

HOSPITAL FIRE SAFETY & FIRE DRILL PROCEDURES

Research prepared

By

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Chapter 1 INTRODUCTION

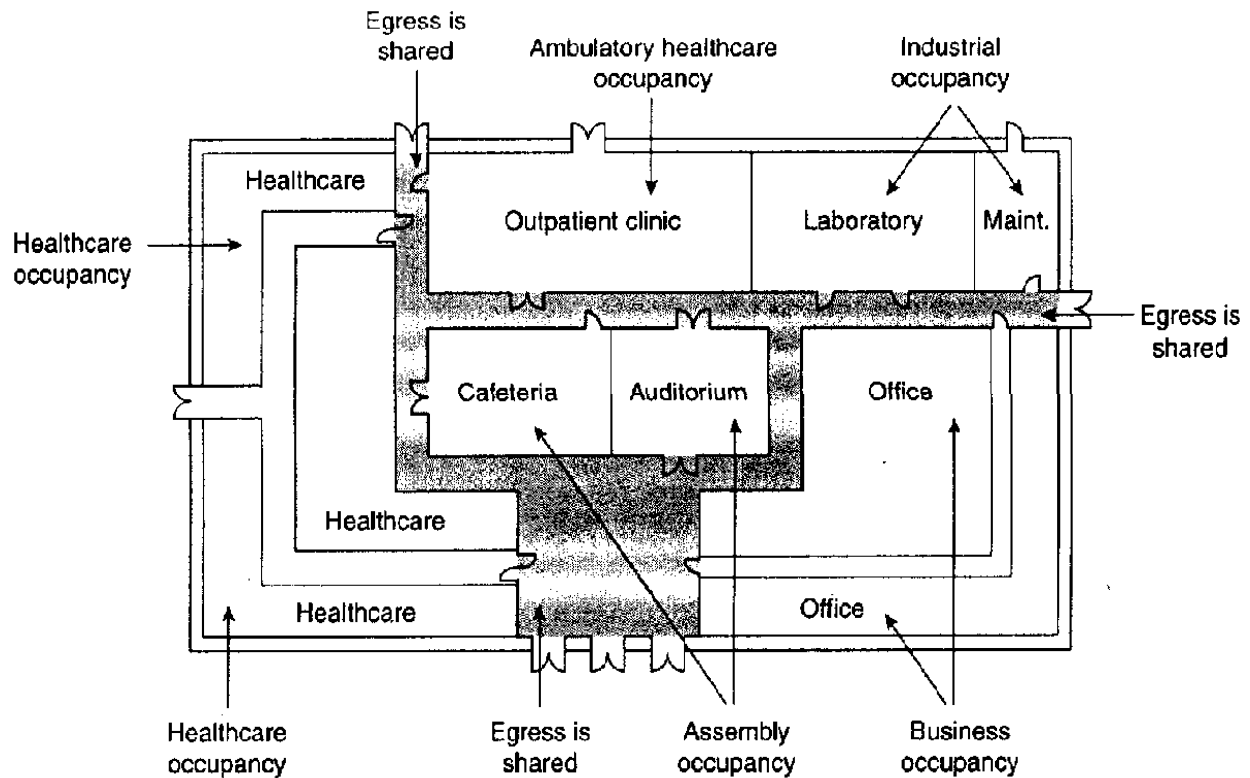
1.1-Increase of population and shortage of space in Metropolitan cities and urban areas led to the proliferation of Multi Storied Hospital buildings.

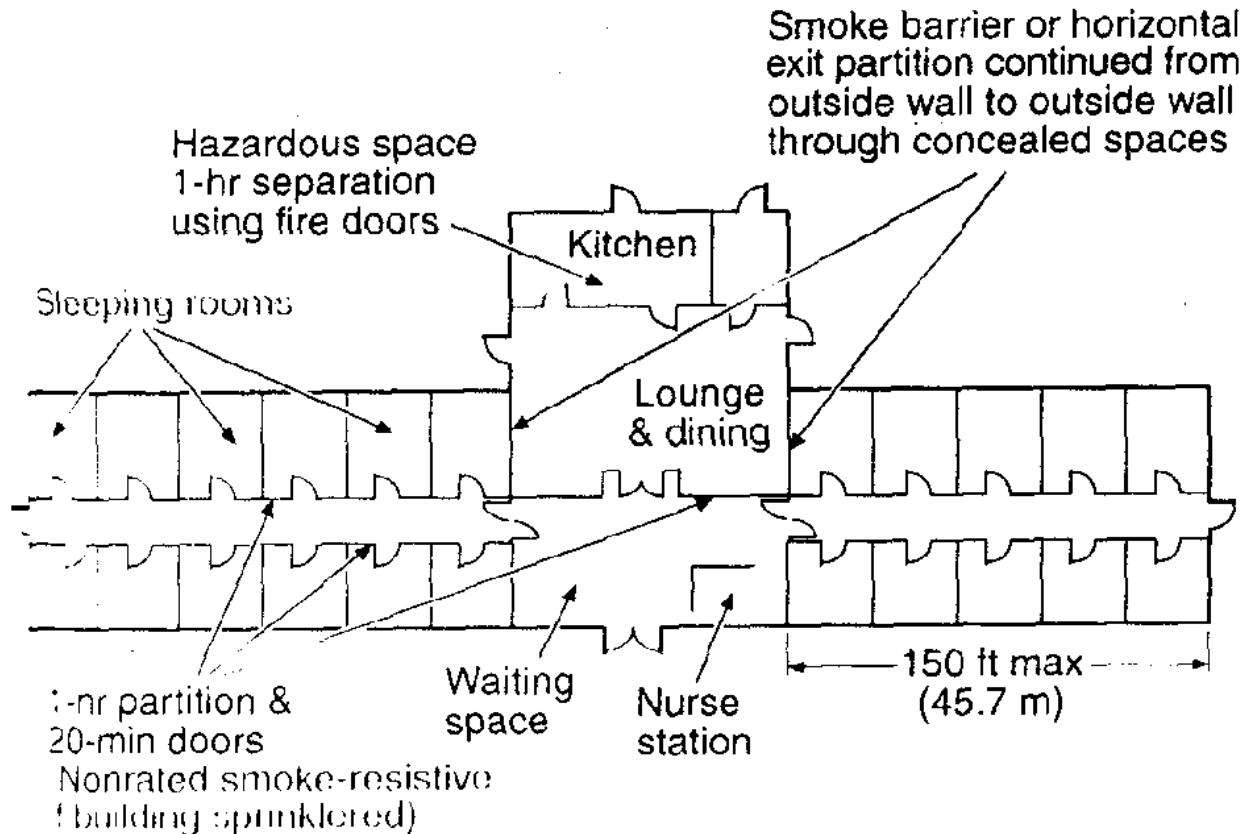
1.2-Most modern Hospitals of any size are multistory complexes and due to the land value and other monetary restraints, there is a temptation or compulsion to locate accommodation for all the service units which Make up a hospital entity, with in the single structure. It is this particular practice which constitute the biggest potential threat to the future safety of the hospital and is one which should be avoided whenever practical to dose.

