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Standard of operation theatres (OT) / Procedural rooms

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GUIDELINES FOR SURVEILLANCE OF THE OPERATION THEATRE ENVIRONMENT

It is important that proper environment is created and maintained in surgery operation theatre area for prevention of hospital acquired infections and optimal outcomes in all neurosurgical cases. For meeting this requirement following is being done:

1. The operation theatre should have the proper zoning concept.
Care should be undertaken to avoid crisscrossing of traffic between the zones. It is ensured that there is unidirectional flow of work and materials.

2. Air conditioning should be planned to support a clean and optimal environment at all places in the operation theatre. There may be a laminar flow with central air-conditioning and HEPA filters with positive pressure environment in all operating suits.

3. Entry to protected and sterile zones is restricted and due care is taken that only authorized persons enter these areas and they are properly clothed as per the requirements.

4. Any member of staff suffering from contagious infections is forbidden entry to these areas till he is clinically cured.

5. Regular washing and sterilization of operation theatre should be carried out and these activities are done in a planned manner and a record of these is maintained by the operation theatre nurse in charge.

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6. Regular fumigation of operating suits should be carried out and a record of these is maintained by the operation theatre nurse in charge.

7. It is ensured that OT change clothes, slippers/ foot wears, caps, masks, plastic gown, sterile drapes and gowns etc. should be available in adequate quantity as per the requirements.

8. Personnel in OT should be properly trained and educated in proper maintenance of the OT Environment and are provided with logistics and materials.

9. Culture swabs should be regularly taken from the operation theatre area for surveillance of hospital acquired infections. This should be done by the HIC nursing sister. The results are documented and a record of this is maintained and findings discussed with all those involved in OT operation.

10. All statutory provisions with regard to Bio- medical waste management should be complied with in the OT.

Primary structure of any hospital which includes main structure with floors, columns and walls, should be built to have 50-60 years of life span.

Secondary structure including steam, ventilation, cooling, water supply, gases, waste-water systems, electric lines, fire extinguishing system, IT net with optic cables supply and disposal pipelines, elevators, heating, radio net, etc should be built to have a15-20 years of life span.

Tertiary Structure: should be built to have a10-15 years of life span.
The tertiary structure includes all decoration, furnishing, wall paneling, paint colors, lighting, floor mats etc .It also includes all flooring, wood fitting, furniture, sanitary equipment, false ceiling etc.

Operation theatre complex
The operation theatre complex consists of operating rooms, pre-medication room, post-operative room, reception, Neurosurgeons room, nursing rooms, male/ female changing rooms and other ancillary areas. The neurosurgery operation theater is a high cost area to the hospital management hence proper utilization of theatres is essential. The facility within the neurosurgery operating room requires presence of high end equipment, sterile operating environment and good lighting and ventilators system. It is preferred to go in for grouping of operation theatres for effective as well as cost effective utilization and overcome duplication of resources.

Design consideration: The Neurosurgery operation theatre should be located on the 1st floor (Ideal) in a vertical structure. It should be away from the main patient movement, close to neurosurgical wards and neurosurgical post-operative rooms and neurosurgery ICU. The central sterile supplies department should have close access to the OT. It is preferred to have Dum-waiters, (sterile and dirty) for movement of sterile and unsterile surgical items to and from the theatres respectively.

There should be unidirectional flow of OT materials. In planning operation theaters the following criteria may be considered.

Functional criteria: Zoning concept should be incorporated while considering the functional criteria's.

1. **Ultra clean Zone**: this covers 1 meter around the operating site.
2. **Sterile Zone**: this area covers the operation rooms/suite; scrub room; gowning area; sterile linen area.
3. **Clean Zone**: This includes drug store; sterile store; staffroom; anesthetist room; premedication room.
4. **Protective Zone**: these are the area through which patient are wheeled into; personal movement; lifts; OT reception, Waiting area; change rooms; all forms part of this zone.
5. **Disposal Zone**: This is outer most zones and comprise of the dirty corridor around the OT complex. Soiled linen and unsterile instruments are taken out of the operating through the hatch, and then moved out of OT complex through this corridor.
6. **Aseptic zone: Putsep** had coined this term to represent the site of incision.

