.



Conduct monthly emergency preparedness drills with all Cath Lab personnel.



Designate an infection control officer to oversee handling and sterilization protocols.



Use UV disinfection or rapid turnover sterilizers to reduce the risk of cross-contamination during high workload hours.

Operation Theatre (OT)

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Incomplete surgical instrument count	2	5	10	Moderate
2	Wrong site surgery	1	5	5	Low
3	Sterilization failure	2	4	8	Moderate
4	Surgical tool contamination	2	5	10	Moderate

Observation



Surgical instrument count errors and contamination risks dominate.



While no critical risk was found, moderate risks pose cumulative threats if not addressed.



Wrong site surgery, though rare, carries a high severity, hence classified as low risk only due to low frequency.



Current Controls And Gaps

- Use of **WHO Surgical Safety Checklist** including "Time Out" and "Sign Out"
- Autoclave cycles and sterility indicators for all instruments
- Pre-surgery huddles and check-ins to confirm patient and site
- Staff training in **surgical aseptic techniques**

Gaps Identified

- Manual instrument counting prone to human error, especially during emergencies
- Discrepancies in surgical marking and verification noted in rare high-pressure cases
- Lack of automated inventory tracking for surgical tools
- No dedicated post-procedure sterilization audit

Recommendations



Implement **barcode-based** instrument tracking systems to automate counts.



Conduct periodic **simulation-based** drills for wrong-site surgery prevention.



Digitally log and verify **autoclave cycle parameters** and sterility checks.



Establish a **peer-audit system** to cross-check OT sterility protocols.



Include **instrument tray photographic checklists** for high-risk surgeries.



Reinforce **mandatory WHO checklist compliance audits** through quality and nursing leadership.

Day-Care

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Delay in triage and treatment	2	4	8	Moderate
2	Miscommunication under high-pressure situations	2	4	8	Moderate
3	Incomplete documentation	2	3	6	Moderate
4	Limited staffing during high-demand periods	2	4	8	Moderate

Observation

- All risks fall in the **moderate zone**, indicating consistent operational concerns rather than high-impact critical incidents.
- **Triage delay and miscommunication** are prominent risks during peak loads and patient handovers.



Current Controls And Gaps



- Use of **triage coding system** (red, yellow, green) for patient prioritization
- Standardized **handover formats (ISBAR)** to ensure communication clarity
- Emergency drugs and resuscitation trolleys available at all times
- Regular training in **basic and advanced life support (BLS/ACLS)**
- Night and weekend **duty rosters pre-scheduled**

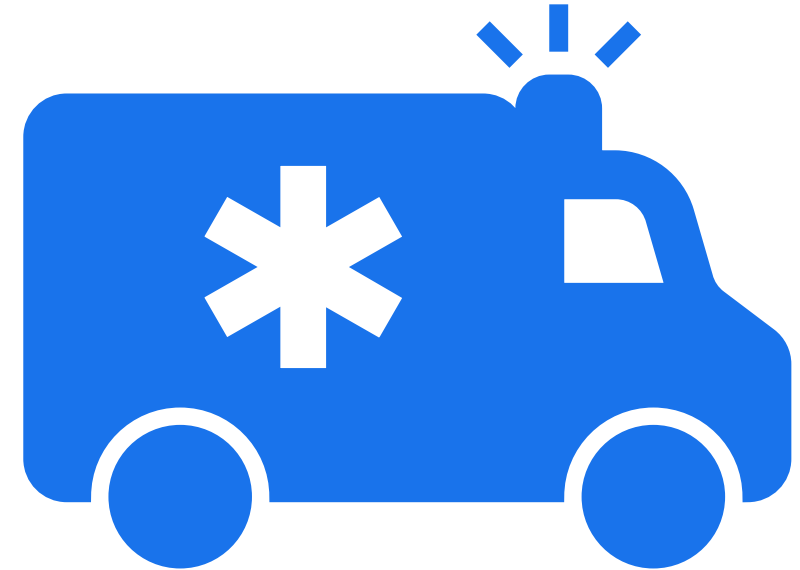
Gaps Identified

- Documentation inconsistencies due to hurried note-taking or parallel procedures
- Limited cross-training of staff to handle surge situations



Recommendations

- Deploy electronic triage dashboards that track waiting time and triage priority.
- Mandate structured ISBAR communication for every handoff and conduct surprise audits.
- Ensure dynamic staffing models, including float pools and on-call backup during peak hours.
- Develop a "Rapid Response Team" within ED for surge or code blue activations.
- Conduct role-based simulations and drills to enhance preparedness and improve reaction time under stress.