1.3-Total building fire protection for life safety is more necessary in Hospitals than in other occupancies because of the nature of the occupants. A majority of the occupants in Hospital are incapable of selfevacuationor are ambulatory and incapable of perceiving a fire threat and choosing a rational response. Therefore, fire protection is based on “defend-in-place “principle and cannot depend on any one safeguard. As a result, health care facility design and operation must incorporate methods by which a fire can be detected early, contained, fought rapidly and successfully. Fire

Safety requirements include fire-resistive construction, compartmentation, fire-alerting facilities, and control of smoke movement. In addition, it is critical that every health care facility have a fire and evacuation plan, including a disaster plan, with which all personnel are familiar. Personnel should be trained in emergency procedures, including how to sound an alarm, move or evacuate patients, and to contain the fire. Emergency drills should be conducted on each shift at least quarterly, with at least 12 drills held every year.

1.4- Hospital building is categorized under the Group of; Institutional Buildings (C1) as per National Building Code of India 2005, Part – 4. A typical layout of Multiple Occupancy Area, separated occupancies and Smoke compartment in a Multi-Storey Hospital are given below.





Typical Floor Plan for a Healthcare Facility

1.5-These Hospital building have the problem of having stack effect during a fire, there by the fire originated in one compartment of a floor spreads to higher floors very quickly due to the convection currents and radiation. In a Multi Storied Hospital building the fire fighting cannot be effectively carried out from outside with the fire appliances. Hence the fire has to be tackled from inside the building, and patients have to be evacuated horizontally to a safer fire compartment in the same floor and it is known as “Defend in Place” strategy, since the inmates face serious problem in evacuating the Multi Storied Hospital building.

1.6- DIFFERENCE BETWEEN HOSPITAL AND OTHER OCCUPANCIES

Multistoried hospitals have the following differences in evacuation of its inmates. A majority of the patients are ambulant or with life supporting equipment and need external assistance for safe evacuation. Hence special attention need to be paid for the safe evacuation which may be partial i.e. moving the patients of the floor where the fire has originated and the patients in the floors above and below the floor of fires or total evacuation i.e. safe evacuation of all inmates of all the floors to a safe place outside the building. In hospitals there are different categories of Occupants present at all times

- 1-Patients (ambulant, non ambulant, needing oxygen another facilities)
- 2- Patients relatives who visit them.
- 3- Medical staff.
- 4-Administrative staff.
- 5- Security staff and others.

1.7- In big Multi-Storey Hospital a majority of the visitors and attending relatives of the in patients are not familiar with the surroundings and hence incapable of finding their way to a safe place during an emergency. Unlike other occupancies, special Hazards are associated with the equipment, materials used for treatment, various hazardous gases like ethylene, Chloroform, ether, cyclopropane, ethyl alcohol, liquid oxygen, used for operation theatres. There are too many people in the hospital premises who can commit an act of negligence which may Result into fire and too many equipment which are capable of providing source of ignition i.e. electrical heaters, laundry, sterilization plant, presence of large quantity of

Liquids oxygen, LPG supplies always turn small fires into uncontrollable inferno. Therefore initiation of fires in hospitals in the absence of fire prevention management indistinct possibility. Basic design and construction faults enable fire to spread and lack of proper escape routes and evacuation procedures place the life of people in danger.

1.8- BUILDING CONSTRUCTION:

Building occupants of Hospitals must be defended in place. To ensure these hospital buildings should be constructed with non-combustible materials that resist the effects of fire and maintain structural integrity. Buildings with two or more stories should be constructed with noncombustible materials with major structural members having at least a 2 hour fire resistance. An automatic sprinkler system is an essential part of the total defense system.

1.9- An evaluation of the building materials should include consideration of their smokegeneratingcapabilities. Plastic constructionmaterialswhich are being increasingly used are sometimes capable of generating large quantities of smoke. In mixed and separated occupancies either occupancy should be totally separated or treat the entire facility as mixed occupancy and comply the fire safety provisions that are more stringent of the occupancies involved.

1.10-The health care occupancies and other occupancies must be separated with two hour fire resistance separation to treat the hospital, business, and ambulatory healthcare areas as separate occupancies. Separation of patients sleeping rooms should be ensured with fire-rated Construction and partitions should be continuous from the floor slab to the floor or roof above through any concealed spaces, such as those above suspended ceilings. Any penetration of fire barriers by building service equipments

Should be protected in order to maintain the required fire resistance Rating. All spaces around piping and duct penetrations should be sealed tightly with a noncombustible material having adequate fire resistance and capable of retarding the transfer of smoke. Smoke barriers should be provided in every floor of inpatients with at least two compartments with one hour fire rating in each of these floors.

1.11- Protection of vertical openings is very important to prevent the fire, smoke, and other toxic products from one floor to the other floor. All shafts should be provided with fire-rated enclosures. Openings to shafts should be limited to those necessary, and such openings must be protected. Means of egress design should be limited to doors leading directly outside the building, interior stairs and smoke proof enclosures, ramps, horizontal exits, external stairs and exit passageways.

1.12- Since vertical evacuation is very difficult in a hospital, horizontal movement of patients is of primary importance and adequate space must be available on each side of the horizontal exit for accumulation of total Number of patients in adjoining compartments. Internal stairs must be properly protected from the effects of fire. Readily visible signs should mark all exits. Where access to exits is not immediately visible, access Routes should also be marked. Emergency power is also required to illuminate the means of egress and exit marking. Emergency power supplies should maintain illumination automatically in the event of fire without any appreciable changeover from normal to emergency.

1.13- All hospitals should be equipped with fire alarm system and it should be heard throughout the facility when actuated. Visible alarms in lieu of audible alarms are permissible in critical patient care areas. Any fire detection or fire suppression system like automatic sprinkler system, fire hydrant system activation should

Automatically activate building alarm system. Full sprinkler protection obviously increases the level of fire protection and life safety in hospitals. It also makes the fire non-compliant hospital compliant, increased allowance for travel distance, increased size of compartments, savings in fire insurance of the building etc.,

1.14- Fire Safety Requirements in a Multi Storied Hospital as per NBC

A Multi-Storey Hospital requires the following fire safety measures as per National Building Code, Part IV.

1. Fire extinguishers as per BIS-2190.
2. Hose reel on all floors.
3. Wet riser system with landing valves on all floors.
4. Yard Hydrant system.
5. Automatic sprinkler system.
6. Manually operated electric fire alarm systems.
7. Automatic Detection and alarm system.
8. Underground static water storage tank of 50,000/1, 00,000 lts. Capacity.
9. Terrace water tank of 10,000/20,000 lts. Capacity.
10. One electric and one diesel pump of 2280 LPM/min and one Jockey (electrical) pump of 180 lts/min.
11. Emergency lighting and exist sign boards.

