

# What do urologists need to know: Diagnosis, treatment, and follow-up during COVID-19 pandemic

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## ABSTRACT

Coronavirus disease 2019 (COVID-19) is an infectious disease which is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). It has had unprecedented effect on healthcare systems globally with severe impact on every specialist service within the hospital including urology. While it affects the respiratory system causing symptoms ranging from fever, cough, dyspnea, diarrhea, nausea, myalgia and fatigue, it eventually causes pneumonia and respiratory distress needing oxygenation and ventilation. Laboratory diagnosis is required to confirm the diagnosis of COVID-19. Radiological changes are seen on chest XR or CT scan of patients. The surge in patients affected by the disease has led to extreme pressures on healthcare systems by the overwhelming number of critically unwell patients. This scenario has presented challenges to maintain other emergency and essential services. Reallocation of staff, wards and equipment has resulted in cancellations of many surgical procedures, requiring urologists to select only the most essential or critical procedures. The outpatient face-to-face clinics are also cancelled or changed to telephone or video consultations. In some hospitals, urologists are required to work outside of their usual scope of practice helping their respiratory and intensive care unit colleagues. The pandemic is disrupting training and education opportunities for junior medical staff. In this review we provide guidance on the diagnosis and management of COVID-19, the influence it has on urological practice and consider the long-term implications that may be of consequence for years to come.

**Keywords:** Anaesthesia; Corona virus; COVID-19; endourology; laparoscopy; training; urology; ventilation.

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## Introduction

In December 2019, Chinese authorities declared clusters of pneumonia cases, which has since been attributed to the virus named Severe Acute Respiratory Syndrome - Coronavirus-2 (SARS-CoV-2), which is now commonly known as COVID-19.<sup>[1,2]</sup> The virus has rapidly spread around the globe, affecting almost every nation and was characterized as a pandemic by WHO on 11<sup>th</sup> March 2020. As of 29<sup>th</sup> March 2020, there are 710,950 confirmed cases with 33,552 deaths.<sup>[3]</sup> Table 1 summarizes the recorded pandemics in the last 2 centuries<sup>[4,5]</sup> and Table 2 compares COVID-19 to other known coronaviruses, with this virus having a fatality rate of around 5%.<sup>[3,6,7]</sup>

Drastic measures have been taken by governments worldwide in an attempt to curb the

pandemic ranging from school closures and social distancing to complete lockdowns.<sup>[8,9]</sup> Major changes have been implemented in health care systems worldwide including the reallocation of staffing, closures of wards and cancellation of all routine non-oncological and certain oncological surgical procedures, with the outpatient clinics becoming telephone-led or video-consultation in some cases.<sup>[10-12]</sup>

Although COVID-19 only sporadically involves the urinary tract, urologists may be assessing patient's with fever secondary to presumed urinary tract infection (UTI) or urosepsis. In some countries, they also help by working on the frontline with assessment and treatment of COVID-19 patients. Surgical procedures may involve open surgery, laparoscopic surgery and those patients with ureteric stents or nephrostomy tubes in situ or those

**Table 1. Table showing the history of influenza and other respiratory pathogens pandemics<sup>[4,5]</sup>**

Name of pathogen	Common name	Time period	Estimated deaths
A (H1N1) virus	Spanish Flu	1918-1919	20-50 million
A (H3N2) virus	Asian Flu	1957-1958	1-4 million
A (H3N2) virus	Hong Kong Flu	1968	1-4 million
A (H1N1) virus	Swine Flu	2009-2010	151,700-575,400

**Table 2. Comparison of geographical distribution, confirmed cases and estimated deaths in SARS-CoV<sup>[6]</sup>, MERS-CoV<sup>[7]</sup> and SARS-CoV-2<sup>[3]</sup>**

