Surgery in covid times

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Introduction

- The Covid-19 crisis has affected all medical professionals.
- In the absence of complete information about the epidemiology of the virus, surgical specialties have been left wondering about what is the best way to ensure safety for the patient and healthcare professionals.
- Apart from dire emergency and obstetric cases, all elective surgical procedures were put on hold during the lockdown.
- The high risk to anesthesiologists is obvious. Similarly, ear, nose, and throat (ENT) professionals and Endoscopists are expected to be at high risk.
- Surgical societies all around the world, including India, have been working on this issue and have come out with guidelines.

How to reduce the risk of covid spread

- **Minimize Patients Coming to Hospital and Crowding**
- **Screening and Triage**
- **Maintenance in Patient Wards**
- **Maintenance in Operation Theatre**
- **Appliance Disinfection, Hygiene and Waste Management**

Waiting outside kilpauk hospital,chennai

Minimize Patients Coming to Hospital and Crowding

- The main strategy in any hospital and so in surgical practice is to avoid unnecessary crowding in hospital and all its areas including outpatient department (OPD), wards, and operating rooms.
- Various strategies need to be in place to achieve this and still ensuring continued satisfactory patient care and follow-up.

- **Telemedicine**
- **Proper instructions**
- **Zonal hospitals/CHC to take care of the population with sound referral (telephonic)**
- **Token/appointment system and time effectiveness**
- **Medicines from nearby dispensary**
- **Minimum attendants**

Telemedicine

- Telemedicine can be utilized in such a time.
- Initial screening as well as follow-up can easily be conducted using telemedicine.
- Initial screening can help in broadly defining the problem and referring to concerned specialty. It will also help in drafting clinical plan even before patient's first visit, hence minimizing repeated contacts.
- When the proper plan is in place and goals of the patient's in person appointment defined, clinicians can use the time more efficiently.
- The follow up, similarly can be via telemedicine or messaging like Whatsapp, etc.
- Public have very easily adjusted to messaging-based communication and healthcare can also tap into this utility.

Telemedicine

Token/appointment system and time effectiveness

- For OPD, hospitals need to decide number of appointments it can handle and patients should be given time-slot based appointment.
- It will certainly reduce crowd at any given time and maintain good overall attendance.
- Strategies must be made to minimize time in waiting for patients.
- Using health technology or other methods such as centralized appointment scheduling with coordinated efforts among departments can aid patient experience and utilize time effectively.

Medicines from nearby dispensary

- Another area where lot of crowding happens is in medicine dispensing areas where patients queue up to receive prescribed medicines.
- The hospitals can create a network of pharmacies (e.g., CGHS dispensaries) to dispense medicines based on prescription.

Large number of attenders in a rural hospital

Minimum attendants

- In any typical hospital, the ratio of attendants to patient is 3 to 4 for one patient.
- This has to be changed favorably by strongly implementing one patient-one attendant policy.
- However, the hospital needs to be patient friendly in order to achieve this.
- Also good number of hospital staff must be available to help patients in times of need.

Screening and Triage

- All persons who are entering hospital should be screened for symptoms of coronavirus disease (COVID 19).
- The screening area must be located at entrance or just outside the entrance to the building; it helps by reducing exposures for other patients and healthcare personnel, helps prevent the spread of disease within the facility and helps ensure PPE is used effectively.
- All suspects should undergo testing as per existing protocols.
- Patients to be assigned to COVID/Non-COVID areas after he/she has been checked to avoid unnecessary mixing.
- At present, screening means symptoms and temperature check (thermal screening) only, so it cannot be sure that patient is negative especially asymptomatic ones.

Covid triage

Screening and Triage

Various screening protocol suggested are:

1. If supplies allow, then provide a cloth face covering or a facemask to patients not wearing the same.
2. Temperature by using Infra-red thermometers/ thermal scanners: though being unreliable with high-false negativity, but still a very useful tool to screen large numbers of people.
3. Rapid antigen test kit can detect positive cases with a fairly confident process in very short time (about 55%–60% accuracy with specificity of 98%). Such test performed at the time of admission can help hospitals avoid mixing of Covid-19 cases with non-Covid 19.
4. Proper signages and posters at entrances and in strategic places around the facility with instructions for patients with fever or symptoms of respiratory infection.

