



Surgical Precautions for Urologists in the Era of COVID-19

Ming-Chun Chan, Jia-Lun Kwok, Sharon E.K. Yeo, and Yew-Lam Chong

Since our article detailing Urologists' efforts in Singapore during its initial outbreak,¹ COVID-19 has become a global pandemic. As incidence and mortality rises worldwide, countries have instituted crippling lockdowns. Singapore has not been immune, resulting in nation-wide restrictions and "circuit breaker" measures.² It is evident that the medical community must prepare for a prolonged effort to not only contain COVID-19, but continue care for non-COVID-19 patients.

This article aims to share surgical precautions and considerations to keep Urologists, surgical teams, and healthcare workers (HCW) safe when performing procedures and operating on confirmed, suspected, or high-risk COVID-19 patients.

We propose 3 key concepts to achieve this:

- 1) Triage
- 2) Operating theatre (OT) management
- 3) Personal protective equipment (PPE)

TRIAGE

Triaging for acuity of urological conditions is crucial to reduce strain on surgical services and minimise hospital attendance. Hospital resources are severely constrained by ventilated COVID-19 patients, anaesthetists should be diverted from elective surgery to intensive care units, and drugs for elective surgery should be conserved for critical care. Conservative measures must therefore be strongly advocated wherever clinically appropriate. Proietti et al have advised on endourological stone management by suggesting a flowchart including phone screening,³ and Gillessen et al have advised on systemic therapy in urological cancers, prioritising regimens with clear survival advantage and curative treatment.⁴ Stensland et al have published

guidelines for triaging Urologic surgeries during the COVID-19 pandemic,⁵ as have the European Association of Urology⁶ and American Urological Association,⁷ which should be applied within local context of different countries, healthcare systems, and hospitals internationally.

In our institution, all elective and emergency admissions are evaluated for risk of COVID-19 based on symptoms, contact and travel history. In [Figure 1](#), we demonstrate our triaging workflow. Patients meeting screening criteria are tested with nasopharyngeal swabs, using reverse transcriptase polymerase chain reaction assay with an average turnaround time of 4-6 hours. Although variable on a case-by-case basis, and often in consultation with a round-the-clock infectious disease team, 2 consecutive negative swabs 24-hours apart allows deisolation of suspected COVID-19 patients.

Ascertaining clinical urgency determines if time is available for COVID-19 testing before surgery. In life or organ-threatening cases where waiting 4-6 hours for one COVID-19 swab is not possible (Fournier's gangrene, testicular torsion, hemorrhagic neoplasms, etc.), surgery is performed assuming COVID-19 exposure. Simple procedures should be done at bedside or in procedural or endoscopic rooms whenever possible, to minimise exposure of ancillary HCW and OT staff.

While triaging guidelines are important during crises, the constantly evolving situation and resource availability means it is crucial to remain flexible. Senior urologists should be assigned as gatekeepers for surgeries and procedures, reviewing each patients needs within the limitations of hospital resources and the local COVID-19 situation.

OT MANAGEMENT

Once decided for surgery, the first step is planning patient transfer. Accompanying HCW should be in appropriate PPE. The patient should be wearing a surgical mask at all times, placed above nasal prongs if oxygen is required. Pre-planned routes should be designated to minimize human traffic, while being direct. Security officers control movement using dedicated, demarcated COVID-19 elevators, which should be regularly cleaned, and should not be utilised for non-COVID-19 patients. ICU transfers should include dedicated ventilators and resuscitation equipment, with careful management of endotracheal tubes including clamping during change of ventilators to prevent aerosolization.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Declarations of interest: none

From the Department of Urology, Tan Tock Seng Hospital, Singapore; the Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore; and the Yong Loo Lin School of Medicine, National University Singapore, Singapore

Address correspondence to: Ming-Chun Chan MBBS, Department of Urology, Tan Tock Seng Hospital, TTSH Medical Centre, 11 Jalan Tan Tock Seng, Level 2, Singapore 308433. E-mail: mingchunchan@hotmail.com