Pharmacy

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Wrong medication dispensed	2	5	10	Moderate
2	Expired medicine stock	2	3	6	Moderate
3	Improper storage temperature	2	4	8	Moderate
4	Unauthorized access to medication storage	1	5	5	Low



Observation

- The most common risks involve **dispensing errors and storage issues**, especially related to LASA medications and cold chain maintenance.
- Unauthorized access and expired stock, while rare, could pose severe safety implications if unmonitored.

Current Controls And Gaps



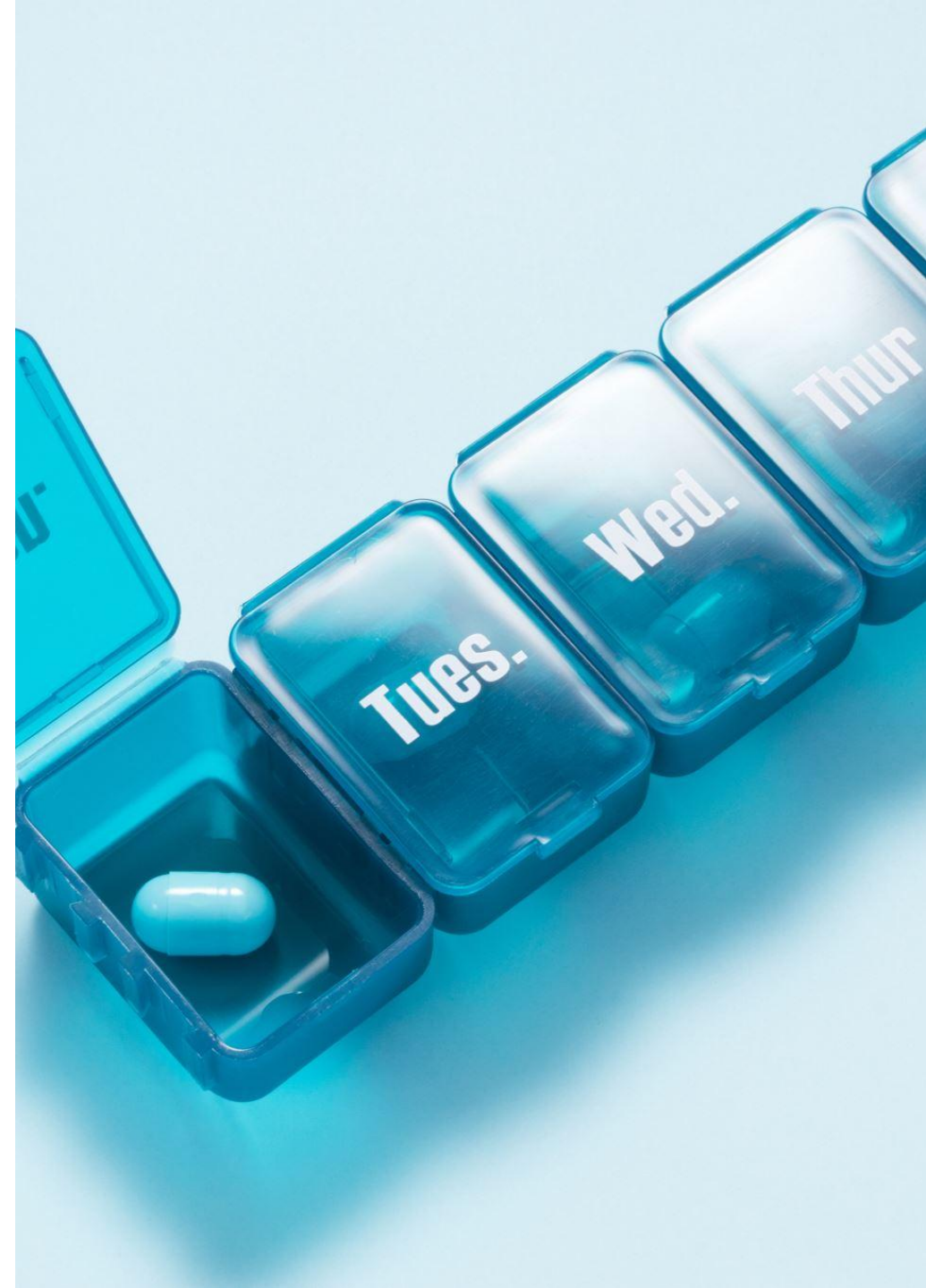
- Segregation and labelling of LASA medications
- Daily temperature logging for cold storage units
- Physical audits of expiry dates and FIFO (First-In, First-Out) compliance
- Pharmacy access restricted to authorized personnel only
- SOPs for drug dispensing and error reporting