Name of virus	Time period	Geographical Distribution/ Countries and territories affected	Laboratory confirmed cases	Estimated deaths	Fatality rate
SARS-CoV	2002-2003	26	8437	813	9.6%
MERS-CoV	2012-	27	2494	858	34.4%
SARS-CoV-2	As of 29 <sup>th</sup> March 2020	199	710950	33,552	4.7%

who have undergone recent urinary tract instrumentation. Some of these patients will inevitably be experiencing symptoms secondary to COVID-19 and it is important to be mindful of this when assessing these patients.<sup>[13]</sup>

## Diagnosis

Approximately 80% of patients present with mild illness, although the elderly and patients with co-morbidities are at high risk of deterioration.<sup>[12]</sup> The WHO clinical classification of disease include: mild disease, pneumonia and severe pneumonia which is then further categorized into adults and children.<sup>[14]</sup> As the majority of cases present with mild symptoms, a high index of suspicion is required and all patients presenting with a fever and/or respiratory symptoms should be treated as having COVID-19 until proven otherwise.<sup>[15]</sup> Most common symptoms include fever, cough, dyspnea,

myalgia and fatigue.<sup>[16]</sup> Gastrointestinal symptoms are not common, however patients can present with nausea or diarrhea one to two days prior to onset of fever and acute respiratory illness.<sup>[15]</sup>

Laboratory diagnosis is required to confirm diagnosis of COVID-19. Real-time reverse transcription polymerase chain reaction (RT-PCR) is used to analyze nasopharyngeal or oropharyngeal aspirates in ambulatory patients. In severe cases, lower respiratory specimens from sputum and/or endotracheal aspirate or bronchoalveolar lavage can be used. If a patient with a high index of suspicion for COVID-19 presents with a negative result, additional specimens should be sent (such as blood, stool and urine). In order to exclude COVID-19, guidelines recommend two consecutive negative tests, which are taken at least one day apart.<sup>[15,16]</sup>

The most common hematological finding shows leukopenia or leukocytosis with a cardinal feature of COVID-19 being lymphopenia.<sup>[17]</sup> Studies have shown that patients with suspected pneumonia due to COVID-19 commonly present with changes on radiological imaging. Chest x-rays were found to show unilateral or bilateral lung infiltrates. A recent meta-analysis showed that up to 97% of patients had abnormal chest computed tomography (CT) findings, showing bilateral ground-glass opacity or consolidation.<sup>[18]</sup> In China, CT is used as the primary radiological imaging modality for all suspected COVID-19 patients presenting with pneumonia.<sup>[15]</sup> If an abdominal CT scan is indicated in a patient presenting with abdominal pathology, a CT chest should also be performed.<sup>[19]</sup> Table 3 shows a summary of the characteristics of COVID-19.<sup>[1,2,15-29]</sup>

### Main Points:

- Coronavirus disease 2019 (COVID-19) is an infectious disease affecting the respiratory system, which has had unprecedented effect on healthcare systems globally with severe impact on specialist services.
- As the world reels with the effect of COVID-19, there will be impact on surgical training and potential problems with trainee progression.
- Patient suffering and the oncological consequences of delay in definitive treatment could worsen clinical outcomes and its impact would be felt far beyond the actual disease control, and while the waiting time could last months, the ripples it creates will last for years to come.