Submitted: May 21, 2020

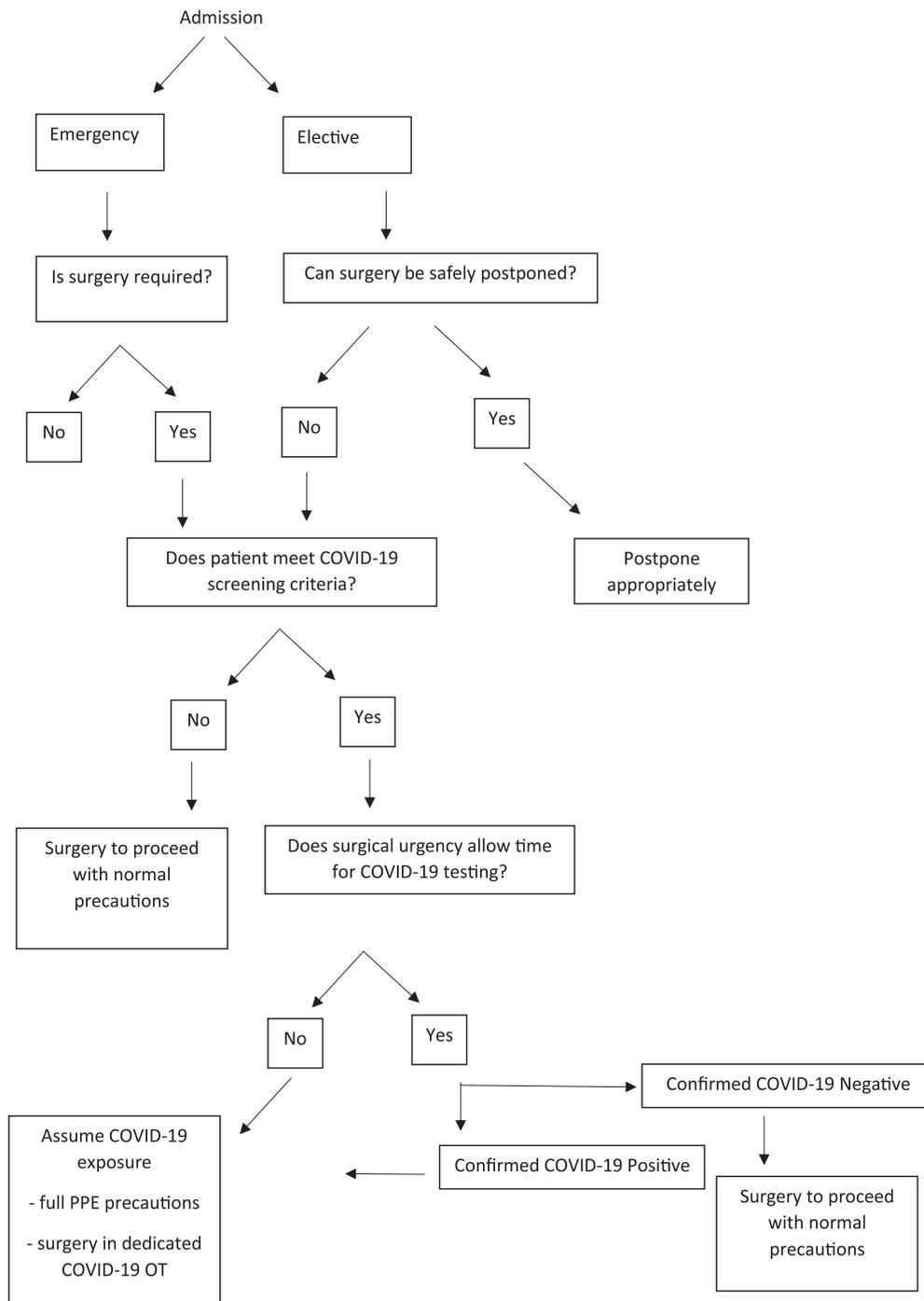


Figure 1. Triage workflow.