1.15- EXIT FACILITIES:

1. Not less than two exits of one or more of the following types shall be provided for every floor, including basement, of every building or section.
 - a-Doors boding directly outside the building.
 - b- Stairways.
 - c-Ramps.

- d- Horizontal exits and.
- e- Fire tower.

1.16- All required exits that serve as egress from Hospital or infirmary sections shall be not less than 2 m clear width including patient bedroom doors to permit transportation of patients on beds, litters or mattresses. The minimum width of corridors serving patient bed rooms in Buildings shall be 2.4 m.

COMPARTMENTATION

Any area exceeding 500 m² shall be divided into compartments by fire resistance walls and the authority may require stories housing a lesser number of patients to be divided into compartments, when in its judgment, such division is essential for the protection of the patients fire doors shall be provided at appropriate places.

1.17- Important Features of Multi-Storey Hospital fires:

The Multi-Storey Hospital fires have the following important features.

- a- The travel of smoke and toxic gases has been responsible for large loss of life in hospital fires.
- b- The coir and cotton mattresses, polyurethane and rubber mattresses produces highly toxic gases.
- c- Traveling smoke and flames through structural openings.
- d- Vertical and Horizontal spread of fire and travel of toxic and hot gases through the provided escape routes.

In a Multi-Storey Hospital fire, the combustion products viz. Smoke, Heat, hot gases spread via stairways, lift shafts, ducting, laundry chutes and communication routes. Every effort must therefore be concentrated on isolating these areas to minimize the risks; this can be achieved by providing the following:

- * Heat smoke detection equipment.
- * Compartmentation to 2 hours fire resistance period.
- * Smoke stop, self closing doors on escape route.
- * Fire resisting screens and self closing doors, and
- * Regularly trained and exercised staff members.

1.18- Hospital fires may also result due to carelessness on the part of cleaners, nursing staff, disturbed patients, visitors, contract workers and Especially from electrical equipment problems. The finest fire detection equipment in any hospital is the olfactory system and / or sixth sense of average nurse. They are in constant attendance in all patient areas and on many occasions in the past have been responsible for the detection and extinction of fires. They have discovered with minimum fuss and little trauma to the patient.

1.19- In view of the above there is urgent need to formulate fire drill and practice Emergency Procedures in a Multi-Storey Hospitals for the safe Evacuation of the inmates and take action to control the fire without further spreading before, the arrival of fire

Brigade and taking all preventive measures to prevent the occurrence of fires in Hospitals.

1.20- Fire Risk in a Multi Storied Hospital which houses various occupancies apart from accommodating the patients viz.,

- * Kitchens * General Stores
- * Laundries * Battery Rooms
- * Boiler Rooms * X - ray suites
- * Laboratories * Pharmacies
- * Workshops * Car Park areas, and
- * Gas stores * Basement areas

1.21- From the above it is evident that the fire risks facing a Multi-Storey hospital are many and varied, given the advances in medical technology. The greatest risk to the patient care areas is presented by the service units within which the fire loading is higher and this is exacerbated in those units which are not staffed on a 24hours basis. These facilities constitute higher fire risk and majority of hospital fires originate in these areas.

1.22- The least risk to the building and its occupant is posed by those areas used for patient care. But within the various groups of the patient care facility, there are sections which merit particular consideration. These are operating suits, labour wards and intensive care units which for some obscure reason all often assigned topper floors with no apparent thought to the problems, this engenders

Chapter 2

AIM OF THE FIRE DRILL IN MULTI STOREY HOSPITAL

2.1- A fire drill in a Multi-Story Hospital is intended to ensure by means of training and rehearsal, that in the event of fire.

a-Effective Adoption of Fire Safety Plan:

To understand danger to the life under the faced situation and act in accordance with the stipulated fire safety plan, safely, swiftly and orderly.

b- Knowledge on fire protection:

To overcome the inborn fear of fire and of abnormal situation, because a frightened person can't act promptly, sensibly and intelligently. Rather he is likely to become panic stricken, absent minded and behave indifferently to harm himself and others and may affect the efficient evacuation which is otherwise orderly.

c- Self confidence and power:

Knowledge is power and power is an ability , so with increased knowledge of fire protection and fire safety plan brings firm, increased confidence in once ability to follow fire exist drill procedure in prompt and correct manner and also ability to prevent fire in most of the cases and to attack fire efficiently with the available resources if necessary

- d- The people who may be in danger act in a calm and orderly manner.
- e- Designated persons carry out their allotted duties to ensure the safety of all concerned.
- f-The means of escape are used in accordance with a predetermined and practiced plan.
- g- If evacuation of a building is necessary it should be speedy, But orderly.

2.2- Fire Safety myths:

It is understood that certain myths about fire and fire situation affects fire safety plan and evacuation procedure badly and under rate swift, safe and orderly evacuation. These myths are.

2.2.1. Fire will light the exit route

.

2.2.2. There is time to escape.

2.2.3. Fire is warm and cozy, person remains relaxed.

2.2.4. It is the flame that kills human being.

2.2.5. Wait inside for being rescued.

The above myths should be dispelled to ensure fire Safety in a multistoried hospital building.

Chapter 3

PSYCHOLOGICAL EFFECTS OF CUMBUSTION PRODUCTS ON HUMAN BEINGS

3.1- As a fire develops, smoke, heat and toxic gases build up over time to create an environment leading to a critical level when survival of life becomes impossible. The lead time for this can be very short and will vary according to the material on fire, the combustion products produced and the physical and mental characteristics of the exposed individual, which govern their endurance to withstand the adverse environment.

3.2-Such untenable condition can develop in room fire within an incredibly short time of 2 to 3 minutes, if unchecked. Therefore, it is this short interval, of time, and more precisely the interval between detection and critical level of human survival, that is available to the occupants for effecting escape or for taking some action to overcome the fire.

3.3-This is the reason for which a lot of emphasis is laid on the need for early detection of fire conditions, especially when life hazard is involved and where early evacuation is badly required. The product of combustion can be divided into four categories –

- a- Fire Gases
- b- Flame
- c- Heat
- d- Smoke

3.4-These products have varying psychological effects on a person and the most important of which is the toxic effect of smoke and heated air and gases. In the vicinity of fire the presence of toxic gases and absence of

oxygen are the most important factors which may bring more deaths or serious incapacitation of occupants while extremely high temperature and direct consumption by fire will bring about immediate death.

3.5- Development of fear which may lead to making rash decision of jumping out from window or balconies and open places may lead to death but these cases are extremely remote. The heat generated and the smoke have also influences on the fire losses and or rescue and fire fighting operations.

3.6- Fire gases:

The term fire gases refer to combustible gases products. Oxygen is essential for respiration and for life 20.8 % oxygen in air must be present for normal respiration.

