

FACILITY SAFETY IN HOSPITALS

Dr Bidhan Das



“I am convinced that designing a building around safety will create a culture of safety.”

- -JOHN REILING, PRESIDENT AND CEO ST. JOSEPH'S
 - COMMUNITY HOSPITAL AND Synergy Health

INTRODUCTION.....Safety Management

“the development of systems to prevent accidents, injuries, and other adverse occurrences in an institutional setting. The concept includes prevention or reduction in adverse events or incidents involving employees, patients, or facilities. Examples include plans to reduce injuries from falls or plans for fire safety to promote a safe institutional environment”.

Safety Management.....

- The word safety in its purest sense means freedom from injury, risk & harm.
- Safety management is a very important aspect of planning in every form of infrastructure.
- It includes aspects of not only fire safety, but also security measures in terms of safety from encounters like thefts, pilferages, extortion, riots and natural calamities.
- Safety measures should be designed in such a way that safety of all service renderers, service recipients, infrastructure is ensured.

Safety Management.....

- The hospital has many heat-dissipating equipments, combustible gasses /fuel, chemicals, that are prone to hazardous incidents, proper precautions to be taken while planning the infrastructure.
- Indicators like architectural designs, interior designs, electrical wiring, appropriate equipment planning and proper waste management are considered while planning such safety measures.
- While planning the layout, care should be taken to design the building such that there is sufficient open space in and around the building for movement and parking of fire fighting vehicles, ambulances, etc in the premises.

Micro Planning Considerations

(A) PHYSICAL FACILITY

- Scales Of Accommodation
- Electrical System
- Ventilation
- Water Supply
- Plumbing
- Refrigeration
- Landscaping
- Gas Supply
- Elevators / Lifts / Dumbwaiter
- Telephone / Epabx
- Fire Fighting.

Micro Planning Considerations

- Hospital Space Module
- Engineering Grid.
- Ward Area
- Primary--- Ward Unit
- Ancillary--- Nursing Station, Duty Doctor, Treatment Room.
- Sanitary----- Toilets, Dirty Utility.
- Auxiliary--- Pantry, Store, Clean Utility.
- Corridor
- Floor Height

Micro Planning Considerations

- Windows
- Floor
- Walls
- Doors
- Light, Power Sockets
- Stand-by Generator
- Ventilation Floor Height

Built-up Area : Plot Area FSI = 1:1.73

Micro Planning Considerations

(B)LEGAL & REGULATORY COMPLIANCES

Hospital should have all the Licenses as per the Countries Law

(C)HUMAN POWER

As per the workload /norms the hospital should have its human power so that it is able to meet the Customer's Expectations .

(D)EQUIPMENTS

- AMC/CMC
- Technology commensurations to services
- Calibration and traceability to international standard.
- Statutory Obligations

Design Consideration

- The building should be so designed that it can resist damages due to earthquakes to a fair extent.
- The floor should be so designed that they are free from obstructions, are slip-resistant & even.
- Staircases, ramps & aisles should be provided with substantial handrails and other suitable support means to prevent slipping, wherever necessary.
- Need proper planning as sterilization has to maintained in some Departments like in CSSD , OT , ICU.

Design Consideration.....

- Considering the type & density of occupancy, lobbies, staircases, aisles, etc should be sufficiently wide to ensure easy movement of traffic at all times.
- Need to avoid crisscrossing and unidirectional flow of traffic. (staff, Patients, Sterile items, non-sterile items, kitchen and food flow, store items, Biomedical waste)
- Precautionary measures should be implemented in critical areas, for e.g. use of fireproof doors.
- In case of centralized air-conditioning systems, care should be taken to provide appropriate automatic fire dampers for each floor in the common ducting system.