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Table 1

Size of operation theatres

S. No	Type of operation theatres	Size(ft)	Areas(Sq feet)	remarks
1	Minor OT	18 x 16	288	Minor neurosurgery OT
2	Major specialty OT	18 x 18	324	Surgery, ortho etc
3	Super specialty OT	25 x 25	625	Neurosurgery, cardiac surgery etc,

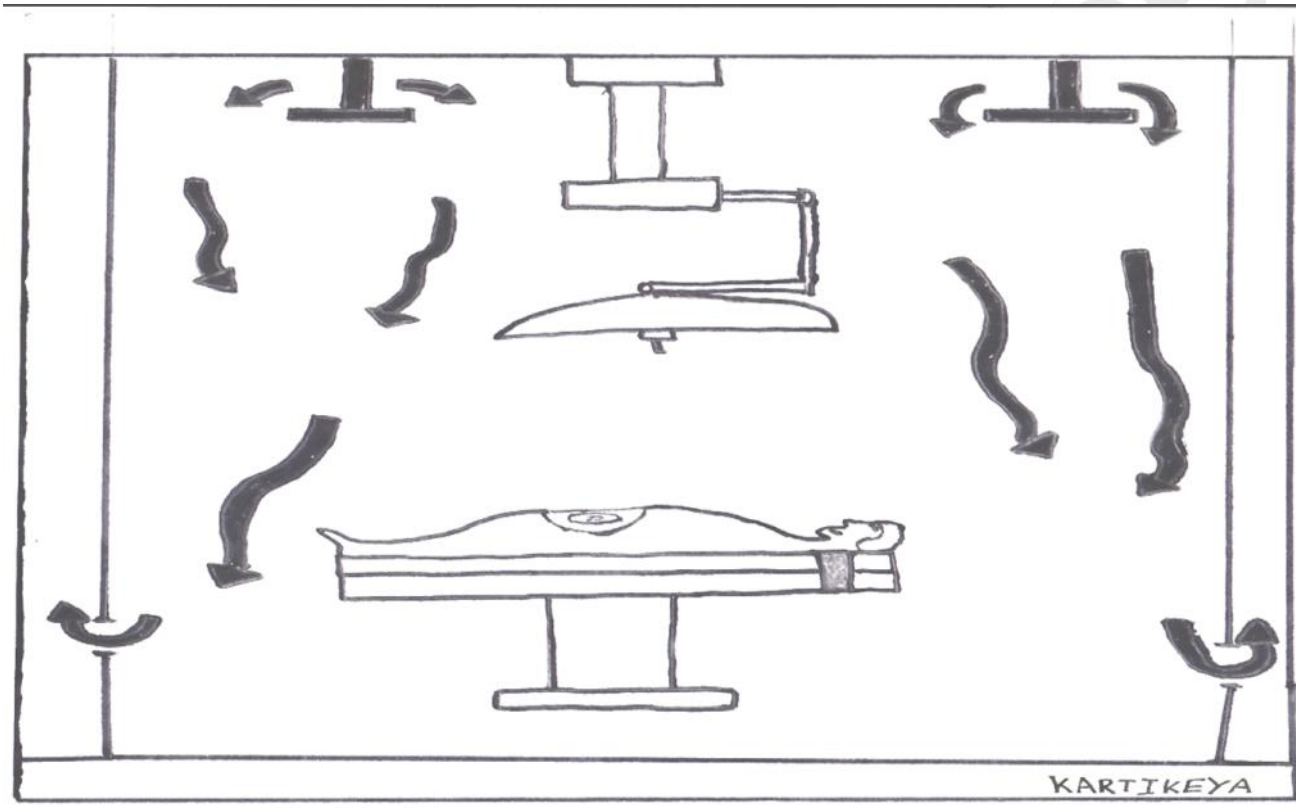

Figure 1

Turbulent Flow

Work Flow in operation theatre: The flow of material and work should be from clean to dirty zone in one direction only. The corridors leading to the surgical operation room should be 2.85-3.2 sq meter. The direction flow should be unidirectional and it should not cris-cross.

Equipments: the technology is rising. The requirement of equipment will be according to the choice of the surgeons and the type of cases being dealt with. They may include electronic- hydraulic operation table, high speed drill, ultrasonic aspirator, cautery machine, operation suit, navigation, stereotactic frame or even frameless stereotactic surgery etc. these are symbolic each surgical discipline will decide specific equipments as required at that place depending on need.