3.7- The combustible material almost invariably contains carbon. In the event of the fire the temperature of the fire area increase very rapidly and evolution of carbon-dioxide, carbon monoxide, water and other gases on thermal decomposition of material take place. The level oxygen depletes to very low concentration in the area, as most of the oxygen is consumed in oxidation reaction process. The toxic effect and collapse occur quickly if oxygen level is below 16 % but rapid treatment would prevent fatal

Outcome. Carbon monoxide is the main toxic gas in smoke generated from burning of all types of combustible materials which causes most deaths in real fire situation. The affinity of carbon monoxide with hemoglobin is 200times greater than that of oxygen and its release in the Tissues.

3.8- Further the combination of carbon monoxide with hemoglobin produces car boxy hemoglobin which is a solid mass interrupting the normal blood

Circulation in the veins which contributes to increased breathing rate to take more oxygen enhancing the danger of more intake of carbon-monoxide and death. In confined smoldering fire, more quantities of carbon monoxide are likely to be present as compared to freely burning fire in a well ventilated room or place. Carbon dioxide is not considered as a toxic agent at concentration observed in fire. Inhalation of carbon dioxide causes rapid breathing to take more oxygen which intern accelerate intake of possible toxic component from the fire environment. Inhalation of carbon dioxide at the concentration about 10% may cause Headache, narcosis in most of the people. Besides above gases the fire gases may contain sculpture dioxide, hydrogen sulfide, nitrous oxide, ammonia etc. These gases cause various degree of toxicity in their own or by way of inhalation of their oxides i.e. nitric oxide etc. It has been Established that more people die of suffocation and toxic effect of these fire gases than from heat or any other fire causes.

3.9-Flame:-

The burning of material in the presence of normal oxygen concentration is accompanied by a luminosity called "FLAME". It is seat of fire reaction. The flames can be non luminous or luminous.

3.10- Flames consist of large masses of reacting gases which are extremely hot. Most of the heat is carried away by the hot products of combustion moving away from the flame itself. But some heat is lost by radiation from the flame.

When flames are produced they

1-Spread fire and heat through the contact of the flames with surrounding matter

2- Spread fire and heat through radiation from the flames.

3- Handicap evacuation process and fire fighting operation through intense radiation of heat.

3.11- Heat:–

This is a combustion product in the form of energy, which is mostly responsible for the spread of fire in the building by way of its transmission process. It also seriously injures or kills the occupants or the fire fighting personnel. Heat therefore is a great handicap to fire fighters

And also has adverse effect on the evacuation process.

3.12- Smoke:–

Smoke is "airborne solid and liquid particulate" in gases released during a fire. Smoke is the greatest single factor in increasing losses which occur in fire. By completely obscuring visibility within the area where fire occurs, it creates panic amongst the occupants, leading to stampede, resulting injuries or death. Moreover, itself it is highly injurious to human being. For its above mentioned properties a great hurdle is created for the evacuation process as well as due to the smoke fire fighter's job is made more difficult.

Chapter 4

IMPORTANCE OF FIRE EXIST DRILL AND FIRE SAFETY PLAN IN MULTI STOREY HOSPITAL

4.1- In a emergency in a Multi-Storey hospital the prime consideration is always given to save the lives of patients, employees, doctors, nurses And visitors. On humanitarian grounds it is laid down and repeatedly stressed principle that the first priority is to save life and second priority for saving property. Hence it is of utmost importance that in case of Emergency the priority shall be given.

- To save life by immediately undertaking rescue work and
- Evacuation of any person that may be there in the building or reported trapped. In many cases the loss of life is due to
- Suffocation from smoke and hot gases.
- Lack of knowledge about the effects of fire.
- Acts of own during fire.

The loss of life under such circumstances should be avoided or considerably reduced if the occupants are made aware of

- Potential danger of fire and
- How to act during such emergencies.

The loss of life and property could be greatly avoided or minimized if

- The fire emergency squad is available instantly.

- Staff is trained to save the patients and bring them out by the quickest.
Possible means of escape.

Provision of escape routes (means of escape), built in fire detection and protection systems are quite important. But

- Manning these systems by trained staff all round the clock.
- Planning of evacuation procedure.
- Training of the staff in their use.
- Constant reminders
- Practices and drills.

Are of equal or probably more important. Even if the hospital is made very safe and all Fire System arrangements are provided, risk to the patients and staff is likely to remain at almost the same level unless the important aspects mentioned above are implemented and adhered to. From the history of fire emergency and causalities there by, it is established that lack of knowledge of "WHAT TO DO" when fire breaks out has been the cause of more loss of life and property than the actual damage caused by the fire itself.

4.2- Emergency Situation:

The situation which is abnormal warrants extra precaution and cautiousness and which may cause damage and destruction to human life and property, if it is not dealt with proper attention and in on appropriate manner. An emergency demands

- Immediate action. It is not the time for reference or study.
- Plan before and act accordingly.
- If staff are to learn anything it should be done before the emergency and not during the emergency.

- Afterwards it may be too late to save the lives of patients and your lives.
- A fire safety plan comprising appropriate fire exit drill.

4.3- Fire Exit Drill:

A investigation and study of hospital fires all over the world and the multiple deaths therein have proved that it is of paramount importance to have pre-planned fire fighting and evacuation procedure, for the safety of life there in the large Multi-Storey Hospitals. These hospitals are fast coming up all over the world, run by the government or private sector. It is experienced that very little thought is given for the safety of patients, The relatives and friends who visit them and many doctors, nurses and other workers and technicians who work there. The following factors have played major role in huge death toll, heavy loss of property and devastating fires in the hospital.

a- Planning the hospital building without providing of safe, appropriate and adequate means of escape for the evacuation of patients and others staying in a Multi-Storey Hospital. The exits include internal staircases, external stair ramps, horizontal exits from one block to another block etc.

b- Managing and running the hospitals without any care to eradicate the chances of initiation of fire due to acts of human failure or negligence

Chapter 5
FUNDAMENTAL PRINCIPLES FOR
FORMULATING
A FIRE DRILL IN MULTI STOREY
HOSPITALS
EMERGENCY PLANNING

5.1- Staff training and emergency planning are more important in a hospital where a significant number of occupants are incapable of self-preservation. Every hospital must have a fire and evacuation plan, including a disaster plan with which all personnel must be familiar. In addition all staff members in a hospital should be trained to use fire extinguishers and hose reels and hydrant systems. They must also know how to sound an alarm, move or evacuate patients, and contain the fire.

5.2- Every hospital should have a safety officer whose primary responsibility is to recognize hazards, act as a liaison with fire service, and arrange for training of staff. Orienting the health care facility staff on fire safety and evacuation is somewhat difficult. Copies of fire and evacuation plans should be available to all personnel. The plan should contain specific instructions for supervisory personnel staff if there is a fire. A copy of the plan should be displayed in prominent places. All employees should be periodically trained to ensure readiness. Fire drills should include transmission of fire alarm signal and simulation of emergency conditions as far as possible without jeopardizing occupants. Drills should be conducted on each shift at least quarterly. The drills should be varied to test the alertness of all shifts and if possible should be conducted unannounced. Use of building alarm during drills also verifies its normal operation. The fire and evacuation plan should include the following fundamentals:

1. Training staff to use the alarm and alarm equipment
2. Transmission of alarm to the fire department
3. Details of fire location
4. Evacuation practices for all areas
5. Preparation of building spaces for evacuation
6. Fire extinguishment

During the drills, emphasis should be on immediate notification to fire department, as many fires have spread because of delayed alarms. Before fire drills are planned in Multi-Storey Hospital the following points must be of prime consideration.

