A basic introduction to the design features of a modern operating theatres and working principles in Khartoum - Sudan

Authors*: Omer A. Salim[1], Mohammed A. Adam[2], Alaa A. Salih[2]*

1. Associate professor Faculty of Medicine U of K, Soba Teaching Hospital FRCS, MD.
2. 5th year Medical Student University of Khartoum.

Summary

Designing of an operation suite complex is a major exercise and is mainly intended to benefit the patient. The need for safety, convenience and economy will guide the planning of a modern operation theatre complex, whatever the size, number or the specialty. Guidelines based on current and widely accepted recommendations as also ones for possible expansion of the operation theatre complex are dealt with in this article.

Key words: Operating room, Operating theatre complex; Designing, Planning and organization; Induction room, Accreditation.

Introduction:

Every patient has the right to be treated using the safest technology available in
health facilities. This requires two main aspects, knowledgeable and well trained
caring healthcare workers, and validated systems in operating theatres and sterile
services that will ensure safety for the patients and to reduce harm. Therefore, all health-care professionals and institutions have obligations to provide safe and quality
health care and to avoid unintentional harm to patients.

The operation theatre complex is the “maestro” of any major surgical hospital. (1) (also known as an operating room, operating suite) is a facility within a hospital where surgical operations are carried out in a sterile environment (2).

On an average, operation theatres cater to 50% of the needs of total healthcare seekers. (1) so, Efforts are directed to maintain vital functions, prevent infections /promote healing with safety, comfort and economy. Including scheduling, administration, staffing, sterilization techniques and audit management.

The establishment of the operation theatre needs specialized planning and is not a simple civil engineering work it based on needs for safety, convenience and economy will guide the planning of a modern operation theatre complex, whatever the size, number or the specialty Both the present as well as future needs should be kept in mind while planning (3).

Goal of planning a theatre:

The goal is to ensure the safety of patients undergoing surgical procedures and protection of the surgical team.

Objectives of planning a theatre:

The main objectives of this article are to ensure:

I. Appropriate pre-operative assessment and patient preparation.
II. Adequate preparation for anesthesia and surgical procedures
III. To ensure maximum safety for patients and staff from installation hazards.
IV. Appropriate post-operative care.
V. Optimum utilization of OT and staff time.
VI. Smooth and effective functioning of OT.
VII. Good working environment for doctors and staff.
VIII. Allow flexibility by use of multiple operation suits.

Planning Criteria:

1. Functional consideration:

1.1 Building and Internal designing

1.1.1 Walls:

Wall of polyester with height of 3-3 ½ meter the colour of paint should allow reflection, washable and resistant to minor damage.

All corners to be smoothly carved and covered with steel or aluminium Plates.

Door should be 1.5 meter wide, swinging and 7f height, flap type, but sliding doors are preferred

Operation table: One operation table per O T.

1.1.2 Roof:

Same as walls, but take the load of the light, X-ray unit, TV camera, gas and electrical panels

1.1.3 Floor:

Easily washable, non-staining slip resistant, strong & impervious with minimum joints (eg. mosaic with copper plates for antistatic effect) or jointless conductive tiles, linoleum Moderately electro-conductive)

1.2 Location

Max six room in one OT Complex preferably ground floor easy access to sterilization unit, ER and surgical wards with max protection from sun, sounds, heat and wind.

The OT should be separate from general 'traffic' and air movement of rest of the hospital

1.3 Size

Recommended size is 6.5 m x 6.5m x 3.5 m Glass windows can be planned on one side only.

Paired OTs help in proper utilization of instruments and equipment

1.4 Number of OT

Number of OTs = one OT unit for 50 surgical beds.

Number of operations/ day = number of surgical beds divided by average length of stay of surgical patient.

Number of operations per room should not exceed 6 per day or 8 to 10 Hour per day.

Factors influencing no. of OTs:

1- Type of hospital
2- Type of surgery
3- No. of hospital bed
4- Hospital policy
5- Staff strength and capacity of sterile supply
6- Time for ot maintenance
7- Turnover rate in ot
8- Average length of the stay
9- Projected emergency surgical cases

10- Average no. of operations

1.5 Grouping

Are single theatre suite, twin theatre suite and OT complexes of three or more OTs.

1.6 Zoning

1.6.1 Protective zone:

- Reception.
- Change rooms for staff.
- Transfer bay for patient, material & equipment.
- Rooms for administrative staff.
- Stores & records.
- Pre & post-operative rooms.
- I.C.U. and P.A.C.U.
- Sterile stores.
- Electrical control.

1.6.2 Clean zone

- Connects protective zone to aseptic zone and has other areas also like:
- patient preparation room
- Stores & cleaner room
- Equipment store room
- Maintenance workshop
- Kitchenette (pantry)
- Firefighting device room
- Emergency exits
- Service room for staff
- Close circuit TV control area

1.6.3 Aseptic zone

Includes:

- operation rooms (sterile)
- Scrub station (96 cm height with water taps with infrared sensor 10 cm height. Both hot and cold water, soap liquid and scrubber
- Anesthesia station
- Instrument sterilization

1.6.4 Disposal zone

Disposal areas from each OR

corridor from clean zone lead to disposal zone

1.7 Installation

Minimum equipment in OT suits with adequate free area around the table for free movement and the tables connected to gas pipe lines

2. Environmental consideration

2.1 Electricity

Ensure round the clock electric supply.