Space Requirement (UK Standard): Space required for an operating room is about 625 sq feet (25 x 25 ft) for super specialty operation theatre (see details in table 1).

The **ceiling height** should be at least 3.1 to 3.2 meters to a maximum height of 3.6 meter.

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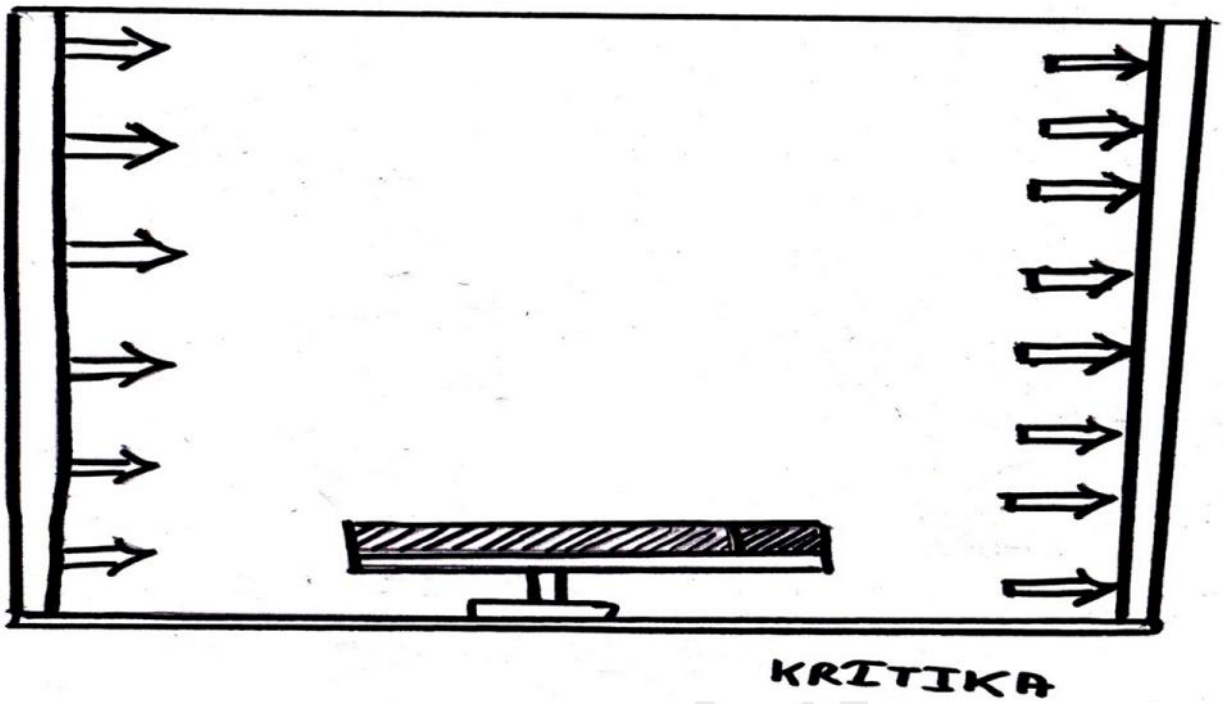

Figure 2a

Laminar flow (horizontal type)

