Operating Room Essentials for Budding Doctors - A Perspective

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ABSTRACT

Young doctors walking into the operating room are eager to develop their skills to become efficient and knowledgeable professionals in future. But precious little is done to actively develop the basic practical skills of the budding doctors. They remain unaware about the layout of the operating room, the OR etiquette and often do not have sound scientific understanding and importance of meticulous execution of the basic operating room protocols.

This article stresses the need to develop the basics of OR protocol and to improve the confidence of the young doctor by strengthening his foundation by showing him that attention to the basics of medical care and empathy for the patient can really make a difference to the outcome of a treatment.

Keywords
Operating Rooms; Cross Infection; Disinfectants; Hand Disinfection; Sterilization; Surgical Attire; Social Responsibility

Working in two teaching institutions in Kolkata, as an Anaesthesiologist for nearly twenty-five years, I have observed the predicaments of medical students, internees, house surgeons and PGTs of different surgical units/departments, when they come into the Operating Rooms. I have also noticed the gaps in their knowledge of minute basic practical matters, which are thought to be learnt by them on their own, by simple observation only. But the fact that glaring gaps do remain has given me impetus to write this article. If it, at all, helps the target readers, my objective will be fulfilled.

First of all, let us take the word "Operating Theatre." Historically, Galleries used to be there, where surgeries were performed (like a theatrical performance) to be watched by other doctors, medical students etc. Medical College and Hospital, Kolkata, could boast of two such "Operating Theatres" with galleries, one in Eden Hospital, another in David Hare Block (both have been restructured after dismantling the galleries). The "Theatre" concept has been banished, as chance of infection do increase manifold with such "galleries" and presence of multitude of "spectators" inside.

Hence "Operating Theatre (O.T.)" has been replaced by more simplistic "Operating Room (O.R.)". There is also the concept of "Operating Room Complex" where multidisciplinary Operating Rooms are clubbed together for following reasons:[1]

(a) Common infrastructure of sterilization etc including manpower optimisation save financial expenditures;

(b) Interdepartmental surgical specialists of various branches may help each other as, when and where required;

(c) Expertise of skilled Anaesthesiologists, Operating Room technicians and other Paramedical personnel's may be utilised in the whole of such O.R.Complex;

(d) Monitors, Gadgets, C-arms etc too may be shared wherever required.

Centrally placed such O.R. Complex from where the postoperative patients can be easily transported to various surgical wards, High Dependency Units or even to Critical Care Units, is the Civil Engineering novelty

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of modern Hospital buildings. A vital point in the matter of O.R. Complex, apart from its central location, is that it must have some barrier system and it must be away from the In-Patient departments, so that crowding near the complex can be avoided.

There has to be four different zones in the O.R. Complex:

(a) Outer zone- areas for receiving patients, toilets, pantry, administrative room etc.

(b) Clean zone- changing room, store room, patients transfer area, doctors' & sisters' rooms, recovery room etc.

(c) Aseptic zone- scrub area, preparation room, area for instrument sterilization and trolley laying, Operating room proper, etc.

(d) Disposal zone- where used instruments are cleaned and bio hazardous waste is disposed.

Each Operating room proper must be big enough to accommodate one Operating table, anaesthetic and surgical machines, monitors, suckers, diathermy machines, ventilators etc, keeping enough space to work upon. It should have as little cleavage as possible (not to speak of galleries). The floor and walls should be built with large marble slabs with little junctions. Mosaic floorings have multiple pores which can harbour infections, must be avoided. A single steel sheet flooring spread to walls will be the best thing. Wall racks and almirahs are to be kept outside. Instrument trolley, anaesthetic drugs etc are to be brought in by modular system.

There has to be continuous laminar air flow by positive pressure through high efficiency particulate air (HEPA) filter located at the upper portion of the Operating room. At the same time scavenger system, either active or passive, to wash away yhe expiratory anaesthetic gases should be there. Carbolisation i.e. swabbing the floor walls (up to the accessible height), Operating table together with all gadgets kept inside the OR, has to be done daily before surgery starts. Swabs from floor walls and Operating table are to be sent periodically to detect growth of microorganisms inside O.R.