ESSENTIALS OF SAFETY

- Hazard Identification
- Promoting and Implementing Safety Measures
- Training of Staff

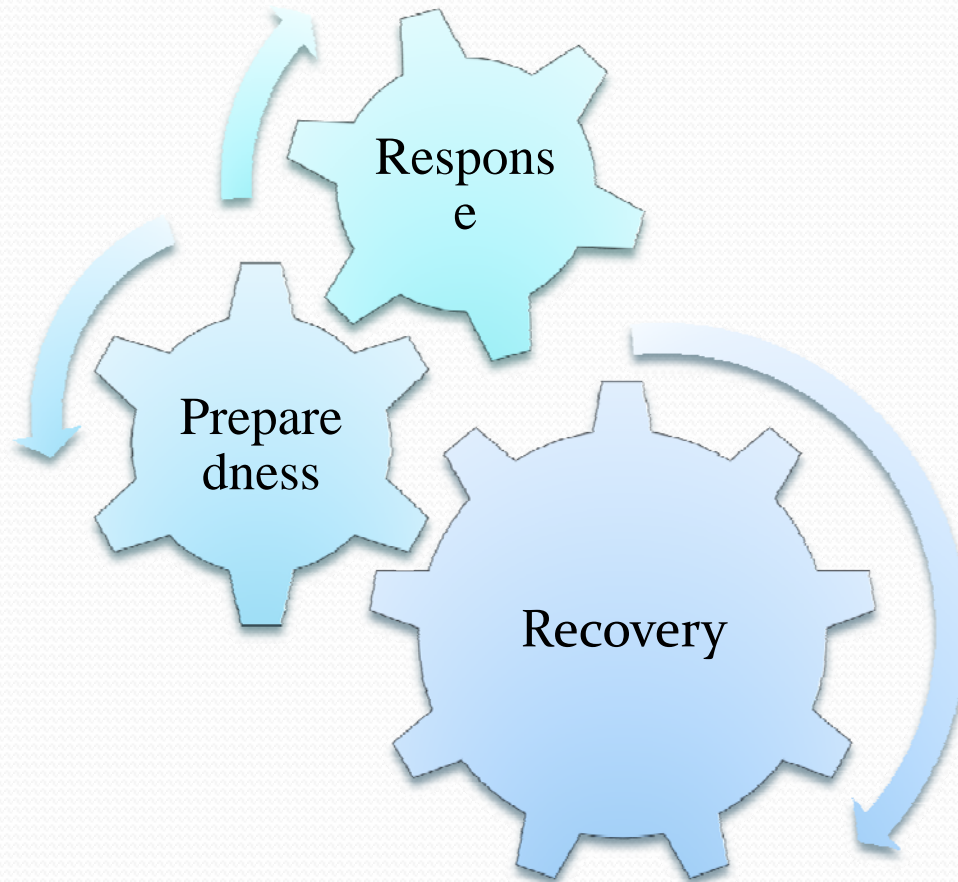
Identification of Risk Factors

- In complex organization like a hospital with myriads of activities, identification of risk is a difficult exercise.
- A comprehensive approach is based on outcome, structure & process. Outcome i.e patient safety is dependent on the safety of infrastructure available and process used to deliver the services.
- A systematic study with a view to find out “ what can go wrong, where and what needs to be done” may provide the right answer.
- Some departments of the hospital are more risk-prone and hazardous than others like laboratories, nursing floors, laundry, kitchen.

Infrastructural Risk factors

- Building
- Vertical Traction (lifts)
- Power supply
- The Lighting
- Air-Conditioning
- Water Supply
- Communication Systems
- Equipment
- Staffing