Approach and risk stratification (All cases, urgent only, emergency only)

- The surgical decision in a Covid-19 positive case needs to consider the risks and benefits.
- At any time, the hospital needs to decide which procedures (All, only urgent, or only emergency life threatening) are allowed and which are not.
- It will be based on ratio between patient load of Covid-19 cases and resources (Personnel, protective equipment, etc.).
- Non-operative management should be considered where ever possible (such as for early appendicitis and acute cholecystitis), but with Covid-19; strategy must be worked out to start routine practice.

Guidelines	Priority	Definition	Action
Inter association surgical practice recommendations [3]	Emergency life threatening conditions	Those conditions in which immediate surgical intervention is required and there is not enough time available to do and get the results of Covid-19 testing. e.g., life-threatening traumatic hemoperitoneum with hemodynamic instability, bowel gangrene.	Immediate (within hours)
	Emergency procedures	Those procedures that require immediate surgical intervention but provide a window of few hours to get COVID 19 testing. Interim non-surgical intervention could also be an option. e.g., Bowel obstruction, perforation of hollow viscous, unresolved obstruction, complicated appendicitis, and complicated cholecystitis.	Early (within 24–48 h)
	Semi-emergent procedures	these includes condition where the procedure can be deferred for a few weeks or months but not more than 3 mo due to worsening of symptoms or progression of stage of disease affecting final outcome. E.g., major malignancies.	Defer (but not more than 3 mo)
	Elective procedures-	These include those procedures which can be postponed by 3 mo or more with mutual consent between patient and surgeon with no untoward effect on final outcome. E.g., uncomplicated groin hernia, varicose veins.	Postpone
National Health Service [14]	Level 1a/1b	1a: Emergency operation (<24 h)1b: Urgent operation (<72 h)	Do not postpone
	Level 2	Deferrable for up to 4 weeks: • Cancer according to MDT decision; • Crohn disease-related complications; • goiter (mild moderate stridor); • medically resistant thyrotoxicosis/hyperparathyroidism/ adrenal pathology	Balance the risk from the underlying condition with the need of viral containment to maximize safety
	Level 3	Deferrable for up to 3 months: • Cancer according to MDT decision; • Cholecystectomy post-acute pancreatitis; • Hernia presenting with complications; • Parathyroidectomy – with medically resistant complications	Postpone
	Level 4	Deferrable beyond 3 months: • Uncomplicated hernias (hiatal, incisional); • Stomas closure included Hartmann's reversal; • Proctology procedures; • Upper UGI benign conditions (eg gallstones. others); • Benign uncomplicated endocrine diseases • Breast reconstruction/prophylactic surgery/benign diseases	Postpone
American College of Surgeons [15]	Tier 1a	Low acuity surgery/healthy patient; (Outpatient surgery; Not life-threatening illness)	Postpone surgery or perform at ASC
	Tier 1b	Low acuity surgery/unhealthy patient	Postpone surgery or perform at ASC
	Tier 2a	Intermediate acuity surgery/healthy patient (Not life threatening but potential for future morbidity and mortality. Requires in-hospital stay)	Postpone surgery if possible or consider ASC
	Tier 2b	Intermediate acuity surgery/unhealthy patient	Postpone surgery if possible or consider ASC
	Tier 3a	High acuity surgery/healthy patient	Do not postpone
	Tier 3b	High acuity surgery/unhealthy patient	Do not postpone

ASC, ambulatory surgery center.

All operative/ severely sick patients to be tested

- Since long and significant exposure is expected during surgery and in ICU, all cases admitted to ICU and those planned for surgery must be tested with high fidelity test like reverse transcription-polymerase chain reaction (RT-PCR) antigen test.
- The hospital cannot afford a health care worker getting positive as it poses a danger of infection spread to other patients in hospital.
- If readily available and practical, surgical patients should be tested preoperatively for Covid 19.

Maintenance in Patient Wards

- The hospital should be designed so that Covid-19 cases are kept in a self-sufficient block.
- The Covid-19 block should be equipped as a hospital within hospital so that all needs of these patients are met in the block.
- If this is not possible, it has to be ensured that there is no mixing of cases and area is regularly sanitized.
- The patients in Covid-19 ward must follow the social distancing and hygiene recommendations and have to be wearing masks.
- Use of cubicles with glass walls can prove very useful.
- For patient monitoring use central console for VITALS and camera surveillance is recommended.
- This can also avoid cross infection and still maintain standard monitoring for patients.
- SOS/panic buttons must be installed on every bed.


CORONA VIRUS WARD


COVID-19
ISOLATION
WARD

Personal hygiene

- The ward hygiene has to be a high standard.
- Though it was always a priority but its importance is even more in these times of Covid-19.
- All patients also must be encouraged to participate in keeping themselves and surroundings clean.
- All staff and patients must be taught and retaught about self-hygiene using prerecorded videos.