Stand by generator system.

Minimum glares, four power outlets on each wall at height of 1.5 meter.

Separate copper earthling, avoid extension cords.

Adequate electric points on the wall (at < 1.5 m height from the floor).

2.2 Lighting

Shadow less, mobile, hanging pendent OT light.

intensity should be 4000lux at incision and 8000 lux at 9cm deep.

Adequate illumination with shadow less lamps of 70,000-120,000 Lumens intensity for assessing patient color and tissue visibility (discussed under "Lighting").

2.3 Air condition and Ventilation

positive pressure with lowering gradient form sterile to protective zone to Control asepsis. [3] (figure 1)

Maintenance of T 22 C for comfort central air condition system.

Humidity 55% +/- 5%.

Filter of 1-3 micron size to be used.

Flow 2-3 cu meter/ minute, All anaesthatic gas to be vented out.

Air removal from floor level through weighted levers.

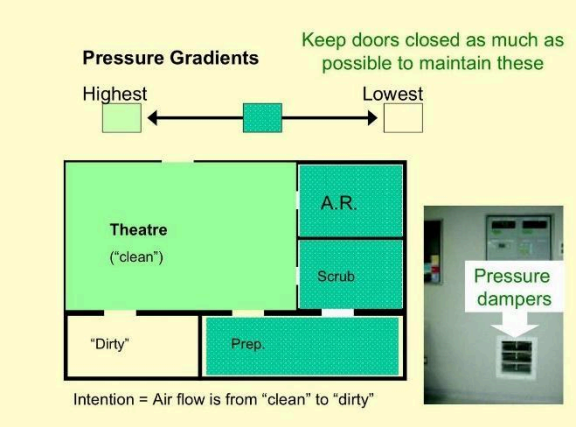
laminar flow is needed.

There are two types of air conditioning systems:

- Non recirculating systems
- The circulating system

The broad recommendations include:

- Ultra-clean laminar air flow
- The filtered air delivery must be 90% efficient in removing particles more than 0.5 mm.
- Positive air pressure system in OT of 5 cm H2O from ceiling of OT down wards and outwards, to push out air from OT.



*

figure 1; (smith, 2013)

2.4 Water supply

Adequate and running fresh water supply

Taps should be easily handled or foot operated, elbow taps have to be 10 cm above wash basins.

Infrared sensor can be used.

water at the rate of 400 liters per bed per day a separate reserve emergency overhead tank should be provided for operation theatre.

With Proper drainage system.

2.5 Plumbing

Seweage shaft should not pass though operating room.

Impervious lining to seal contamination.

Toilets to be provided in change room area.

All fire safety measures to be taken.

Gas pipe line system.

2.6 Pendant services

2.6.1 surgical team pendant

2.6.2 anaesthetist pendant

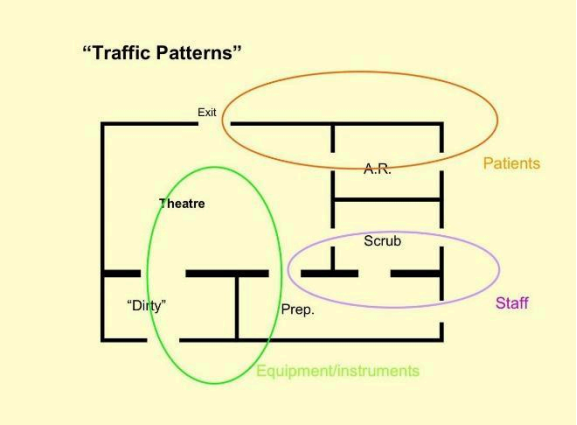
both should be retractable and have limited lateral movement and a shelf for monitoring equipment and oxygen, nitrous oxide, four bar pressure medical compressed air, medical vacuum, scavenging terminal outlets and at least four electric sockets.

3. Technical consideration:

3.1 Operation Theatre staff
3.2 Functional areas
3.3 (Pre-operative check in area (reception).
3.4 Holding area.
3.5 Induction room (anesthetic room).
3.6 Post-anasthetic care unit.
3.7 Staff room.
3.8 Offices.
3.9 Rest rooms.
3.10 Sanitary facilities for staff.
3.11 Anasthesia gas storage area.
3.12 Laboratory.
3.13 Seminar room
3.14 Store room.
3.15 Theatre sterile supply unit.
3.16 Scrub room

4. Work flow:

to avoid criss-cross movements of men & machines figure describe the space for free movement of staff patients and supplies [3] (figure 2)



* figure 2; (Smith, 2013)

1. References:

1- Harsoor, S. S., and S. Bala Bhaskar. "Designing an ideal operating room complex." *Indian Journal of Anaesthesia* 51.3 (2007): 193.

2- *Guinet, A. and Chaabane, S. (2003). Operating theatre planning. International Journal of Production Economics, 85(1), pp.69-81.*

3- Tasnim, Nasira, et al. "Manual vacuum aspiration: a safe and cost-effective substitute of electric vacuum aspiration for the surgical management of early pregnancy loss." *Hypertension* 1 (2011):

4- Smith, M., 2013. Theatre Intro Design Priciples. [image] [Accessed 8 May 2020].