**Table 3. A table showing a summary of COVID-19**

What is COVID-19?	Coronavirus disease 2019 (COVID-19) is a disease caused by the virus SARS-CoV-2 <sup>[2]</sup>
Where was the origin of this virus?	First cluster of cases were reported from Wuhan City, Hubei Province, China. The outbreak was reported to be linked to a large seafood and live animal market. <sup>[11]</sup> The exact origin currently remains unknown but there have been suggestions that it is from a zoonotic origin. <sup>[20]</sup>
How does SARS-CoV-2 cause disease?	SARS-CoV-2 is an enveloped RNA virus. Pathophysiology remains unknown but studies have suggested that it can bind to angiotensin-converting enzyme 2 (ACE2) receptors in humans. <sup>[21,22]</sup> On binding to these receptors, it allows entry into the human host cells leading to an estimated median incubation period of 5 days and the period can range from 1-14 days. Subsequently, following the incubation period, it then can cause symptoms. <sup>[23]</sup>
How is the disease transmitted?	The risk of transmission is believed to be related to viral load and shedding of the virus. Transmission is believed to be possible during the incubation period. <sup>[15,24]</sup>  Transmission is most commonly thought to be through respiratory droplets, and this explains why aerosol-generating procedures are deemed as high risk and full PPE is required. The virus has also been tested in bodily fluids including sputum, stool, blood and conjunctival fluids. <sup>[15,25]</sup> There is limited evidence of the virus being tested in urine. <sup>[26]</sup>
What are the common symptoms?	Fever, cough, dyspnea, myalgia and fatigue. <sup>[15,16]</sup>
How is it diagnosed?	RT-PCR is the most common laboratory test used for diagnosis. <sup>[15,16]</sup> A good history, blood results and radiological imaging can be used to help diagnosis. <sup>[15,17-19]</sup>
What are the treatments so far?	The primary aim is to isolate all suspected or confirmed cases to prevent further transmission. In severe cases where hospital admission is required a step-wise approach is advised.  Close monitoring of clinical observations is essential to identify signs of deterioration. Early escalation to critical care is advised as respiratory distress can progress rapidly in this disease.  Supportive care will be commenced with oxygen therapy and simple airway management. Fluids are advised to be used conservatively as it may worsen oxygenation if used in no evidence of hypovolaemic shock. <sup>[15]</sup>  Empirical antibiotics should be commenced prior to microbiology and virology results.  Antipyretics can be used to relieve fever. There is no scientific evidence relating to the use of NSAIDs affecting prognosis in COVID-19 but concerns have been raised. Paracetamol is deemed to be safe to use. <sup>[15]</sup>  If limited response to therapies above, early critical care support will be required to provide advanced ventilatory support. <sup>[28]</sup>
Is there a vaccination?	No, there currently is not a vaccine for this novel virus. The NIH are enrolling for their phase one clinical trial. <sup>[29]</sup>
PPE: personal protective equipment; NIH: National Institute of Health	

## How does this affect clinical practice?

In an attempt to manage the pandemic, healthcare institutes worldwide have taken drastic measures including reallocation and reassignment of staffing and pre-empted bed space, especially critical care areas for COVID-19 treatment. As the outbreak worsens, ward closures and drop in staffing levels are commonly seen. This creates major changes to daily clinical practice and in many cases, the urologist is working outside of usual scope of practice such as managing screening centers to assess potential COVID-19 cases.<sup>[30]</sup> Some countries have also

built rapid assessment centers and specialized isolation type hospitals to deal with the mass influx of these patients.

## Anaesthesia

COVID-19 has greatly impacted the usual clinical practice of anaesthetists. In many healthcare institutes where the outbreak is present, anaesthetists have worked very closely with the intensive care medicine team utilising the cross-over of skill sets and knowledge to treat the critically unwell patients with COVID-19. In the UK, The Royal College of Anaesthetists and

Faculty of Intensive Care Medicine have collaborated to produce guidelines advising on airway management and personal protective equipment (PPE) used to treat COVID-19 cases.<sup>[28]</sup>

Airway management carried out by anaesthetists are aerosol-generating procedures which pose a high risk of transmission. These procedures include endotracheal intubation and extubation, tracheostomy insertions, tracheal suction without a “closed in-line system”, disconnection of ventilatory circuits during use and non-invasive ventilation (NIV).<sup>[31]</sup> Non-invasive ventilation should be avoided where possible outside areas not using full PPE, in COVID-19 and if patients develop respiratory distress with deterioration, early intubation should be considered.