Table 2 Sanitization sequence

Surface and electromedical sanitization sequence
1. Clean with chloro-derivate solution
2. Rinse and dry
3. Disinfect with chloro-derivate solution in a concentration ≥ 0.1% or 1000 ppm; time of contact must be superior to 1 min

ppm parts per million

Communication with attendants

- As attendants are not allowed in Covid wards, the lack of family or attendant support can be a cause of their despondency.
- Hospital must encourage them talking to their relatives using phones, video chats and all help must be provided, if patient is unable to do it on their own.
- Hospitals on their own must update relatives on regular intervals using messaging/ phone calls.
- All efforts have to be made so that patient is discharged as soon as possible.
- The Enhanced recovery protocols such as Enhanced Recovery after surgery, which is proven to lower both recovery time and postoperative complication rates can be utilized.

Maintenance in Operation Theatre

- **OT layout and workflow -** Dedicated operation theatres (OT) to be used for all confirmed or suspected Covid 19 infected patients and should be labeled “COVID 19 Operation Theatre” with clear and large signage.
- The OT closest to the entrance of the OT block entrance should be the first one designated for COVID 19 patients, this will restrict movement of staff between OTs and helps in avoiding cross-contamination.
- The COVID 19 OT should preferably be located near high dependency unit (HDU), COVID 19 ICU, Emergency Ward with two functional lifts (one for staff on COVID 19 duty and one for other purposes).
- There should be preferably two OTs; one for obstetric cases with neonatal resuscitation facility and second for other general surgical operative procedures with appropriate facilities for all age groups.

COVID + Infant being operated for brain hemorrage

Intraoperative management

- The OT should be pre-equipped with supplies and instruments needed for particular surgery.
- The OT door must be kept closed at all times and personnel present in the OT must not leave during surgery.
- Electromedical devices (e.g., ultrasound) must be used with adequate protective cover and adequately sanitized at the end of the operation.