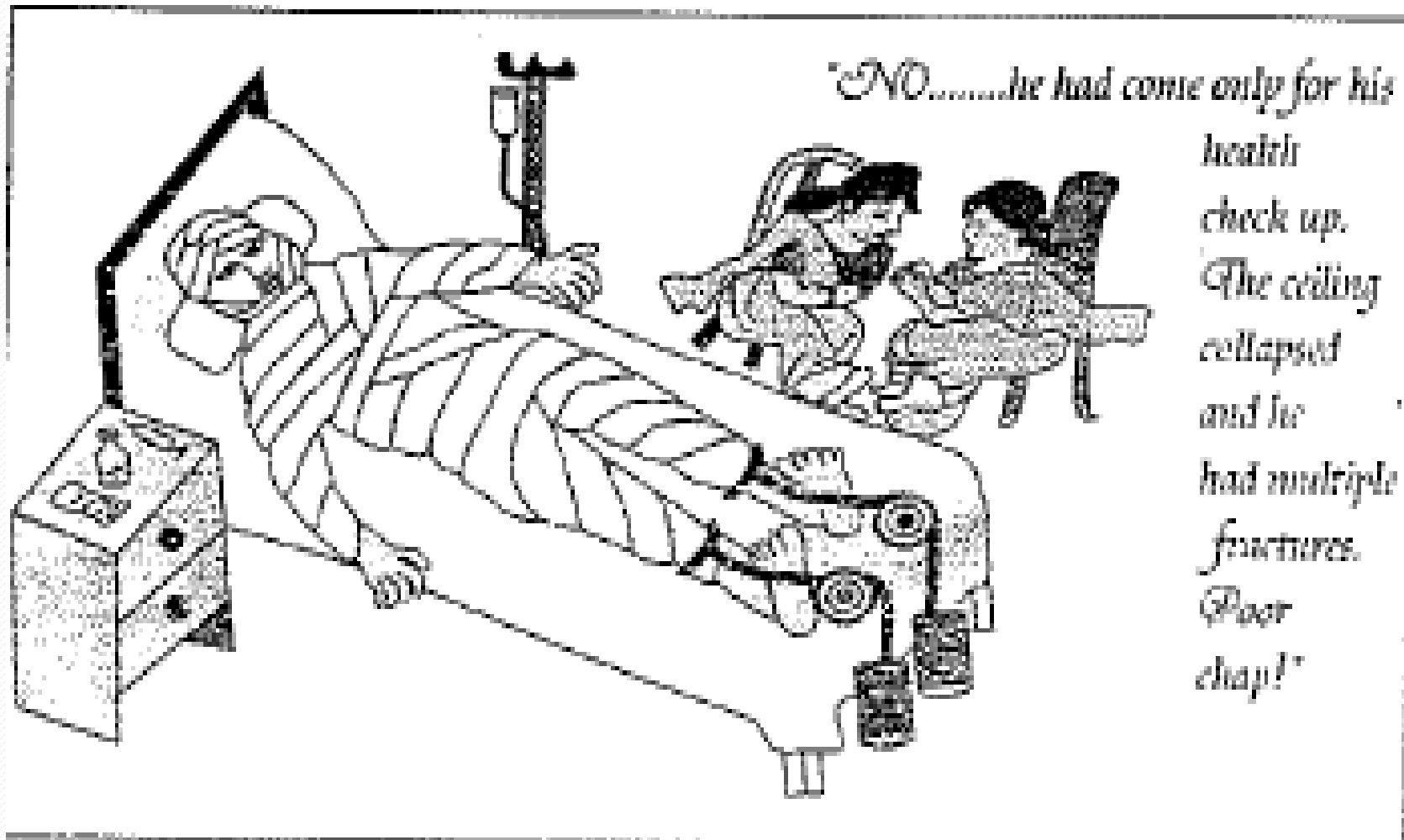
Risk Management in Hospital Planning



Patient Safety

- Internal & External sign posting (Bilingual)
- Smoking limitation policy
- Installation of Patient safety devices & regular inspections e.g. grab bars ,safety belt etc