Nowadays, Operating rooms can be sterilized by dispersing disinfectants like hydrogen peroxide, hydrogen peroxide 4% with silver nitrate 0.1%, peracetic acid or other compounds of formaldehyde through a fogger. The contact time is about an hour, after which, the OR is ready for use.[2]

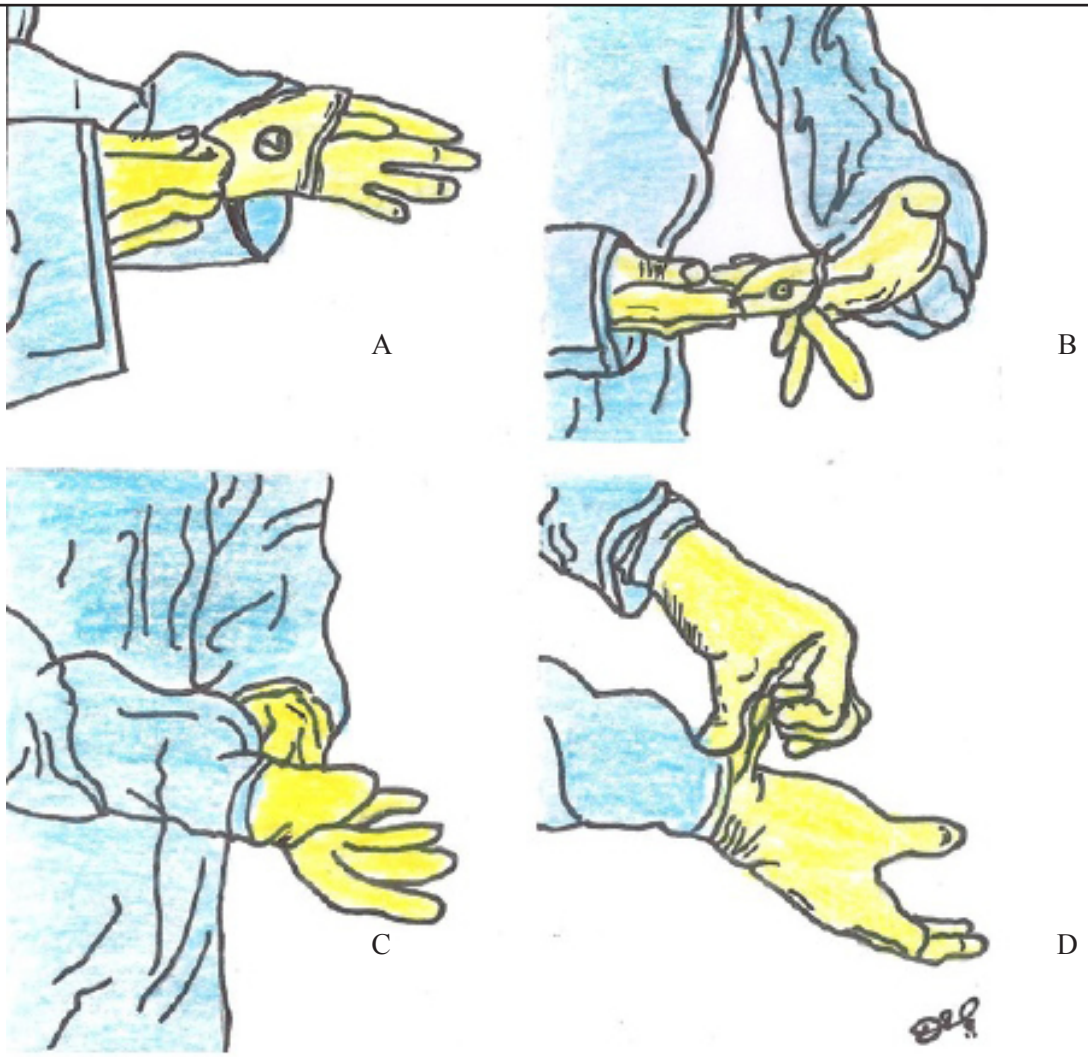
The students must be taught precisely the procedure of surgical hand preparation (Fig. 1) and putting on gloves (Fig. 2), not leaving it to their power of observation only. Previously hand wash was done with soap water which does not have antiseptic property. Nowadays good quality antiseptic hand scrubs like povidone iodine and chlorhexidine etc. are available.One thing must be particularly mentioned that all ornaments like rings, bangles, watch etc including any sacred cotton threads must be taken off before washing hands for putting on gloves (Table I). After handwash and also after putting on the gloves the hands must not go below the waist or above the shoulder at no point of time, till the procedure is over (Table II).[3]

Consent - Before any procedure, not to speak of surgery & anaesthesia, informed consent is a must. It should be taken not at the time of admission; but only after the Operating has been duly planned and after explaining the pros and cons of the surgical treatment and its alternatives, in the patient's own language in front of proper witness. Only the patient's signature is valid unless he is minor, unconscious or insane. In case the patient is unconscious and is not accompanied by any guardian/relative, two responsible senior doctors can decide and sign for any Operating they feel would be lifesaving.