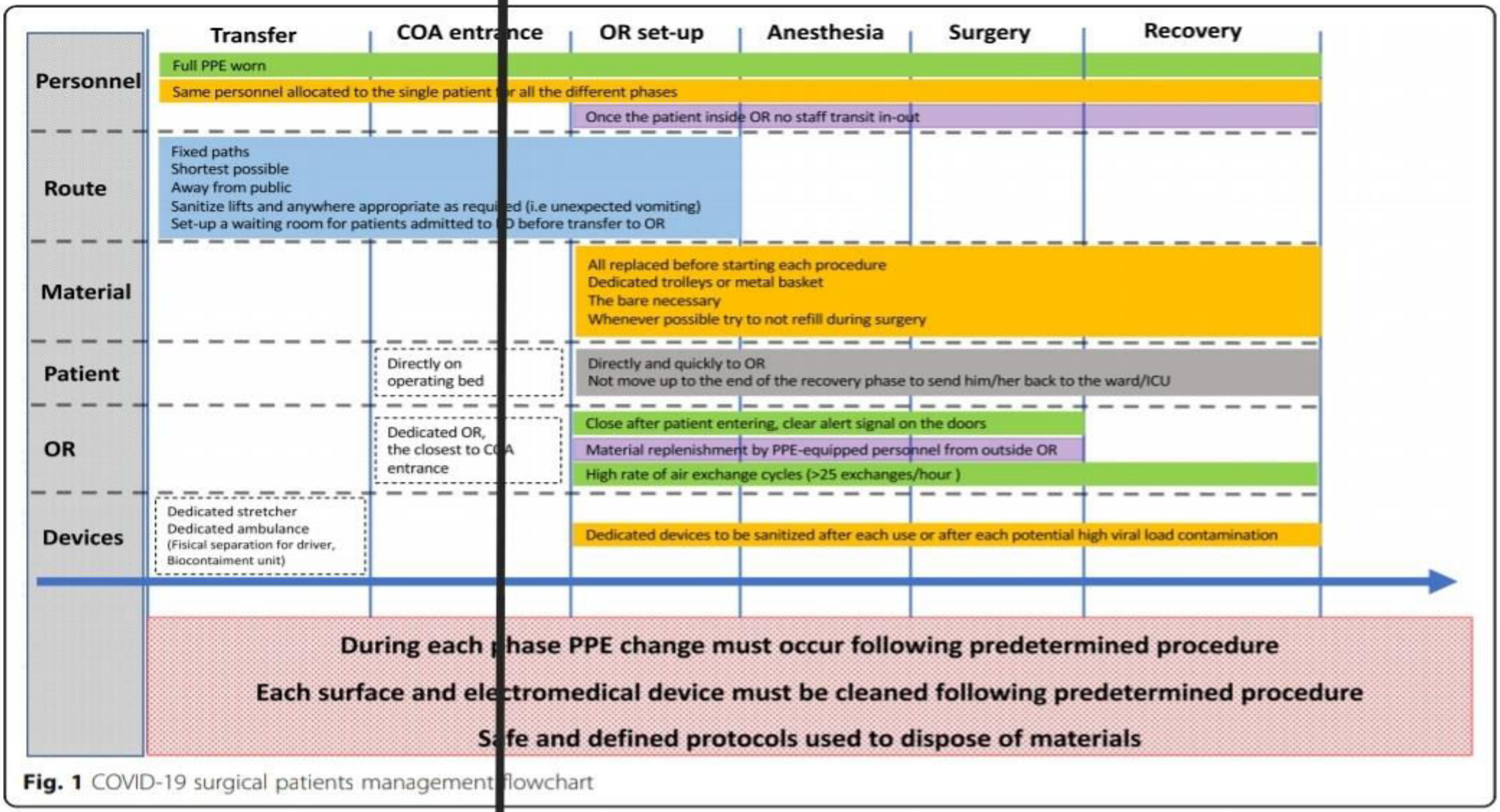


Fig. 1 COVID-19 surgical patients management flowchart

OT pressure, Air changes and Air Conditioning of OT

- The mode of transmission of COVID 19 is likely via contact and droplet transmission directly or indirectly through fomites.
- Keep minimum number of personnel in the OT with appropriate PPE, as airway manipulation is considered to be aerosol generating.
- OTs have been traditionally designed to have positive pressure air circulation.
- Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can survive for days on multiple operating room surfaces, including plastic and stainless steel; therefore, OTs with negative pressure capabilities are recommended.
- In absence of negative pressure facility, the positive pressure system and air conditioning must be turned off. Laminar flow and the functional high-efficiency filters are preferable.

- In well maintained OTs 15–20 air changes per hour can take place, which corresponds to 14–18 min to ensure clean OT air for the next patient and OT staff.
- At 10 air changes per minute, it needs about 30 min to reduce 99% air contamination, therefore there should be a minimum of 12 air changes per hour during standard times.
- It must be remembered that these time estimates are based on an empty, uncluttered room, therefore infection control guidelines must be in accordance.
- A high air exchange cycle rate (20-25 cycles/h) contributes to effectively reduce the viral load within OTs.

- Laminar flow/air conditioners in the OT has to be started after induction of anesthesia and laminar airflow/air conditioners should be stopped 20 min before extubation.
- All airway devices should be removed in the OT and not in the recovery area.
- Next patient should be wheeled in after minimum of 30 minutes after cleaning and sanitization or minimum 1 h time gap to be given between two procedures/surgeries.
- one percent Sodium hypochlorite solution cleaning is recommended for OT tables and trolleys as soon as the patient is transferred.

- Normally, OTs are connected by a heating, ventilating, air conditioning (HVAC) system that is of a recirculatory type, wherein the air from the OT is taken back to the air handling unit (AHU) for thermal conditioning and brought back.
- The same system or central system is also connected to a few other areas of the hospital.
- This poses a significant risk of the virus laden particles spreading out from the designated OT.
- In order to convert an existing OT into a COVID 19 OT, it is first necessary to change to a non-recirculatory system or AHU dedicated to Covid 19 OT only.
- An independent exhaust blower can be used to extract the room air and exhaust out into the atmosphere, preferably, after suitable “exhaust air treatment”.
- The exhaust air quantity should be greater than the supply air quantity so that a negative pressure of minimum 2.5 Pa (preferably >5 Pa) is achieved in the room.
- Another option can be having stand-alone room air-conditioners, the number and tonnage of ACs depend on the room size.

- As these ACs cause recirculation of cool air, there must be outdoor air intake through slightly open windows and exhaust by natural exfiltration or intermittent exhaust fan usage.
- Keep the room temperature between 24°C and 28°C and maintain relative humidity between 40% and 70%.
- In humid climates, set the temperature closer to 24°C for de-humidification and in dry climates closer to or at 30°C and use fans to increase air movement.
- This will make working somewhat comfortable while wearing PPE, especially during the summers.