Patient Safety Management Program



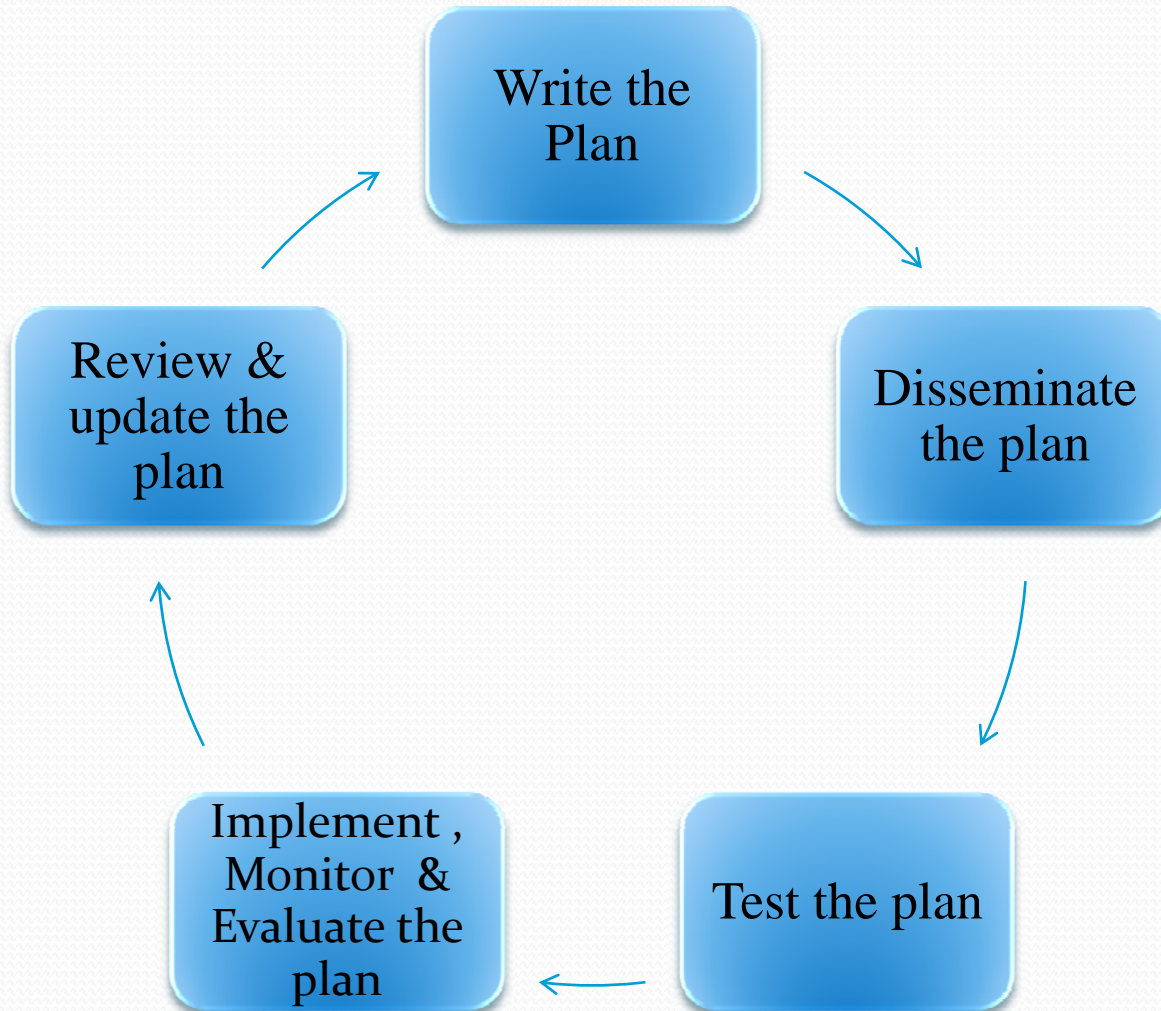
Essentials of Patient Safety Management Program

- Constituting a patient safety committee.
- Identification of Possible hazards such as unsafe building , unsafe equipment, ill trained staff & unsafe practices.
- Implementation of effective measures to eliminate the risks or hazards.
- Periodic regular review of effectiveness of the system.
- A system of continuous monitoring & analysis of sentinel events in order to identify and take corrective actions.