5.3- THE PURPOSE OF FIRE DRILLS:

The responsibility for carrying out fire drills in multi storied Hospital. Rests with the management of the hospital. A fire drill in a hospital is intended to ensure by means of training and rehearsal that in event of fire.

- 1- The people who may be in danger act in a calm and orderly manner.
- 2- Where necessary, those designated carry On their allotted duties in ensure safety of all concerned.
- 3- The means of escape are used in accordance with pre determined and practiced plan. It is done in a judicious way so that total evacuation is done only if required.
- 4- If the evacuation of the hospital becomes necessary, it is done in a speedy and orderly manner.

5- To have co-ordination between mind and muscle during in a emergency. Lack of knowledge leads to loss of more lives and property in an emergency and creates a panic chaos and stampede. Fire drill is a pre-determined and practiced plan of action.

6- Give confidence to all the staff that they can perform the duties allotted to them for safe guarding the lives of patients and their own lives by following pre-determined plan with speed and accuracy. For better results fire drills should be conducted repeatedly and periodically.

- INSTRUCTION AND TRAINING:

The fire officer should explain the object of fire drill, pointing out that the responsibility for the prevention and prompt extinction of fires rests equally on every member of the staff regardless of their rank. The senior Hospital officials should be motivated to give the instructions frequently as there is change of staff. During the instruction the fire officer should start with explaining the purpose of drill, position of exists, methods of rescue, and equipments of fire fighting, prevention of fires in hospitals by explaining about the common causes of fire in hospitals.

The instructions shall include topics viz. Fire Spread by conduction, Convection, Radiation, Causes of Fires, Usage of Fire Safety System, and Training shall include reaction to Fire Alarm Activation, Smoke and Fire Doors Operations, Operation of Fire Safety System, moving of Patients/Residents calling Fire Services.

5.4- FIRE EQUIPMENT

Firefighting equipment is provided in all sections of the hospital suitable fire extinguishers can be noted on the walls and hose reels/fire hoses are also located in particular areas. Take note of the type of fire extinguisher and the situations in which it can be used, if you note that

One is missing or some other problem; advise your superior when the opportunity arises. Always take the time to read the operating instructions on whatever equipment you are to use before you operate it.” All staff must be advised of what is expected of them by the administration. They should be given basic training in the use of fire equipment provided in the hospital various rescue methods required for the evacuation of patients and undergo the fire drills once in every six Months. Every staff member should be given a document detailing his / her specific duty for which they should sign a ledger to acknowledge the receipt and an understanding of its content. The staff should also be appraised of behavior of smoke and dangers of being caught in smoke - tips like closing of doors to restrict the flow of air to the fire and the Spread of smoke and how to work in smoke.

5.5-Moving Patients / Residents:

It should be appreciated that it may be possible to remove patients in their beds, if space permits (Hospitals, large residential care premises) or by.

1-Two handed seat

2- Three handed seat

3- Four handed seat

4- By bringing a patient to a sitting position on the side of the bed. A person sitting alongside could by placing their arms under the patient's arms from the back and grasping the patients wrists across the front of his body pull the patient from the bed and along the floor in this manner, no lifting being involved.

5- Spread a blanket on the floor alongside the bed remove the patient as explained in lowering him gently on to the blanket and then pull him along the floor on the blanket (blanket drag)

6- Two persons working together have the patient sitting on the side of the bed, one person on each side of the patient, each clasping the others hand behind the patients back and beneath his knees. The patient then puts his arms lower the shoulders of the persons who are lifting him and the lift is completed. The above methods normally should prove successful and less tiring.

5.6- Position of exits and equipment:

Instruct the staff to remember the position of exits, fire appliances and means of sounding and alarm in relation to their places of duty and also in their quarters. They should acquaint themselves with these details as soon as they are posted to new positions.

5.7- Causes of fire:

Draw attention to the common causes of fires, e.g. negligence, laundries, electrical origin, careless smokers, airing linen on fire guards, defective hearths, improvised electrical extensions, gas and electrical fires, irons etc.

5.8- Procedure in an emergency:

Give clear and concise instructions on what the staff are expected to do on discovering a fire and in answering an alarm of fire.

a- On discovering a fire:

Operate the internal fire alarm system, remove patients from the proximity of the fire, ensure that the fire brigade has been called, and endeavor to extinguish the fire with the appliances provided.

B-Calling the fire service

All fires, suspected fires or potential fires should be reported immediately to the Fire Service by the quickest method available. It is the duty of the chief warden to ensure that the fire service is called. However, the priority is to ensure call is made. It is important that there is no delay in transmitting the call. A fire notice (instructions for Calling the fire service) should be posted adjacent to the telephone. An Example is as follows.

Circumstances will dictate the order in which these actions should be carried out, and all staff should be trained and receive regular instruction of what to do in case of fire.

C-Answering an Alarm of Fire

Instruction should be varied to suit the type of premises and differing types of staff that may be available.

裸 Senior members of the staff,

裸 Nurses on duty in the wards.

裸 off duty Nurses.

裸 Sub-ordinate male staff.

裸 General maintenance staff.

裸 Female Domestic staff.

D-Test Calls:

The Internal fire alarm system should not be actuated for giving a test call without first consulting the person in charge of the premises whose wishes should be strictly complied with. It must be remembered that the sounding of an alarm causes a dislocation of the normal routine at the premises and for this reason an objection is sometimes raised.

5.9- FIRE ROUTINE DETAILS:

A fire routine as a general rule should be based on a sequence of events. Details will be as listed below for a Multi-Storey Hospital.

5.9.1. *Alarm Operation:* Type – single or Two stage – Audible or otherwise – total or Partial – Notification to central point.

5.9.2. *Power:* Stopping central A. C., isolating power supplies.

5.9.3. *Call the fire brigade:* Precise instructions – watchmen or receptionist's instructions.

5.9.4. *Evacuation:* Two stage instructions closing of Doors and windows, search of toilets etc.- Responsible persons for carrying Out the patients by various rescue methods.

5.9.5. *Assembly* - Away from premises under cover – mutual arrangement with nearby premises.

5.9.6. *Roll Call* - Registers – patients list Responsible person – Reports to Fire Brigade Officer about any missing patient / staff.

5.9.7. *Attacking the Fire* – Circumstances will dictate whether fire fighting operations should be attempted.

5.10- FREQUENCY OF DRILLS

The amount of instruction and frequency of drills (as per National Building code or Local fire service Acts.) It will vary according to the degree of risk i.e. liability to outbreak of fire and the size, construction and layout of the premises and any legislative requirement.