- Negative pressure could be created by putting up exhaust fans which will drive air out of the room.
- Treatment of exhaust air can be performed preferably by high efficiency particulate air (HEPA) filtration.
- If filtration is not possible, then the exhaust air shall be let off into the atmosphere through an upward plume at a height of 3 m above the tallest point of the building, thereby lowering the viral load concentrations to insignificant levels by dilution.
- For this to be achieved the exhaust outlet shall be connected to ducts reaching the top of building and away from air intake points.

A recent Expert panel Consensus guideline from AMASO suggests Rule of 20 in 2020 PANDEMIC which is;

1. 20 number of air changes per hour minimum (ideally > 25) in the theater.
2. 20 minutes before endotracheal intubation and extubation to keep AC and positive pressure switched off
3. 20 minutes after intubation to enter OT for surgeons and nurses
4. 20°C AC temperature setting
5. 20 minutes minimum waiting time after patient is transferred out to start cleaning the theatre

Appliance Disinfection, Hygiene and Waste Management

- Environmental sanitization
- PPE undressing and removal
- Waste disposal
- Hand hygiene
- Linen management
- Manpower

Environmental sanitization

- Cleaning should progress from the least soiled (cleanest) to the most soiled (dirtiest) areas and from the higher to lower levels so that debris may fall on the floor and is cleaned last.
- After cleaning, the following disinfectants and defined concentrations can be used on environmental surfaces to achieve a >3 log10 reduction of human coronavirus, and they are also effective against other clinically relevant pathogens in the health-care setting.
- Apart from medical devices, surfaces of operating tables, IV stands, footstools etc., and all areas where COVID 19 patients have transited must be carefully sanitized too.
- Some recommended agents are:
- Ethanol 70% to 90%
- Chlorine-based products (e.g., hypochlorite) at 0.1% (1000 ppm) for general environmental disinfection or 0.5% (5000 ppm) for blood and body fluids large spills
- Hydrogen peroxide >0.5%
- Contact time of a minimum of 1 minute is recommended for these disinfectants or as recommended by the manufacturers.

Waste disposal

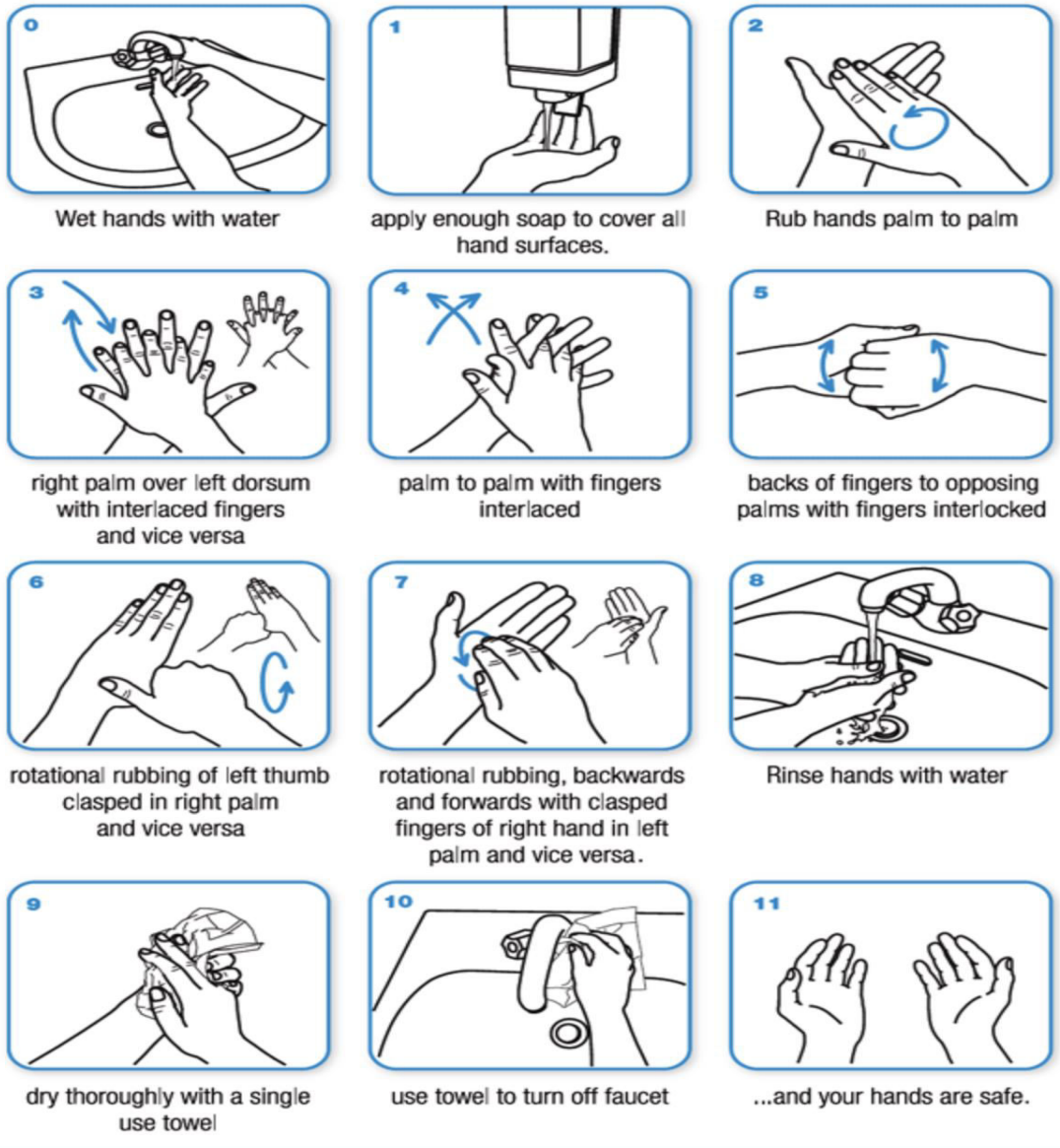
- It is advisable to set up a dedicated container for hazardous medical waste immediately outside the OT, to immediately dispose of all contaminated disposable material and PPEs.
- It is recommended to use double layered bags to pack/store Covid 19 related biomedical waste with “Covid-19 waste” label.
- Containers should be closed and sealed before being transferred to the collection point.
- All sharps should be disposed off in a dedicated rigid plastic container.
- There is an important and urgent need for all health care worker (HCWs) to be sensitized about segregated and protected disposal of Covid 19 waste.
- If safety issues are not addressed, it can pose risk to the health of sanitary workers and thereafter the community.
- They must wear recommended PPE while handling and transporting the waste.