Gaps Identified

- Occasional delays in return or disposal of expired or near-expiry stock

Recommendations

- Implement digital temperature monitoring with alert systems for cold-chain drugs.
- Use color-coded bins or drawers for LASA drugs with visual warnings and separation.
- Transition to biometric access control for all pharmacy zones.
- Maintain a centralized dashboard for tracking expiry dates and auto-flagging near-expiry stock.
- Conduct regular LASA risk assessments and staff training on high-alert medications.
- Introduce a near-miss reporting system and incentivize non-punitive self-reporting to promote safety culture.



Cafeteria

S. No	Identified Risk	Likelihood	Severity	Risk Score	Risk Level
1	Food contamination	3	4	12	High
2	Allergen mismanagement	1	5	5	Low
3	Poor hygiene by food handlers	2	4	8	Moderate
4	Pest infestation	1	4	12	Low

Observation

- **Food contamination** is the most significant risk due to direct impact on immunocompromised or cardiac patients.
- Hygiene lapses by handlers and poor allergen tracking could lead to hospital-acquired conditions or allergic reactions.
- **Pest risks**, High in frequency, is a great threat if ignored.

Current Controls And Gaps

- Use of hair caps, gloves, and aprons for food service personnel
- Daily kitchen cleaning schedules and waste segregation
- Periodic pest control services from external vendors
- Display of allergen information and meal labelling for special diets
- Food handlers trained in FSSAI hygiene standards
- Use of Temperature control Trolleys for food catering.