In circumstances of suspected or confirmed cases requiring emergency surgery, careful planning and considerations is required. Regional anaesthesia should be preferential for any non-airway operative procedures.<sup>[32]</sup> If intubation is required, following factors should always be considered<sup>[33,34]</sup>:

- Endotracheal intubation to be used rather than laryngeal mask.
- Intubation to occur in a negative-pressure environment.
- Minimal members of staff present during induction.
- Full PPE should be used including eye protection, fluid resistant gowns, gloves and a particular respirator (which needs to be fit tested).
- Any PPE heavily soiled during induction should be replaced immediately.
- Same ventilators used for COVID-19 cases.
- The use of heat and moisture exchanger (HME) on the expiratory limbs of the ventilators.
- Minimise any disconnection of the ventilatory circuit during use.

### Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)

NSAIDs are commonly used in many urological conditions due to their effective analgesic and anti-inflammatory properties. They are particularly useful in the management of renal colic as they reduce ureteric peristalsis as well as glomerular filtration which therefore reduces renal pelvis pressure.<sup>[35]</sup>

There has been concern raised that the use of NSAIDs in COVID-19 can worsen prognosis and should be avoided. There is evidence to suggest that in bacterial pneumonia, NSAIDs can prolong the illness or increase risk of complications including empyema or lung abscess.<sup>[36]</sup> However, the MHRA, FDA and WHO advise that there is no scientific evidence relating to the use of NSAIDs in COVID-19.<sup>[37]</sup> They suggest using paracetamol rather than NSAIDs if patients develop symptoms suggestive of COVID-19 (e.g. fever), but to continue taking them if prescribed for another reason. Therefore, current guid-

ance would suggest it is safe to prescribe NSAIDs in renal colic providing there is no evidence that the patient has COVID-19.<sup>[38]</sup> However, this should be considered on a case-by-case basis and the patient should be carefully counselled.

### Laparoscopic Procedures

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)<sup>[39]</sup> and The Royal College of Surgeons (RCS)<sup>[19]</sup> recommend avoiding laparoscopic surgery wherever possible and suggest using non-surgical approaches to management or open surgical procedures. This relates to concern regarding the potential exposure to aerosolized biological fluid carried within surgical smoke.<sup>[11]</sup> Additionally, the removal of trocars or surgical specimens can result in an explosive release of smoke.<sup>[40]</sup> This can be mitigated by the use of smoke filters, smoke extraction devices and use of PPE, however the risk is not completely eliminated.<sup>[40]</sup>

### Urine and Fecal Samples

Wang et al.<sup>[41]</sup> found that SARS-CoV-2 was identified in the faeces of 29% of patients that had COVID-19, suggesting that surgical procedures that involve potential exposure to faecal contents had the risk of transmission. This may increase the exposure to the virus when performing trans-rectal procedures including trans-rectal biopsy. Interestingly, they found no evidence of SARS-CoV-2 RNA in urine samples taken, but a further study has shown evidence of RNA in urine samples in a minority of cases (6.9%).<sup>[26]</sup>

### Effects on outpatient clinics

Outpatient clinics have been largely affected where many scheduled clinics were postponed or cancelled. The amount of rescheduling depended on the extent of disruption due to the pandemic in each area. Some centers that are severely affected only offered diagnostic clinics to investigate possible underlying malignancies with a triage system prior to the consultation, so only patients without fever or respiratory symptoms can attend. All clinics have been one-to-one with clinicians wearing simple PPE like surgical masks. In some settings, telephone consultation and video-consultations have also been used.<sup>[42,43]</sup> Phone consultations have also been used to triage the urgency for surgical treatment. To avoid further hospital attendance, previous imaging has also been used in conjunction with phone consultations and postpone routine follow-ups.<sup>[30]</sup>

### Effects on surgical procedures

COVID-19 has resulted in unprecedented disruption to routine hospital service provision. Redeployment of anaesthetic staff to