COVID WASTE DISPOSAL

Hand hygiene

- The term “hand hygiene” includes both hand washing with either soap and water, and use of alcohol-based products (gels, rinses, foams) that do not require the use of water.
- It is important to ensure the availability of hand rub products at all times in the ambulance to ensure hand hygiene compliance.
- Hand hygiene should be meticulously performed recalling the “5 movements of hand hygiene” as advocated by WHO.
- Using alcohol based handrub (ABHR) with greater than 60% ethanol or 70% isopropanol in healthcare settings is suggested by CDC.
- Hands should be washed with soap and water for at least 20 seconds when visibly soiled, before eating, and after using the restroom.

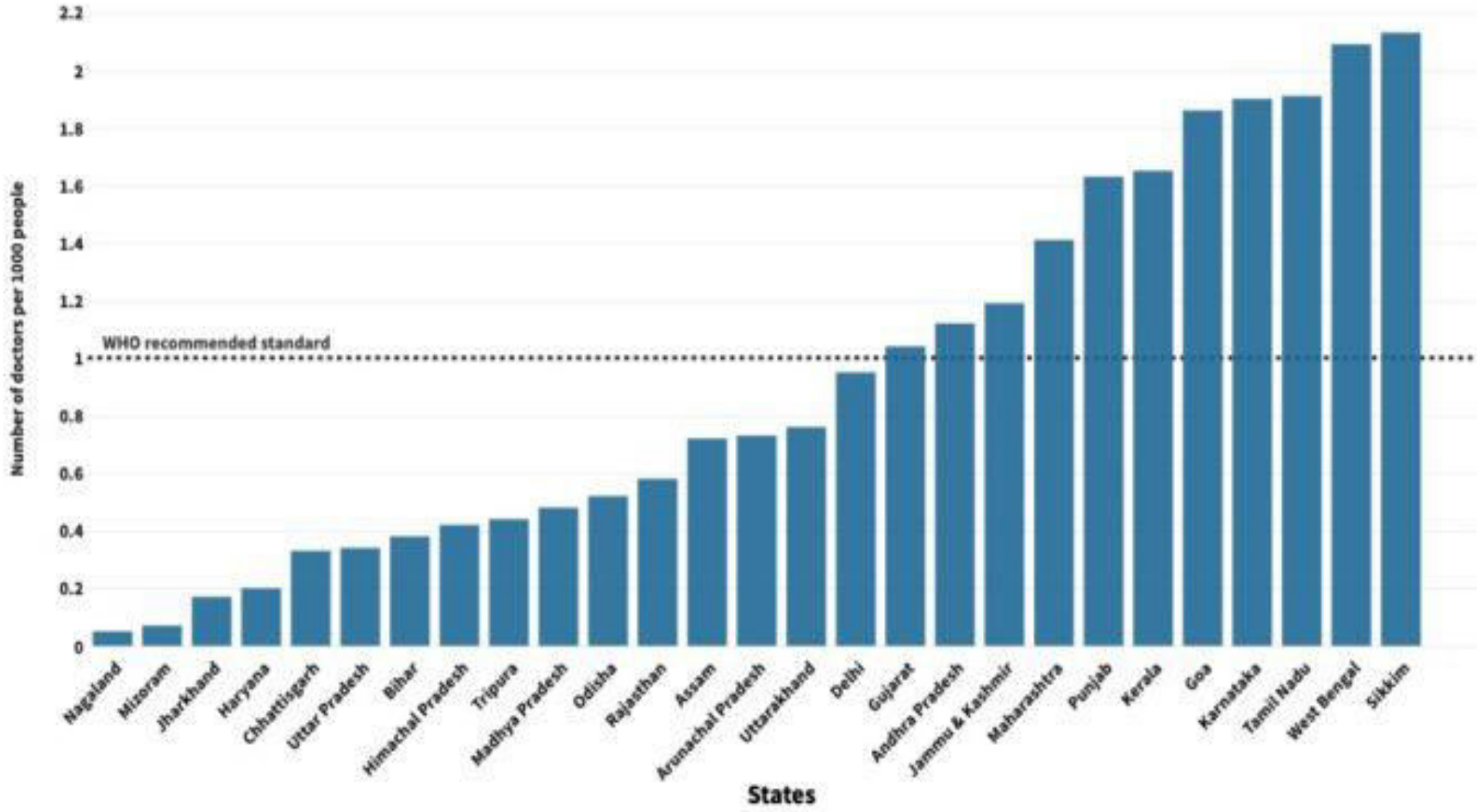
Handwashing – crucial step to prevent spread of covid 19



Manpower

- The number of health workers posted is determined by the nature and severity of sickness of patients
- If the healthcare staff follows the safety norms, there should not be any need of quarantine as PPEs are quite effective.
- High-risk contacts will be quarantined for 14 days, tested as per Indian Council of Medical Research (ICMR) testing protocol, actively monitored for development of symptoms and managed as per laid down protocol.
- Low risk contacts shall continue to work.
- However, a cooling off period, if possible is desirable after a posting in COVID 19 area.
- An efficient training module with refreshers must be in place to train all health workers.

Doctor to population ratio for Indian states



Source: National Health Profile, India 2019 • Data was unavailable for Manipur, Meghalaya, Telangana and Union Territories except Delhi

Surgery

- Consent and ethics
- Checklist
- Energy sources
- Open or laparoscopic surgery

Consent and ethics