Gaps Identified

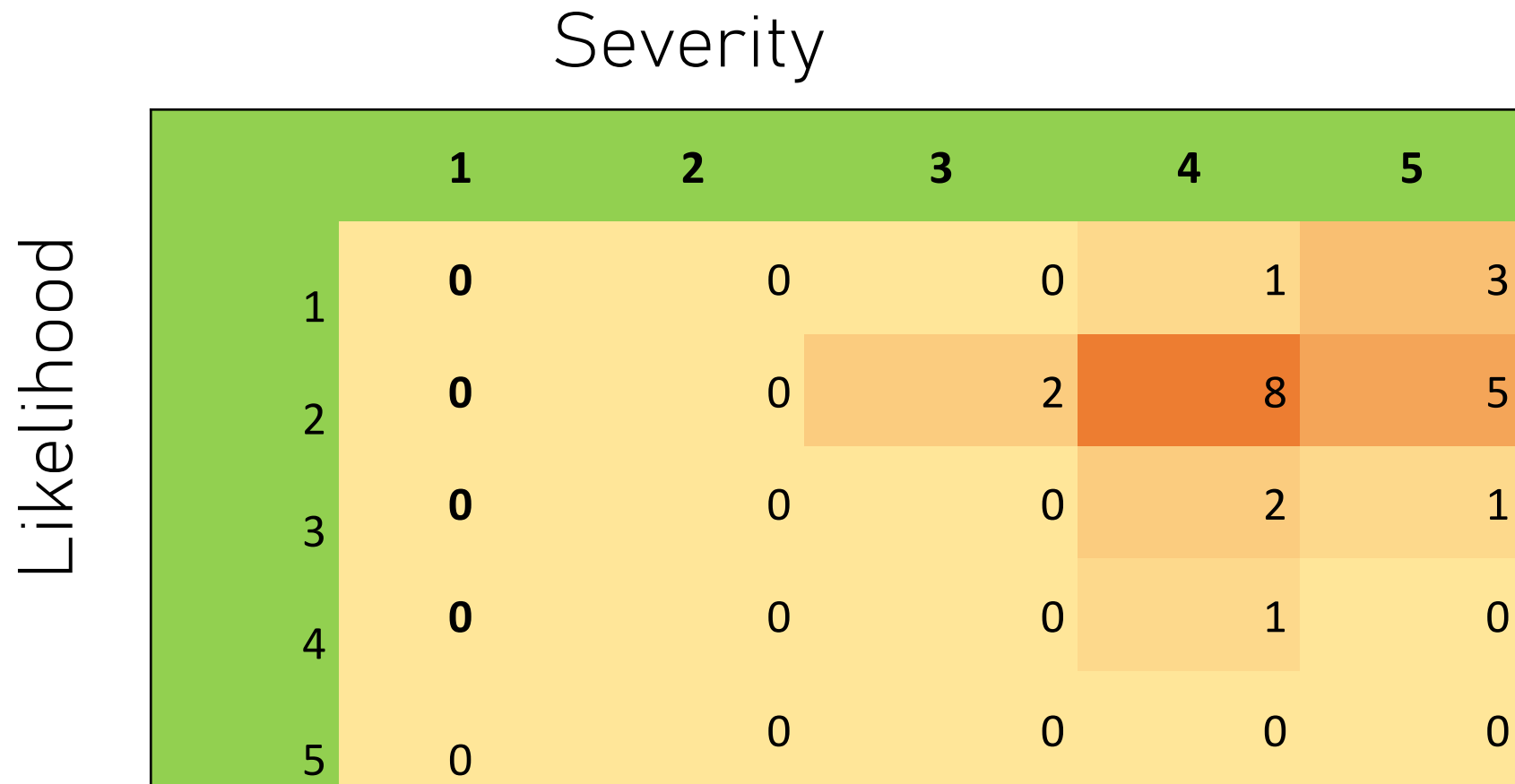
- Inconsistent hand hygiene practices during peak preparation hours
- Cross-contact risks in shared kitchen areas for allergen-free meal.



Recommendations

- Introduce **real-time hygiene audits** using electronic checklists and surprise inspections.
- Allocate **separate prep areas and utensils** for allergen-free or special dietary items.
- Install **automated temperature monitoring systems** for food storage and service areas.
- Maintain **digital pest control logs** integrated with quality reporting systems.
- Conduct **monthly food handler training refreshers** and maintain compliance certificates.
- Use **color-coded uniforms or badges** to ensure zone-specific food handling accountability.

Overall Heat Map



Key Findings



- 62.5% of all risks (15 out of 24) were moderate.
- Cafeteria and Pharmacy had more low-risk incidents, often procedural in nature but important for infection control.
- OT and Cath-lab also had low-moderate risks.





Conclusion

- In an era where patient safety is non-negotiable, proactive risk management is no longer an option—it is a necessity. This study provides a replicable, department-sensitive, and accreditation-aligned methodology to identify, visualize, and address hospital risks. When translated into routine practice, it can transform healthcare organizations into learning, resilient systems where safety is embedded into every action, every department, and every individual.
- By applying both operational rigor and theoretical depth, this research contributes to a future where hospitals are not just centers of care—but beacons of safety, quality, and trust.

Thankyou