**Table 4. A table showing PPE required according to transmission risk<sup>[10,46,47]</sup>**

Level of transmission risk	Clinical environment	PPE (Personal protective equipment) required
Low	More than two meters from the patient – Surgical outpatient clinic Clinical areas with no aerosol risk	Surgical masks Consider gloves Consider waterproof apron
Moderate	Clinical areas less than two meters from patients – e.g. examining or performing procedures under local anesthetics	Surgical mask but consider respirator mask if high suspicion or confirmed cases Gloves Waterproof apron Consider eye protection
High	Suspected or confirmed patients with COVID-19 – Surgical theatres with procedures under general anesthetics regardless of laparoscopy or open. High dependency or intensive care areas with suspected or confirmed cases of COVID-19.	Sterile donning and doffing of full PPE required Respirator mask Eye protection Two layers of gloves Two layers of waterproof long-sleeve gown

**Table 5. A table showing the stepwise approach to cancellations of urological surgeries<sup>[42,44]</sup>**

Non-essential	Low priority	High priority	Emergency
Circumcision	Robotic Prostatectomy	Orchiectomy for testicular cancer	Testicular torsion
Vasectomy	Cystectomy for low risk tumour	TURBT for high risk tumour	Scrotal abscess/ Fourniers gangrene
Surgery for BPH	Ureteroscopy	Nephrectomy (high risk/ IVC invasive)	Obstructed/ Infected Kidney
Incontinence surgery	Transperineal Prostate Biopsy	Nephroureterectomy (high risk)	Clot retention
Benign scrotal surgery	Nephroureterectomy (low risk)	Ureteroscopy for obstructive/infection ureteric stones	Urinary tract trauma
Infertility and Andrology	Asymptomatic ureteric calculi TURBT for low risk tumour	Penile cancer RPLND post chemotherapy Infected artificial urinary sphincters and penile prosthesis Urinary tract trauma Intravesical therapy for high risk bladder cancer	

TURBT: Transurethral resection of bladder tumour; RPLND: Retroperitoneal lymph node dissection

manage critically unwell patients requiring invasive ventilation has become a priority for all hospitals. Shortages of ventilators, hospital beds compounded with staff illness and the requirement for more intensive cleaning between cases have resulted in a reduction in the number of surgical procedures performed. Countries throughout Europe have suspended elective surgery to counteract this new stress.<sup>[42,44]</sup>

A stepwise approach to cancellation of services has been introduced by some centers. Initially, operations performed for benign

indications such as circumcision, urinary incontinence, benign scrotal pathology or surgery for benign prostatic hyperplasia (BPH) have been suspended.<sup>[30,44]</sup> Where necessary, alternatives such as urethral or suprapubic catheter for urinary obstruction secondary to BPH can be utilized until elective surgery can resume. At this point surgery for most oncological cases or other emergency indications would be continued. However, in situations where there is more severe disruption to elective services because of the effects of COVID-19 further measures may be necessary. This could include postponing definitive management

**Table 6. A table showing Non-Deferrable Urological Surgical Procedures<sup>[42,44]</sup>**

Non-deferrable surgical procedures	
Bladder Tumor	Radical cystectomy MIBC CIS refractory to third line therapy TUR-BT cT1+ suspected tumors
Testicular Cancer	Orchiectomy RPLND after chemotherapy
Kidney Cancer	Radical Nephrectomy cT3+ with/without renal vein or IVC
Upper Urinary Tract Cancers	Nephroureterectomy
Adrenal Tumors	Adrenalectomy Tumors >6 cm Suspected adrenal cancer
Penile Cancer	Partial/total Penectomy
Stones	Ureteral stent insertion/nephrostomy tube Obstruction/infection Ureterorenoscopy If stent insertion/nephrostomy tube options are not possible
Artificial urinary sphincters and penile prosthesis	Infected explants must be removed
Testicular torsion/Testicular trauma/Penile Trauma	Emergency Procedure
Scrotal abscess/ Fourniers gangrene	Emergency Procedure
Clot retention	Emergency Procedure
Urinary tract trauma	Emergency Procedure