- Informed consent for surgery, which is a critical component of surgical practice, has become a challenging issue in the time of COVID 19 infection.
- The true impact of asymptomatic or pre-symptomatic COVID 19 disease on physiologic risks of surgery and/or anesthesia is not yet understood.
- The risk of nosocomial COVID 19 acquisition for a patient coming to the hospital, nor the risk of transmission of COVID 19 from unsuspectedly infected patients to the operative team members is known.

- While emerging evidence suggests increased cardiorespiratory and microembolic/thrombotic complications in symptomatic COVID 19 positive patients, there remains considerable uncertainty the extent to which the risks of undergoing an operation or general anesthesia are increased in asymptomatic or pre-symptomatic individuals.
- It has become important to convey to the patients that the COVID 19 pandemic has changed day-to-day hospital operations in ways that have the potential to significantly impact their perioperative care and experience due to man power and resource shortages.
- The treatment of postoperative complications can be impacted by limitations in diagnostic or interventional services including imaging, interventional radiology, or endoscopy due to COVID 19 disruptions in services.

Check list

Preoperative:	Intraoperative:	Postoperative:
Minimize traffic, keep patient chart & staff belongings outside OT, COVID 19 related notifications, availability of masks & PPE, checking viral filter between patient & circuit, Surgeon entering 20 min after intubation and WHO Checklist as usual.	perform Time out, Only essential personnel during surgery and extubation,	OT documents placed in plastic sleeve, Remove PPE after patient transferred, wait one hour after extubation to clean operating room, carefully handle specimen, sanitization of surfaces, all waste materials from OT placed in double plastic bag for disposal.