Institution of I.V. fluid line & catheterisation too will need proper informed consent. In this age of litigations, verbal consent will not suffice, as it would not hold water, if put to scrutiny. Before I.V. cannula insertion use of eutectic mixture of local anaesthetics should be advocated. Here comes the question of putting an airway in I.V. bottles--- The era of glass bottles has gone as they were bulky, fragile and needed an airway for the fluid to run. Through the airway enter dust, other floating particles, soluble materials and microorganisms. Hence came PVC bottles which won't need any airway, almost till the end. Then, instead of piercing the bottle by a needle, we can run the bottle by applying pressure.[4]

While catheterising, after antiseptic dressing of urethral meatus and its surroundings, some amount of

Fig. 1 Hand rubbing technique for surgical hand preparation (Reproduced with kind permission from WHO)



A. Pick up the cuff of the left glove with your left hand. Slide the the right hand into the glove until you have a snug fit over the thumb joint and knuckles. The bare right hand should not touch any other part of the right glove other than the folded cuff.

B. Insert the fingertips of the gloved left hand into the folded cuff of the right glove and pull it over the right hand to fit it in the glove.

C. Unfold the right cuff in the same movement over the gown sleeves.

D. Insert the gloved right fingers into the still folded cuff of the glove covering the left hand and unfold it over the gown sleeves.

Fig. 2 Technique for donning sterile gloves (Diagrams courtesy Dr Debasish Guha)

Table I: Key steps before starting surgical hand preparation (Reproduced with permission from WHO)

KEY STEPS BEFORE STARTING SURGICAL HAND PREPARATION
• Keep nails short and pay attention to them when washing your hands – most microbes on hands come from beneath the fingernails.
• Do not wear artificial nails or nail polish.
• Remove all jewellery (rings, watches, bracelets) before entering the operating theatre.
• Wash hands and arms with a non-medicated soap before entering the operating theatre area or if hands are visibly soiled.
• Clean subungual areas with a nail file. Nailbrushes should not be used as they may damage the skin and encourage shedding of cells. If used, nailbrushes must be sterile, once only (single use). Reusable autoclavable nail brushes are on the market.

lubricant jelly/local anaesthetic jelly should be pushed in. Catheterisation should be done gently by no touch technique i.e. without touching the catheter, which must be introduced by holding the pack which should be rolled over the catheter. While attaching the urobag or inflating the balloon of the Foley's catheter, it may be touched.[5]

When the medical students first come into wards and Operating rooms, they are overawed by the situation there, and are also overzealous (eager) to learn. If they are given a proper lecture about what they are expected to do and learn over there, then they can be spared many

Table II: Protocol for surgical scrub with a medicated soap: Procedural steps (Reproduced with kind permission from WHO)

PROTOCOL FOR SURGICAL SCRUB WITH A MEDICATED SOAP: PROCEDURAL STEPS
• Start timing. Scrub each side of each finger, between the fingers, and the back and front of the hand for 2 minutes.
• Proceed to scrub the arms, keeping the hand higher than the arm at all times. This helps to avoid recontamination of the hands by water from the elbows and prevents bacteria-laden soap and water from contaminating the hands.
• Wash each side of the arm from wrist to the elbow for 1 minute.
• Repeat the process on the other hand and arm, keeping hands above elbows at all times. If the hand touches anything at any time, the scrub must be lengthened by 1 minute for the area that has been contaminated.
• Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
• Proceed to the operating theatre holding hands above elbows.
• At all times during the scrub procedure, care should be taken not to splash water onto surgical attire.
• Once in the operating theatre, hands and arms should be dried using a sterile towel and aseptic technique before donning gown and gloves.

a nervous moments.

While in the ward, they should know that before touching any patient for examination (or performing any procedure) they must wash their hands. Mere hand washing may reduce incidence rate of dreaded Hospital Acquired Infection (HAI) and/or nosocomial infection, which is the bane of today's hospital system.

While in Operating room complex, they must know the difference between unsterile, relatively sterile (clean) and sterile zones. They must change their shoes and socks before entering the clean zone and put on Operating room slippers. In the clean zone, they must change their outer apparel and wear Operating room dress (not the sterile surgeon gown) and cap mask (either cotton or disposable). None should even peep into the O.R. proper before changing, not even to ask for the O.R. dress. All, especially the female students must take special care to hide the whole of their hair by the cap. Mask should cover the mouth & nose properly, so that droplet infection may not be transmitted from them to others including the patient and also the surgical instruments kept in the open trolley.

Once inside the O.R. proper, they must follow the Operating room culture, which should be enumerated to them:

(i) All should speak in low voice, if at all. At the same time students must be allowed, even encouraged, to ask questions because seeking answers to correctly formed questions is the best way to acquire knowledge.

(ii) None should touch or lean on anything inside there; (a) the surgical trolley, the patient after draping has been done or the surgeon and assistants who have already put on surgical gown-lest they become unsterile. (b) The anaesthesia machine, ventilators, monitors etc-lest the settings are inadvertently changed.