Chapter 6

EVACUATION STAGES

Evacuation normally works on principle of progressive evacuation viz, evacuate the fire area first, progressive horizontal evacuation (moving away from the fire in stages), vertical evacuation ground floor horizontal evacuation. An evacuation can involve the total removal of the people from the whole building or a partial evacuation brought about in different stages.

6.1- Stage 1. Affected room or area

This will be situation, where a localized area, such as a room, ward kitchen or office will have to be evacuated once this area has been evacuated and the door closed, the fire will be contained in that room or Compartment for a period of time. This period of time can be vital in reducing the spread of fire to the other parts of the building. It may be necessary to evacuate only the area affected.

6.2- Stage 2. Affected floor or section

A condition may be reached where the fire is not being contained to the room or area of origin, under these circumstances, it will be necessary to Implement stage 2 of the evacuation, which will normally necessitate the evacuation of the complete floor. When evacuating the complete floor, persons should be moved downstairs and never up-stairs. Where possible enclosed stairs should be used in preference to external stairs, and lifts should only be used under the control of the fire service or nominated members of the emergency team in the absence of the Fire service.

6.3- Stage 3. Total evacuation

In the event of a serious fire in the hospital building or even a small fire where there are large quantities of smoke that has penetrated throughout the building, it will be necessary to evacuate the complete building. This will necessitate the resources of all available staff to assist in the movement of persons to a place of safety. A total evacuation would also be undertaken for a small fire contained to the room, area or floor of origin, it is felt by the chief warden, or the fire service that it is in the best interest of safety totally evacuate the whole building. But, the need for total evacuation is a rarity. For the average fire situation patients can be moved from the affected area to unaffected areas, compartment or stairway and attended by the staff until the incident has been dealt with will be sufficient. There is a tendency these days to cover ward and corridor floors with carpet tiles which have made the emergency evacuation of patients slightly more difficult. With polished floors patients could be pulled along on blankets quite easily to a place of safety but this is difficult on carpeted floor. Moving patients with their beds can cause congestion on escape routes, so it is best avoided as is the practice of moving them fastened in mattresses a task which takes far too much time. It is quicker to carry non ambulant patients or to pull them along the floor wrapped in a blanket or sheet if possible to do so. Whatever method is used it matters not as long as evacuation is achieved in the minimal time with minimal trauma to the patients and staff. It is incumbent on the emergency team or staff to be aware of the individual action to be taken by them in the event of fire, and to ensure that no one reenters the premises until advised by the fire service that it is safe to reenter the building.

6.4-ASSEMBLY:

A place of assembly should be pre determined and be situated away from the fire area. Consideration should be given to the effects of smoke, embers, broken glass, traffic and any other factors that could Affect the safety of people having evacuated from the building.

Further consideration should be given to the continuation of vital medical health services being provided to occupants and that some occupants could only be dressed in bed attire. The comfort of health Care patients in cold or wet environment needs to be a factor when selecting safe assembly places. Where circumstances make it possible, Arrangements should be mode for all the patients in a safe place, preferably under cover, outside the building. It should be ensured that congestion does not occur on streets and pavements immediately outside The hospital building and exit doors in such a way that the exits or approach for the fire brigade are blocked. In certain circumstances there may be difficulty in finding a suitable assembly point and in such cases

Arrangements should be sought with the neighboring buildings. Assembly place may well be in the hospital garden or in the car park area. Every effort should be made to provide an assembly point away from the front entrance of the building where the fire appliances can be expected to arrive.

6.5- ROLL CALL:

Immediately the residents and staff have mustered at the place of assembly, a roll call should be taken, if possible from the registers, and each responsible person should report immediately to the chief warden that all people are accounted for or a search may be required. If any one is missing, immediate search should be undertaken by the emergency team and advice of the progress of the search given to the arriving fire Service officer. Every place that residents or staff may have access to should not be overlooked during the search. The safety of those people involved in a search must be considered and effective control and communication of searching personnel is paramount.

6.6 -Attacking the Fire:

Circumstances will dictate as to whether fire fighting operations should be attempted. The important thing to be noted is that Fire Fighting Must Always be secondary to life safety.

Chapter 7

TYPES OF DRILL

For continuous fire safety regular training of hospital staff is absolutely essential and should include all categories of staff including those engaged on shift duties or other regular duties outside normal working Hours. Since only a proportion of the staff can be made available at any one time, and having regard to constant changes of staff, instruction needs to be given at sufficiently frequent intervals to ensure that all Personnel are familiar with the action which they should take on discovering a fire and on hearing the alarm signal. To this end, a responsible officer should be nominated for arranging instruction to be given to staff, and he should receive the support and cooperation of all departments in the carrying out of his duties.

By arrangement with the fire authority, the services of the fire brigade should be utilized where possible in giving instruction to staff and in particular, on the use of fire extinguishing equipment.

7.1- Frequency of fire drills:

At least once in every 3 months for existing buildings and for new buildings during the first two years after the issuance of the certificate of occupancy. There after fire drills shall be conducted once in every Six months. The fire drills should not be allowed to become stereotype as the situation under actual fire conditions may vary widely. For instance a stair case may be unsuitable due to smoke or other causes before. Arranging a fire drill where a staircase is presumed to be blocked it is essential that an alternative safe route is available which leads to open air and safety.

7.2- Practice fire Drill - By staff (Using other staff as patients)

7.2.1. Evacuation of bed patients to a place of safety using various methods.

7.2.2. Discovery of a fire in a room adjacent to a ward / bedroom raise alarm patients/residents evacuated attacking fire with appliances available if safe to do so.

7.2.3.

Discovering a fire in kitchen fat fire or electrical fire usual closing of door etc, and attack on fire as appropriate, foam, dry powder, CO₂, and fire blanket.

7.2.4. Smoke spreading from corridor to a ward alarm given evacuation commenced investigates smoke and source of fire and attack fire.

7.3-And practice fire drill should be carried out in every hospital, simulating conditions in smoke in which one or more escape routes is obstructed by smoke. During these drills the fire alarm should be operated by a member of the staff who is told of the supposed out break and thereafter, the fire routine should rehearsed as fully as circumstances allow.

7.4- The principles of fire, drills and procedures should also be taught at Nurses training schools but must afterwards be related to the arrangements actually in force at each hospital.

7.5-Evacuation of Patients:

People designated for evacuation should know basic methods. They should be taught the following.

裸 2, and 4 handed lifts.

裸 Fireman's lift from the bed.

裸 Human Crutch.

裸 Blanket removal.

裸 Wheel Chair.

裸 Pick a back.

裸 Fore and Aft method.

裸 Removal Downstairs.

裸 Removal by stretcher.

The details of rescue by the above methods are given below.