Within our OT complex, 3 OTs have been purpose-built for handling infectious pathogens including airborne microbes.⁸ These dedicated negative-pressure OTs have individual air-handling units and HEPA filtration of exhaust air. Each OT is accessed by 2 air-lock anterooms. Each anteroom is served by dual interlocking doors to ensure negative pressure gradient is maintained while sufficient air exchanges occur in the time between door closure and reopening. All OT staff don and doff PPE in the anterooms. Understanding the use of airflow in OTs help urologists minimize the risk of COVID-19 transmission.⁹

In Figure 2, we demonstrate and suggest Urology/Surgical and scrub team movement, Anaesthesia team movement, and patient movement in and out of OT.

COVID-19 transmission is primarily by respiratory droplets.¹⁰ Surgical teams need to recognize aerosol generating procedures at high risk of aerosolizing the SARS-CoV-2 virus, including endotracheal intubation. To reduce transmission risk, regional anaesthesia should be advocated over general anaesthesia (GA) wherever possible. Regional anaesthesia has the added advantage of avoiding respiratory complications and post-operative

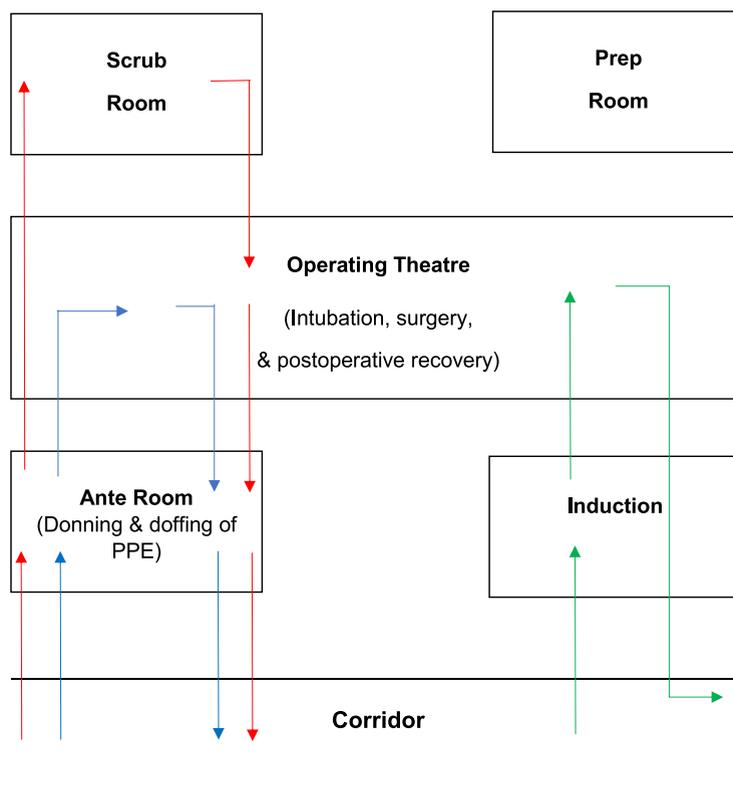


Figure 2. Urology/Surgical and scrub nursing team movement (red), Anesthesia team movement (blue), and patient movement (green). (Color version available online.)

nausea associated with GA. Reports of SARS-CoV-2 in stool¹¹ should dictate that the rectum is covered or draped during endoscopic work, and handling of bowel (eg, ileal conduit formation) is minimized. A recent study by Ling et al reported limited persistence of SARS-CoV-2 nucleic acid in urine with no correlation of urine spillage and virus transmission.¹² Nonetheless, endoscopic procedures and handling of urine should entail necessary splash precautions.

Should GA be necessary, endotracheal intubation is preferred over a laryngeal mask airway as it is a closed circuit with less propensity to leak around the seals. In our institution, during intubation, all nonessential personnel including the Urology team must leave the main OT and remain outside until 2 minutes (duration dependent on air volume changes per hour of OT¹³) after intubation. The same is repeated for GA reversal. Both induction and reversal should only be done in the main OT by essential anaesthetic personnel in full PPE. Anesthetic machines, equipment and drug trolleys should be dedicated to the OT.

To minimize transmission risk, it is crucial to limit operating time and movement of the surgical team in theatre. Preoperative huddles by the Urology team with the anesthetic, nursing, and ancillary teams are crucial to communicate anticipated surgical or anesthetic issues, planned surgical steps, equipment required, and role of each member.