(iii) Every student must be observing everything and every step being performed viz hand washing, wearing of gloves, anaesthetic procedure, surgical steps - from aseptic dressing & draping to suturing and final dressing, recovery from anaesthesia and finally, patient shifting.

At the beginning of surgical procedures, of course after anaesthesia has been undertaken, aseptic dressing by a contact antiseptic is applied on a large area around where surgical incision will be given,. If Povidone iodine is used, it ought to be 10% solution, it should be allowed to dry (otherwise its contact antiseptic property is not active) & it should not be wiped away with spirit.

Next is the step of covering the surroundings with drapings, lowest layers of which must be rubber/ polythene sheet so that it does not get wet from below or above, lest microorganisms from underneath does not come up through wet sheets. Then on the top of that, cotton sterile sheets are placed, leaving the actual surgical area bare. By this time, students must have observed that their dress, surgeon's gowns, drape sheets are usually green in colour. It is not by chance, but due to two reasons: (1) The colour must be soothing to eyes(besides green, white, pink, a shade of blue also are soothing); and (2) when stained by blood it must not look gaudy, and that holds true only for green.

The drape sheets must cover the whole body of the patient leaving a bare area only at the site of surgical incision.[5] This is to maintain body temperature of the anesthetized (hence poikilothermic) patient in the cold O.R. temperature. It is usually kept at 21-24 degree Celsius, for the sake of surgeons' convenience, otherwise they may sweat with their multiple dressings, inners, Macintosh & finally surgical gowns and their nimble finger work may be hampered.

The drapings must hang beside the table up to at least half of the height of the Operating table. Nowadays sterile disposable drapings are available, from the lowest rubber sheet layer, up to the uppermost cotton ones. Finally a transparent adhesive sterile layer is to be fixed covering the area which is kept bare for surgical incision. Incision is to be given through it, so that the incised skin margin is everted and drawn away by the adhesive layer. The purpose of antiseptic preparation of the skin is marred after sometime as the skin bacterial flora regenerates. By the use of this sterile adhesive transparent drape, the regenerated flora are kept away from invading the surgical field. Hence its use is always done in CTVS, Eye surgery, orthopedic surgery, Neurosurgery etc, wherever infection is very much dreaded.

Once draping is over, the surgical team is down to its business of Operating. Students must be observant

& inquisitive for the sake of learning. At the same time they must learn to keep away and not to disturb too much, particularly at crucial junctures of Operating and anaesthesia.

It has been observed that, surgical assistants of many departments do ask erroneously for various suture materials without naming them specifically. Then they scold and shout at the sisters why the latter have given the sutures which is not as thick/thin as required, why the size, curvature and tip of the needle is not what they felt essential. Students too notice that and thereby they don't learn that the assistant should ask for specific suture of specific material (silk, prolene, vicryl, nylon etc), specific thickness(2-0,3-0 etc) and specific needle size & edge. Otherwise wrong practice will perpetuate in the future generation too.

How to pass on an instrument by the trolley assistant to the surgeons? One should hold the working end (may be sharp edge also) and handover the grip end to the surgeon. Though nowadays, cuttables (sharp edged instruments like scalpels, needles, scissors etc) should be passed on small trays from where the surgeon himself should pick it up.

Needle holders are to be held by the thumb and the middle finger, with the extended index finger giving strength and support to the active movements during suturing. The needle is to be held near the tip of the needle holder at the level of anterior two third and posterior one third of the needle. The lever action for rotational movement during suturing is the best by the above two holds.

While cutting sutures during operations, the principle is to place left index finger laterally below the scissors to give support. Sutures should be cut flushed if they are inside the body and longer at the skin level.[5] How much longer? They should be cut at the size just shorter than the interval between two skin stitches, lest the cut end gets included in the nearby suture. With Prolene®, as it slips, multiple knots (some call it in odd numbers) must be applied and tails must be longer, while with other suture materials just 2 or 3 knots would suffice.

About collecting and sending specimen for biopsies, it is almost always mistakenly said that they are to be preserved in formalin. Formalin actually is 40% formaldehyde, which is highly corrosive to tissues, hence it cannot be used as tissue preservative for biopsies.What should be used is Formal Saline i.e., 10% formalin in normal saline. For fungal culture, the sample has to be sent in normal saline only.

In conclusion, I would be happy to send two sermons to the budding doctors:

(1) Whatever comes, the students of all tiers must remember, that it is neither their merit nor money which can make them good doctors. It is only the chance they get to learn by examining, or by working upon, the general patients who come in the hospital, that will help them to be knowledgeable professionals in future. Hence, they must remain grateful to such patients throughout their medical profession.

(2) Secondly whatever they see being performed on, or they themselves do on a patient in their training period, they must think everyday at night whether it would have been proper if the same things were done on one of their own relatives. This alone will make them perfect in their dealings and techniques in their career.

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