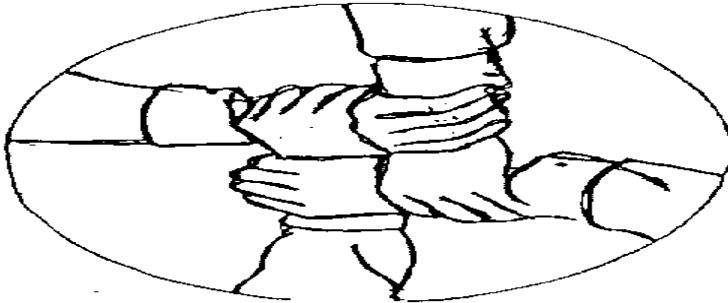
Two handed seat method



7.6- Two rescuers face one another on either side of the casualty and stoop. Each rescuer passes his arm nearest the casualty's head under his back. Just below the shoulders and, if possible, grips his clothing. They raise the casualty's back and slip their other arms under the middle of his thighs. Rescuers join their hands with a hook grip. The rescuers rise together and step off with short paces. This seat is mostly used to carry a casualty who is unable to assist the bearers by using his arms.

Four Handed Seat

This



Four handed seat



This seat is used when the casualty can assist the bearer by using one or both arms.

Fire Man Lift



7.7- This method should be used when the casualty is not too heavy for the bearer or rescuer. Help the casualty to rise to the upright position. Grasp his right wrist with left hand. Bend down with head under his extended right arm so that right shoulder is level with the lower part of his abdomen and place right arm between or round his legs.

7.8- Taking his weight on right shoulder rise to the erect position. Pull the casualty across both shoulders and transfer his right wrist to right hand so that having left hand free.

Human Crutch



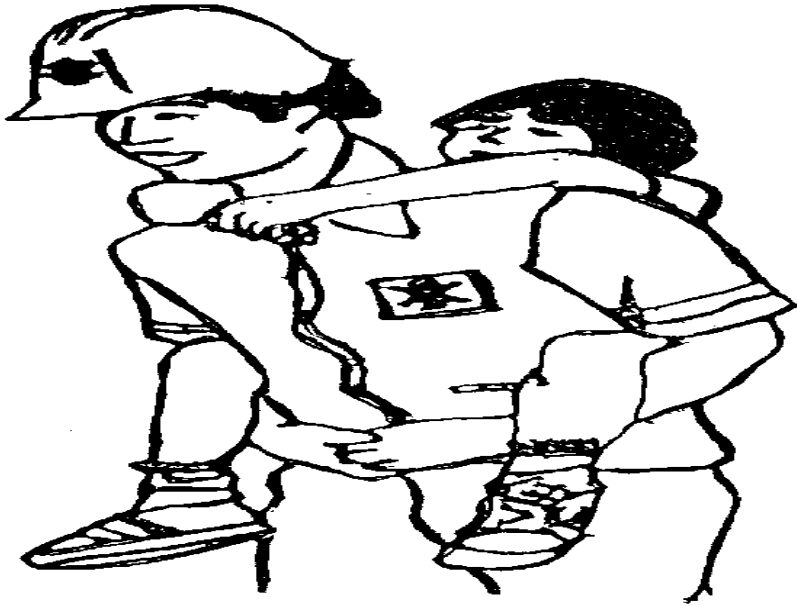
7.9- Where the casualty can help himself the rescuer stands at his injured side and places the casualty's arm round his shoulder grasping the wrist His hand. At the same time he passes his other hand round the casualty waist gripping his clothing at the hip and thus assists him by acting as crutch. Each person should step off with the outside foot, the rescuer using his nearest foot to the casualty as a propos in a three legged race.

Blanket Lift



7.10-A blanket is placed length wise on the ground in line with the casualty and rolled up half its width. The casualty is then carefully turned on his side. The rolled up portion of the blanket is then placed close to the casualty and he is gently replaced on his back upon the unrolled position of the blanket. The rolled portion is then unrolled so that he lies in the center of the blanket. The two edges of the blanket are then rolled up against the casualty's body grasped by two bearers on each side of the casualty, thus supporting the head, shoulders, legs and hips.

Pick a Back



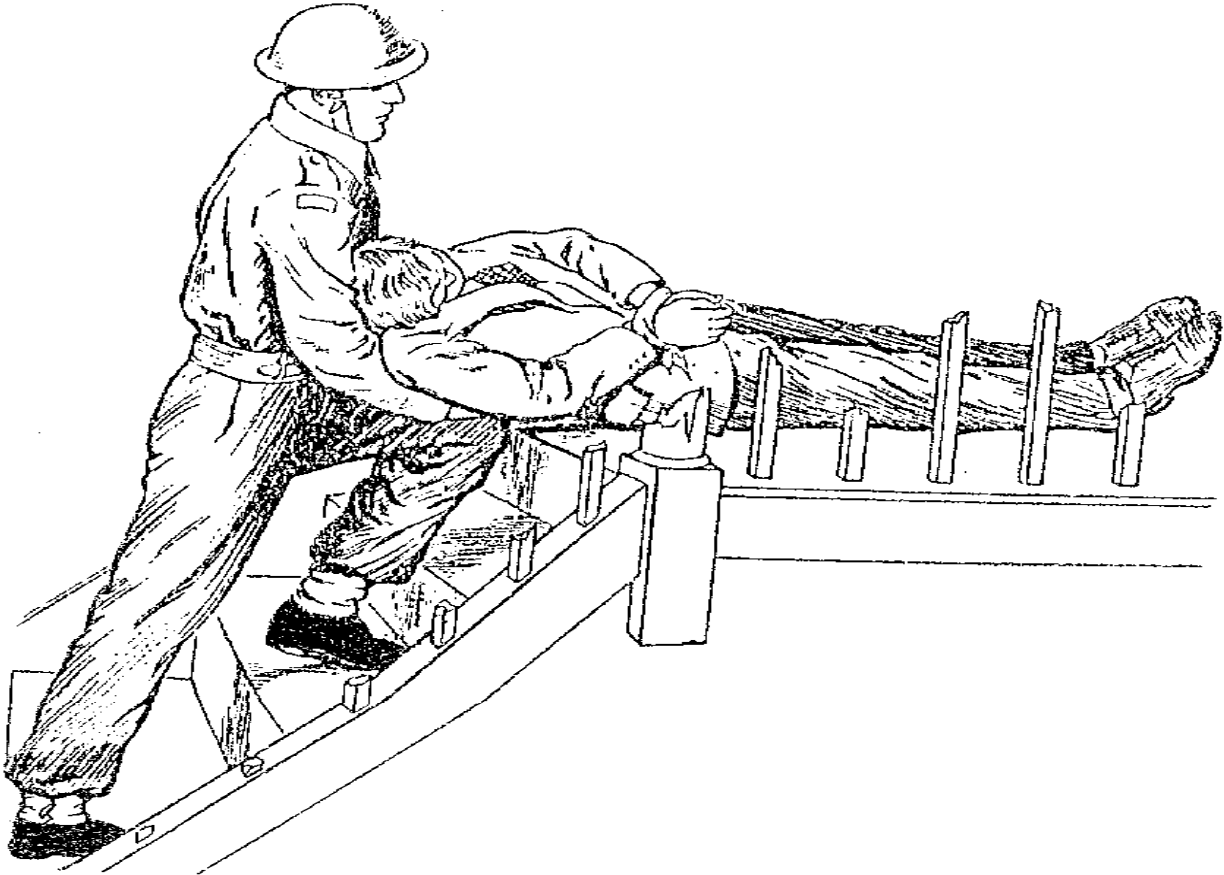
7.11- In this method the casualty is carried in the ordinary pick a back position. This is the best way if casualty is conscious able to hold on.