Other surgical considerations aim to reduce intraoperative time, inpatient stay, and transmission risk. For

example, choice of ureteric stents may favor those allowing longer intervals between changes and stone surgery may favor approaches with higher clearance rates to minimize staged surgery. Theoretical risk of virus aerosolization from use of electrocautery and pneumoperitoneum in laparoscopic surgery means minimizing their use is a consideration, with measures such as lowering electrocautery settings and careful management of trocar valves and air release kept in mind.¹⁴ Wherever possible, the most experienced available surgeon should be assigned.

Surgical samples may be required to be sent out of OT for frozen section histology, and unexpected equipment may require delivery. The circulating nurse as part of the surgical team should not leave OT in PPE, and therefore, should leave samples to be passed out in an anteroom. After leaving the anteroom, a separate nurse stationed outside OT should enter the anteroom (after an appropriate time interval) to retrieve it. The same should be repeated in reverse for delivery of equipment to OT, therefore minimizing unnecessary movement of the surgical team, and changing of PPE.¹⁵

Postoperative recovery should be in the main OT or anteroom. Transfer should ideally be by the same personnel. Ample time should be given for thorough disinfection of all OT surfaces due to the propensity of coronavirus to linger on surfaces.¹⁶ Removal of PPE should be supervised by an infectious control nurse to prevent contamination during this process,¹⁷ and the surgical team should shower before leaving the OT facility.

Patient Profile	OT Location	PPE for OT staff
A) Confirmed COVID-19	COVID-19 OT A	Tier 2 PPE is mandatory for all OT staff. OT personnel involved in AGP or surgical team involving in long surgery may consider the use of PAPR if trained.
B) Known pneumonia, air-borne precaution (e.g. tuberculosis), or unclear COVID-19 status	COVID-19 OT B	Tier 2 PPE is mandatory for all OT staff. OT personnel involved in AGP or surgical team involving in long surgery may consider the use of PAPR if trained.
C) Low risk patients who do not fit profiles A) or B)	Regular, non-COVID-19 OT	Tier 1 PPE is mandatory for all OT staff. OT personnel involved in conduct of AGP should don additional PPE.

Figure 3. Patient profiles, appropriate OT location, and appropriate PPE.

PPE

Basic personal hygiene should be enforced including trimmed fingernails, tidy hair, and hand hygiene.¹⁸ Our institution has incorporated 2 tiers of PPE, with both tiers requiring eye protection, gown, gloves, and shower cap. Choice of mask is the difference between Tier 1 (surgical mask) and Tier 2 (N95 mask). In [Figure 3](#), we suggest appropriate OT locations and PPE for different patient profiles.

In our institution, bronchoscopy, oesophagogastroduodenoscopy, colonoscopy, nasoendoscopy, tracheostomy, thoracic surgery and dental procedures require performing staff to don full Tier 2 PPE or powered air-purifying respirators (PAPR), as these are potentially aerosol generating procedures (AGP). Urological endoscopy procedures require Tier 1 PPE, due to the lack of evidence that SARS-CoV-2 may be transmitted or aerosolized from urine.

To ensure patients are operated on in the appropriate designated OT, we suggest 3 patient profiles according to risk for COVID-19, which are as follows:

- A) Confirmed COVID-19
- B) Known pneumonia, air-borne precaution (eg, tuberculosis), or unclear COVID-19 status
- C) Low-risk patients who do not fit profiles A) or B)

Our dedicated COVID-19 OTs are split into 2 groups to minimise risk of transmission; COVID-19 OT A for profile A) patients and COVID-19 OT B for profile B) patients.

Disrupted global medical supply chains have resulted in worldwide concern over dwindling supplies, therefore the appropriate use and rationing of PPE is an important consideration and having designated OT staff dispense PPE materials appropriately should be considered, without compromising staff and patient safety.

CONCLUSION

As we continue to address this pandemic, we must not forget patients who still require Urological care and surgery. It is imperative that Urologists and all surgical staff are equipped with the knowledge and framework to ensure our own safety during COVID-19. By employing the concepts of (1) Triage, (2) OT Management, (3) PPE, and applying them to the local hospital and healthcare context, Urologists can keep ourselves, our colleagues, and our loved ones safe as we continue to care for all our patients.

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