TURBT: Transurethral resection of bladder tumour; RPLND: Retroperitoneal lymph node dissection; CIS: Carcinoma In-Situ; MIBC: Muscle Invasive Bladder Cancer; IVC: Inferior Vena Cava

of patients with ureteric stents in situ and surgery for malignancy in those deemed to be of 'low risk'.<sup>[42]</sup>

Emergency procedures for indications including scrotal abscesses or Fournier's gangrene, obstructed infected stone or testicular torsion should still be performed.<sup>[44]</sup> However, where possible procedures should be performed under local anaesthetic or alternative management options should be considered. In patients admitted with urosepsis secondary to infected obstructed stone, it may be possible for a nephrostomy to be placed under local anaesthetic rather than ureteric stent insertion under general anaesthetic.<sup>[44]</sup> This would reduce the risk posed to anaesthetic

staff by performing aerosol generating procedures. Another alternative would be to place ureteral stents under local anaesthetic at the bedside.<sup>[45]</sup> Though such options may be limited by availability of resources and center experience. In situations where ureteric stents are necessary, the use of stents on strings should be considered if possible, to reduce the need for a further procedure for stent removal. In many cases the patient would be able to remove the stent at home, obviating the need for a further trip to hospital.

Attendance at multidisciplinary team (MDT) meetings can be greatly affected due to illness, self-isolation and reallocation of

staffing. However, these meetings are pivotal for patient care, utilising expert input to prioritise the cases in order of clinical need.<sup>[30,42]</sup> Oncologists play a vital role to advise the feasibility of non-surgical treatment e.g radiotherapy or chemotherapy in the management of cases with malignancy. This needs to be carefully balanced with the risks posed by inducing immunosuppression with systemic chemotherapy.<sup>[44]</sup> Virtual meetings through video conferencing could be set up to maintain these meetings whilst conforming to social distancing measures.

All the surgical procedures should be assessed by the urology team in order to define if the procedure is deferrable or non-deferrable. The prioritized -non-deferrable- procedures determined by the team should be added in a 'pool of weekly procedures'. All the patients should be questioned in order to unveil the usual symptoms of COVID-19 the day before the surgery. Temperature measurements should be done before hospitalization and all the patients should be hospitalized with a surgical mask in order to prevent contamination of the urological wards. All the prioritized patients for surgical procedures would be tested with nasopharyngeal aspiration for COVID-19 if possible. The maximum capacity of the urology departments should be re-organized to reduce the number of beds for adequate social distancing between patients.<sup>[42]</sup>

High risk PPE (Table 4) is recommended for all the operative procedures performed on the suspected or positive COVID-19 patients. Surgeons should be aware of the viral contamination risk during the operation via aerosol effect of the gas used in laparoscopic surgeries and the surgical smoke in open surgeries. As is known viruses such as Hepatitis B can be detected in surgical smoke. Electrocautery devices should be used with the lowest possible settings in order to avoid high aerolisation risk. Smoke evacuators should be used with all the electrosurgery units whenever possible.<sup>[48,49]</sup>

Table 4<sup>[10,46,47]</sup> categories clinical areas and use of PPE. Table 5<sup>[42,44]</sup> summarises the stepwise approach to cancellation of urological procedures, and Table 6 shows non-deferrable urological surgical procedures.

## Future Implications

As the world reels with the effect of COVID-19, there will be impact on surgical training and potential problems with trainee progression. Patient suffering and the oncological consequences of delay in definitive treatment could worsen clinical outcomes. The impact of catching up on cancelled procedures is likely to have a significant impact on waiting times for all procedures. It seems that the impact would be felt far beyond the actual disease control, and while the later could last months, the ripples it creates will last for years to come.

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