Fore and Aft Method



7.12-The casualty is placed on his back. One rescuer raises the shoulders and passes his hands under the arms from behind clasping them in-front of the chest. The other rescuer takes one leg under each arm and they carry him feet first. If the leg is broken both legs should be tied together, or put in splints and both carried under one arm.

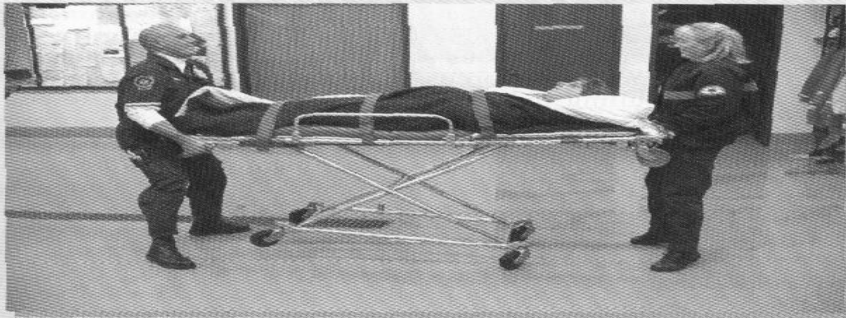
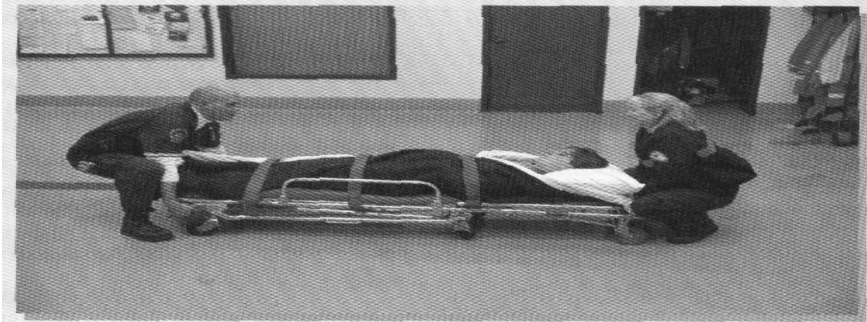
Removal through Downstairs



To remove the casualty downstairs, lay him on his back, head downwards on the stairs, place your

Hands under his armpits so that his head rests on the crook of your arm and ease him gently downstairs

Remo Val by stretcher



Patients are evacuated with the help of stretcher by the above method.

7.13-Extinguishing drill:

Ascertain where extinguishers are usually discharged and let the staff volunteer to operate them. It is inadvisable to go too deeply into the chemical reactions that take place inside the extinguishers when actuated. Generally speaking and this applies to all types of extinguisher, you should lay most emphasis on a clear, concise description of the method of actuating and using it. A good way to do this would be to assemble the party in some convenient open space. The lectures should then ask a member who has not previously operated an extinguisher to do so under his guidance, emphasizing the ease and simplicity with which it can be used.

7.14- Recording Fire drill instruction details

Such details as are necessary to show the trainee and instruction given should be recorded. The following of the examples of matters which may need to be included in the record..

1. Date of instruction or exercise
2. Duration
3. Name of the person giving the instructions.
4. Name of the persons receiving the instructions.
5. The nature of the instruction, training or drill.
6. Size and magnitude of the drill.

Chapter 8

FIRE IN STRUCTION NOTICES

At conspicuous positions in all parts of the multi storied hospital building printed notices should be exhibited stating, in concise terms, the essentials of the action to be taken upon discovering a fire and on hearing the fire alarm. The fire instruction notices should be brief, clear, prominent, legible, appealing.

8.1- Evacuation Procedure:

1. Evacuate through the nearest safe exit.
2. In the event that an operation is in progress, the decision to evacuate is at the discretion of the surgeon in charge of the operation.
3. When operations are not in progress, the designated senior staff member will supervise whatever evacuations may be required by whatever means are safest.
4. Staff should make every attempt to turn off all medical gas supplies and electrical equipment before vacating the suite.

8.2. When a Alarm is raised.

1. Report to the designated control centre.
2. Ascertain the location and size of fire.
3. Check that the fire brigade has been called.
4. Advise all units of the fire status and instruct them to stand by for further instructions.
5. Send additional staff to the fire scene to assist if, it is considered necessary.
6. Send staff members to main entrance to prevent visitors from entering the building.
7. On receipt of status reports, this officer will determine further course of action and advice an evacuation or stand down action.
8. In the Ward areas, report to the sister in charge for assignment.

N. B. The senior receptionist will assume the duties of fire control officer pending the arrival of the designated person or until relieved by a senior staff member.

8.3- If you discover a fire

1. Raise the alarm and if there are any patients or visitors in the area, move them to a place of safety.
2. Attack the fire using available fire equipment only if you feel capable of controlling it. If not, take all steps to isolate the fire by closing Windows and doors.
3. If the fire cannot be controlled, evacuate the area completely at once.
4. Take with you all patient records and other essential documents without placing yourself in further danger. Avoid moving bulky record Cabinets as they could block e-

Chapter 9

CONCLUSION

9.1- Finally it may be concluded that fire drills are very important in a Multi-Storey Hospital building to make an efficient and orderly evacuation of all the patients before the conditions of fire make the Safe evacuation impossible. Determining when and what area to evacuate is probably the most important decision in a fire emergency. Any area at all affected by heat, flame or smoke should be evacuated. In case of doubt, the entire building should be evacuated. All staff in a Multi-Storey Hospital should recognize the evacuation signal and follow the plan of action as pre determined. After each drill a meeting of the Responsible staff should be held to evaluate the success of the drill and solve any problem that may have arises.

9.2- Fire drills in Multi-Storey Hospitals are usually conducted as a part of orientation program for new employees latter the drills are supplemented with in service training for the staff personnel, including the emergency procedures. The training for the drills typically involves instruction and practice for the staff personnel in the various means of moving non ambulatory patients, procedure for alerting the facility Staff and the methods of notifying the fire department. Adequate training for floor wardens or other personnel in effective monitoring the evacuation of patients is necessary and must be specifically developed to Include the procedure of the emergency evacuation plan for the Multi-Storey Hospital Buildings.

9.3- Finally, it may be concluded that effective evacuation of patients and emergency plan of action in case of fire in a Multi-Storey Hospital will largely depend on the effective training of all personnel in the emergency plan of action, periodical conducting of fire drills, and review after fire drill and alteration of emergency procedures if required.

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