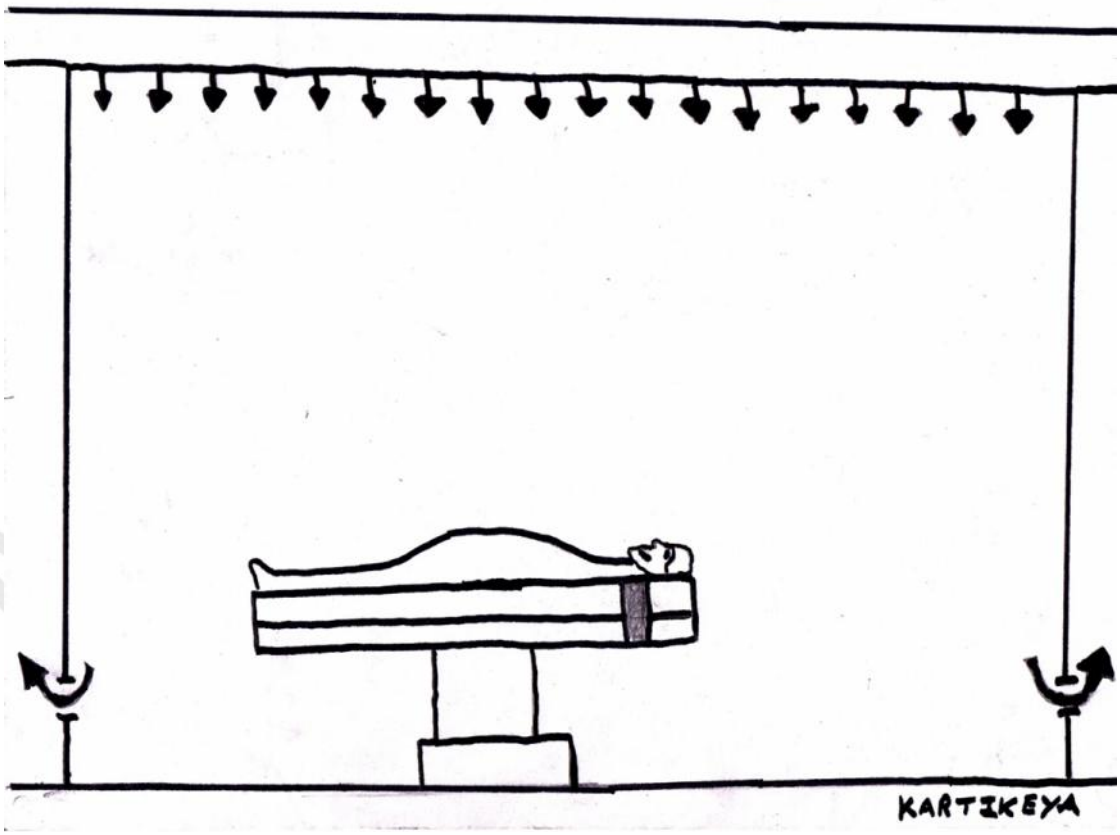

Figure 2b

Laminar flow (Vertical type)

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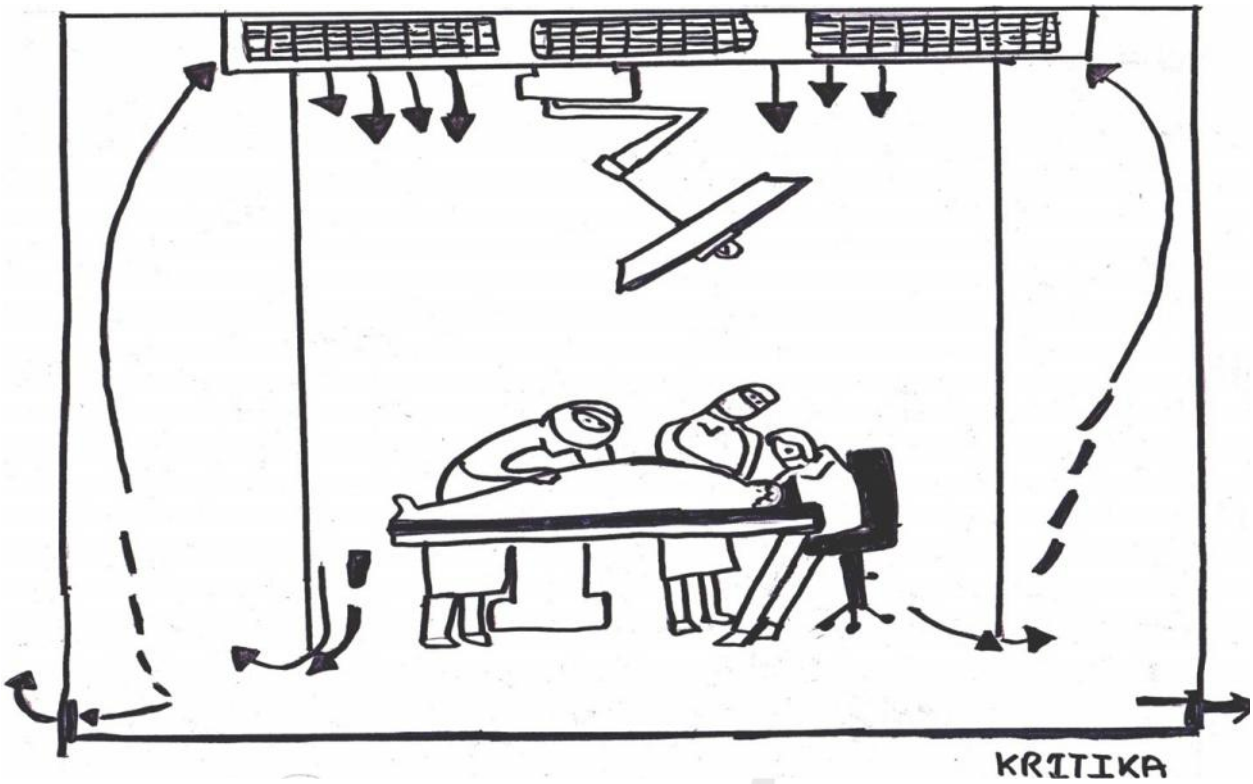