SAFETY MANAGEMENT COMMITTEE

- Representatives from facility management, clinicians, administrator, nursing & paramedical staff.
- Conducts exercise on hazard identification & risk analysis.
- Coordinates development, implementation & monitoring of the safety plan.
- Facility management rounds
 - Twice in a year in patient care area
 - Once in a year in non patient care area

ACTION PLAN



International Patient Safety Goals

- Identify patients correctly.
- Improve effective communication.
- Improve the safety of high alert medication.
- Ensure correct site, correct procedure, correct patient surgery.
- Reduce the risk of health care acquired infections.
- Reduce the risk of patient harm resulting from falls.

CATEGORIZATION OF HAZARDS

•

Electrical

Radiation

•

Chemical

Fire

•

Biological

Others

Electrical safety

- Electrical devices shall be protected from wet floors.
- Frame of all electrically operated machinery shall be grounded.
- If a "shock is felt" , immediately remove from service, and report to the facility Department
- Switch to "off" position before connecting or disconnecting.
- Do not disconnect the plug from the wall by grasping the power cord.
- Remove from service device that has been dropped, abused, had liquid spilled on it or has evidence of overheating.

Electrical safety....

- Discontinue use if any wire or power cord shows fraying, extreme wear, cut in insulation or evidence of burning.
- Preventing overload
- Areas around electrical switchboards kept clear for a distance of at least 1 meter.
- Fire extinguisher adjacent to electrical switchboards.
- Routine Inspection of the power outlets
- Trip Switches
- Periodic inspection of wires

Chemical safety

- Safe storage
- Safe Transportation
- Disposal
- Accidental exposure
- Chemical composition
- Managing Spills
- MSDS & Training

Biological safety

- Pre exposure prophylaxis
- Segregation at source
- Safe disposal
- Handling needles & sharps
- Personal protective equipments
- Needle stick injury & PEP

Radiation safety

- TLD Badges
- Lead Aprons
- Thyroid shield
- Gonad guard
- Radiation safety signage
- Annual health check up
- Training

Fire safety

- Fire is a continual threat to hospital & nursing home.
- Fire has been ranked as the third largest accident killer next to motor vehicles accident & accident falls.
- It is potential hazards in a hospital which involves sick & dependent human beings.

Elements of Fire safety

Prevention

1. Detection & correction of hazards
2. No smoking Policy

Detection

1. Automatic Sensors
2. Smoke Detectors)

Containment

Evacuation

Extinguishment

1. Water Hydrant
2. Fire Extinguisher

Grades of Fire

Grade	Cause of Fire	Fire Extinguisher
A	Ordinary Combustible Material like wood ,coal ,paper .	Soda Acid ,CO ₂ ,Dry chemical powder ,water.
B	Inflammable liquids	Halons & Dry chemical powder
C	Electrical faults	Dry chemical powder .
D	Combustible metals like magnesium, sodium .	Dry chemical powder

Focus Areas

- Use of non combustible materials in load bearing elements, stairways & corridors.
- Electrical wirings in separate ducts, sealed on alternate floors with NC materials.
- All heating appliances used with proper amperage.
- Proper storage & segregation of combustible & explosive materials.
- Regular formal periodic inspection of exits, detectors & extinguishing systems.

National Building Code,2005

Focus Areas

- At least 2 fire exits(2m x2m) in an area 500 metre square
- Corridors minimum 2.4mts wide, clear of obstruction, sign posted.
- Life risk areas should be separated from hazardous service areas.
- High fire hazard areas in separate structures with 2 hrs Fire Resistance construction materials.
- For buildings more than 24mts high, more refuge area(@0.3sq m/person)

Focus Areas

- Fire Extinguishing System is different for all types of fires.
- Entire complex surrounded by network of hydrants 30-60 mts apart.
- Wet riser system kept charged, 1 riser for floor area of 1000 sq mts.
- Exclusive UG tank having:
 - 50,000 - for up to G + 2 floors
 - 100,000 - for 15-24mts high buildings
 - 150,000 - for buildings 24-30 mts high

National Building Code, 2005

Seismic Factors in safety

- Structural & non structural components
- DBE: Earth Quakes which can reasonably be expected to occur at least once in life
- MCE: Refers to Earth Quakes most severe effects.
- Zone factor(Z) to obtain the design spectrum on max seismic risk by MCE in the zone where hospital is located.
- India is divided into 4 seismic zones (II,III,IV,V) depending on probability of occurrence of Earth Quakes.
- Horizontal seismic forces are more important for consideration.