COVID 19, coronavirus disease; OT, operation theatre; PPE, personal protective equipment; WHO, World Health Organization.

Energy sources

- Cold hemostasis is the method of choice.
- Surgical drains should be used only if necessary.
- Ultrasonic scalpels or electrical energy devices used in surgery can produce large amounts of surgical plumes during laparoscopic or open surgery, and smoke evacuation and filtration systems can be used both at the time of laparoscopy and laparotomy.
- Out of all the energy devices, Harmonic Scalpel™ produces maximum aerosol and bipolar scalpel being the least producing.
- The energy sources should be used at the lowest power setting and charring of tissues should be avoided to minimize the creation of smoke.
- Use of monopolar electrosurgery, ultrasonic dissectors, and advanced bipolar devices should be minimized, as these can lead to particle aerosolization.
- If available, monopolar diathermy pencils with attached smoke evacuators should be used.
- The smoke evacuator must be ideally placed within 2 cm of the source, with 50% loss of capture for every 1 cm from the source of the plume.

Open or laparoscopic surgery

- Though laparoscopy can lead to aerosolization of blood borne viruses, there is no evidence to indicate that this effect is seen with COVID 19, nor that it would be isolated to minimal invasive surgery (MIS) procedures.
- SARS-CoV-2 RNA has also been detected in blood and stool specimens, but it is unknown if infectious virus is present in these extrapulmonary specimens or transmission of COVID 19 has been documented through this route.
- Furthermore, surgery in patients with HIV and hepatitis B and C has been ongoing for decades, without documented increased risk of transmission from the surgical plume or laparoscopic pneumoperitoneum to surgeons, anesthesiologists, or OT personnel.
- Laparoscopic techniques, in fact significantly minimize exposure of surgeons to blood-borne pathogens as compared to laparotomy.

Open or laparoscopic surgery

- The practical tips for laparoscopy are:

  - Incisions for ports should be as small as possible to allow for the passage of ports but not allow for leakage around ports;
  - CO_2 insufflation pressure should be kept to a minimum and an ultra-filtration (smoke evacuation system or filtration) should be used, if available;
  - All pneumoperitoneum should be safely evacuated via a filtration system before closure, trocar removal, specimen extraction or conversion to open.

Table 3 COVID-19 surgical patients' management

Key aspects in COVID-19 surgical patient management
All suspected or infected patients must be managed with the maximum attention.
All personnel in contact with the patient must wear PPE.
Transfers must be protected.
Infected patients must be moved as little as possible through the hospital.
Transfer routes must be precisely planned and be as short as possible.
The COVID operating area should be in a dedicated and possibly separate area.
COVID operating room must be dedicated and as close as possible to the entrance of the theater block.
Disposable material should be preferred.
Minimal material should be used for each intervention.
Transport personnel should be the same from transport origin to destination.
Once the patient has entered, the OR doors must be closed.
Operators (i.e., surgeon, anesthetist, nurses, technicians) should enter the OR in a timely manner to minimize exposure to infected patients.
Personnel involved in the intervention should not leave the OR during the procedure.
High OR air exchange cycles are recommended (> 25 exchanges/h).
Clinical documentation must remain outside the OR
At the end of each intervention all disposable materials must be disposed of and all surfaces and electromedical devices accurately cleaned and disinfected.
PPE must be removed and disposed of outside the OR in dedicated doffing areas ensuring the virus is not transmitted to the healthcare worker.
OR and surrounding donning/doffing areas must be sanitized as soon as possible after each procedure.
After each procedure, all involved personnel, whenever possible, should shower.
Recovery phase after surgery must be done in OR, before transfer the ward/ICU.

Conclusions

- SMS viz. ‘social distancing’, ‘masks’, ‘sanitizers’ must be practiced sincerely.
- In the absence of epidemiological data on this new virus, the hospital administration will have to implement stringent precautions for the safety of patients and hospital staff.
- Proper PPE is the most important in this regard.
- It is recommended that the risks of Covid infection are clearly mentioned in the consent form.
- The role of proper air circulation and conditioning while doing procedures is to be stressed, as there is some evidence that the virus may be airborne instead of spreading by droplet infection.
- One has to remain vigilant, keep updating information and implement evidence based measures.
- As more evidence-based knowledge of SARS-Cov 2 is gathered, these measures can be made part of universal precautions.

THANK YOU