Figure 3

Exponential Flows

Environmental criteria: The operation theatre should be well ventilated, there should be adequate lighting and a good lighting and a good infection control protocol should be adopted to decrease the risk of infection and related morbidity and mortality.

Temperature: The temperature should be maintained between 21^0 -23^0. However 22-26 ^{0} C may be used in Neurosurgery ICU.

Humidity: the humidity of 45-55 % should be ideal for OT while 30- 60 % may be used in neurosurgery ICU.

Air changes: air changes should be 15-20 / hour is accepted norm in OT while even 6 air changes suffice in NS ICU. The exhaust should be placed at ground level. HEPA (high efficiency particulate aggregate) filters which have the filtration capacity between 0.3-0.5 microns may be used in case of operating rooms taking up neurosurgeries requiring ultra sterile environment while even HEPA or Millipore filter (0.5 micron) can be used in neurosurgery ICU. A continuous positive pressure should be maintained.15-20 mm of positive pressure should be in OT while 15 mm of hg may be ideal in ICU (Neurosurgery-intensive care unit as well).

The wall may be metallic in modular OT with antibacterial paint. However wall may be plain and green and easily washable. The color of the wall should be glare free; shades of green, blue, violet are preferred. The corners should be rounded to prevent bacteria from harboring in sharp corners. The terrazzo tiles or mosaic may be used for flooring.

Sliding doors are ideal for the operation theater. Proper grounding is essential. Electrical switches should be of high quality, spark proof. There should be a minimum of 4 sockets with two of them 15 amps; all sockets should be placed at 4 ft height within the theater or outside.

Ventilation flow types: The ventilation system is essential within the OT, both to maintain the desired temperature and also to maintain the air changes. Different flow pattern have been used.

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1. Turbulent flow: In this type there is uniform mixing of air in the room. This method uses continuous turbulent flow diluting the clean incoming air, with the contaminated operating room air exhausted through the exit with same rate as in flow (Figure 1).

2. Laminar Flow: In this type of, is most preferred where there is high velocity air flow. These are further classified into vertical, horizontal and others (tunnel type, cross –flow pattern) (Figure 2a & b).

3. The Exponential Flow: This gives a trumpet shaped air flow pattern. In this type there is down ward and out ward flow of air. This type of air flow has the facility of moving the sterile air centrally downward over the operation table and operating team, and then curves progressively outward towards the periphery of the clean (Figure 3).

Noise level should be low than 30-40 decibel in OT whiles it should be below 40 in NS ICU.

Hazards in operation theatres:
The theatre is also subjected to multiple hazards, which may be as below

1. Electrical hazard: Due to accumulation of static charges, inflammable anesthetic gases, use of electric cautery etc.
2. Infection Hazards: due to improper planning and design of OT, lack proper ventilation systems.
3. Cardiac arrest: team should be alert; crash cart maintained and readily available.
4. Identity: Proper identification of patient, limb /operating site, gas cylinder etc.
5. Transfusion hazards:
6. Fire hazards
7. Falls etc

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