Seismic Factorsgeneral guidelines

- Design should be such that it has minimum strength to withstand all minor(<DBE) earthquakes, resist mod EQs (DBE) without structural damage, aims at withstanding MCE without collapse.
- Simple designs are better than complex/irregular designs.
- In longer buildings, seismic expansion joints at 30mts intervals is desirable.
- Avoid concentration of mass at higher floors.
- Avoid “soft” storey- as more vulnerable to damage.
- Measures to reduce structural vulnerability:
 - Retrofitting by adding diagonal bracings
 - Adding buttresses, moment resisting frames
 - Base isolation techniques

Other safety aspects

- Civil disorder
- Hysterical fit of patient or relative
- Temperamental disorders of staff
- Fall or slip of patient
- Disaster
- Anti social behavior by patient or relative
- Structural & non structural components

Occupational Hazards

A great variety of jobs are performed in healthcare facilities, workers in these settings can face many hazards.

- Infectious diseases
- Back Injuries.
- Repetitive strain injuries.
- Shift work
- Violence
- Radiation
- Chemicals
- Noise
- Slip/Falls

Manifold Gas Pipeline Service Safety

- A Centralised Medical Gas system is increasingly becoming an essential requirements in hospitals so as is safety also.
- The medical gas supply department supplies the medical gases like oxygen, nitrous oxide, vacuum and compressed air to the critical areas like OT, ICU, Cath lab and also to specialised wards.
- Pipeline should be seamless type ,non-ferrous, non-arsenic of high quality copper tubing.
- Exposed oxygen pipeline should not be installed near areas like kitchen, laundry and rooms where combustible substances are stored.
- The gas content of the pipeline should be readily identifiable by the colour of the tubing. Specific color-coding on each outlet.

Safety measures in MGPS.....

- Safety valves provided to be set at 1.5 times the working pressure.
- Locknut provision on regulators for preventing inadvertent high-pressure settings.
- Two stage regulators for avoiding fluctuation in flow.
- Line pressure alarms for continuous monitoring pipeline pressure.
- These pressure monitoring units shall be installed in OT, ICU and the gas manifold room.
- Non-interchangeable adaptor for each outlet .

Safety measures in MGPS....

- The department shall be well equipped with fire extinguishers, sand store etc in case of accidents.
- All medical gas piping, valves and manifolds shall have permanent labels bearing the name of the gas they carry or control
- Alarm system in medical gas systems, two kind of alarm are incorporated:
 - one monitors the pressure of various gases, if abnormal pressure is sensed, the red warning signal glows with audible alarm.
 - second alarm is called the remote signal lamp, which is generally only visible.

Colour coding in MGPS....

- Gas specific color-coding in each pipeline according to international standards. (Oxygen- green, CO₂- Grey, Nitrous Oxide- Blue, Compressed air- Yellow)
- Gas specific color-coding on cylinders(Oxygen- black with white collar, CO₂- Grey, Nitrous Oxide- Blue, Compressed air- Yellow)

ALARM SYSTEM

- A hospital more than any institution is exposed to emergencies & life threatening situations like cardiac arrest, accidents, casualties and disasters arising from fire & bomb threat.
- Built in safeguards and preparedness are the essence of all safety programme. The alarm system is one such programme

ALARM SYSTEM

Few of the alarm system that hospital should have :

- Fire Alarm
- Medical Gas Alarm
- Blood Bank Alarm
- Narcotics Alarm
- Voltage Fluctuation Alarm
- Elevator Alarm
- Security Alarm
- Patient Emergency Alarm
- Code Blue Alarm

CONCLUSION

- Health care facility infrastructure forms an important component of quality assessment.
- World-wide patient safety issues are presently in the limelight.
- If this is overlooked/neglected, one may have to pay a very heavy price for consequences.



THANK YOU

