



# Triaging urological surgeries to cope with the coronavirus-19 pandemic

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## **Purpose of review**

The coronavirus-19 (COVID-19) pandemic has led to strains on hospital resources and difficulties in safely and effectively triaging surgical procedures. In this article, we discuss the important considerations for triaging urologic surgeries during a global pandemic, mitigating factors on how to perform surgeries safely, and general guidelines for specific surgeries.

## **Recent findings**

Many urological procedures have been cut back due to the pandemic, with benign disease states being most affected whereas oncology cases affected least. Current recommendations in urology triage life-threatening conditions, or conditions that may lead to life-threatening ailments as a priority for treatment during the pandemic. Additionally, published recommendations have been put forth recommending all surgical patients be screened for COVID-19 to protect staff, prevent disease dissemination, and to educate patients on worse outcomes that can occur if infected with COVID-19 in the postoperative period.

## **Summary**

COVID-19 has caused worldwide shortages of healthcare resources and increased the need to ethically triage resources to adequately treat the urologic community. These resource limitations have led to increased wait times and cancellations of many urology surgeries that are considered 'elective'.

## **Keywords**

coronavirus-19, surgery, triage, urology

## **INTRODUCTION**

The World Health Organization declared coronavirus-19 (COVID-19) a pandemic on March 11, 2020. Hospitals were forced to divert surgical resources to prepare and care for ventilator level patients. The American College of Surgeons (ACS) along with hospitals across the globe have recommended the curtailing of 'elective' surgical procedures to decrease the spread of disease and to allow reallocation of resources to COVID-19-specific care [1]. Along with all surgical specialties, this reallocation has significantly impacted the surgical care of urologic patients.

The definition of 'elective' in surgery is difficult to define. Generally, surgical conditions that threaten life or limb, or conditions that may progress to such states without urgent treatment can be considered 'nonelective' [2]. The lack of a uniform definition and applying the life or limb mantra to determine 'elective' status can lead to subjective interpretations [2]. It is true that some cases may be postponed indefinitely, but many cases that fall under an 'elective' category are associated with progressive disease, which if not treated in due time can

often develop into life-threatening ailments (such as cystoscopy for tumor diagnosis and nephrolithiasis which has the potential for renal deterioration and infection leading to sepsis) [1].

In this article, we discuss the important considerations for triaging urologic surgeries during a global pandemic, mitigating factors on how to perform surgeries safely, and general guidelines on specific surgeries and disease states.

## **FINANCIAL IMPACT OF SURGICAL DELAYS**

The delay of all nonessential surgeries during the COVID-19 pandemic negatively impacted surgical care throughout most American hospitals, whereas

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**KEY POINTS**

- Triaging urology surgery during the COVID-19 pandemic in the face of limited resources is difficult but requires foundational ethics principles of nonmaleficence, beneficence, and justice.
- Despite limited direct evidence, all urologic patients undergoing surgery should have a COVID-19 swab completed prior.
- The risk of disease progression and mortality in uro-oncology has led to these procedures being least delayed when triaging cases during the pandemic.

also significantly reducing hospitals' total revenue [3]. Elective surgeries are major income generators for hospitals, accounting for up to two-thirds of total hospital revenue [4]. The pandemic is an unprecedented financial strain on the healthcare system. A recent American study found that national hospitals lost approximately \$1.53 billion in revenue during the pandemic from delayed pediatric surgeries alone [5]. Another US-based study estimated that – collectively – American hospitals lost \$22.3 billion in total income from delayed or cancelled elective surgeries between March and May 2020 [6].

Urologic surgeries consistently rank amongst the most commonly performed elective surgeries in these studies. Thus, it can be inferred that the dramatic cut-downs in urologic surgeries contributed significantly to overall lost hospital revenue [5,6].

**GENERAL PRINCIPLES IN TRIAGING OF UROLOGIC CASES DURING CORONAVIRUS-19**

Triaging urologic care requires consideration of ethical values and principles. Table 1 outlines the principles and ethical foundations one should consider when triaging urology care during COVID-19 [7].

The term 'safely delayed' was proposed by Lockey *et al.* for hand surgery that can be postponed without negatively affecting the patient's clinical status [2]. Its foundation consists of three ethical principles that can be adopted for use in triaging urological surgery (Table 2).

**PRE- AND POSTOPERATIVE CORONAVIRUS-19 SCREENING**

Obtaining timely preoperative COVID-19 infection status on patients helps avoid surgical delay. Preoperative screening also helps keep the healthcare

**Table 1.** Principles and ethical foundations of triaging during COVID-19 pandemic

1.	Status of COVID-19 test result and disease condition
2.	Trend of pandemic in local context and calculated risk of exposure
3.	Disease severity or stage
4.	Prognosis by deferring.
5.	Available alternative treatment modalities
6.	Resources (human, capital, and infrastructure) availability and utilization
7.	Expected total hospital stay, recovery, and number of follow-up visit.
8.	Expected complications and strain to the critical care unit.
9.	Risk of exposure during referral or deferral.

Source: Thapa *et al.* [7].

team and other patients safe. The most used diagnostic test for COVID-19 is the polymerase chain reaction (PCR) test [8,9]. Unfortunately, the reported sensitivity of the PCR test ranges from 30 to 90% [10]. Despite widespread use, preoperative PCR testing catches very few cases. In two separate American studies, Lin *et al.* reported a mean preoperative positive testing rate of 0.93% in pediatric patients and Morris *et al.* reported a 0.74% positive preoperative test rate in adults [11,12].

Despite the low detection rate, the importance of preoperative testing cannot be over-emphasized, as COVID-positive patients are at increased surgical risk. Kirmeier *et al.* found a 23.8% 30-day mortality rate among COVID-19 positive patients undergoing surgery [13]. Moreover, >50% of COVID-positive patients suffered postoperative pulmonary complications, with a 38% 30-day mortality [13]. Prior to the pandemic, multinational observational data established a baseline rate of

**Table 2.** Bioethical principles underlying the 'safe delay' of surgeries in the time of COVID-19

Bioethical Principle	
Nonmaleficence	Postponing procedures should only be considered if by doing so does not cause harm or disease refractory to treatment
Beneficence	A delay will benefit the patient with similar outcomes and treatable and/or tolerable symptoms or burdens.
Justice	Public health resources and patient autonomy are balanced to prevent the unjust allocation of already limited resources.

Source: Lockey *et al.* [2].

10% for postoperative pulmonary complications in patients undergoing elective and nonelective surgery under general anesthetic, with a mortality rate of 0.3% [14,15]. Also, there is evidence that up to 20% of asymptomatic COVID-19 patients die after surgery [16]

The American Society of Anesthesiologists has provided recommendations for preoperative COVID-19 testing [17]. It has been recommended that all surgical procedures on all suspected COVID-19 cases be suspended until virus clearance has been confirmed [18]. If an emergent case must be done, the recommendation is that minimal staff be involved as the infection of, and subsequent self-isolation of senior surgeons would pose an additional strain on the short-staffed departments [18]. Several intra-operative strategies have been devised to avoid surgical staff exposure including smoke evacuation of electrocautery plumes, pre and postintubation precautions, operative theatre ventilation systems, designated operating rooms, and personal protective equipment [19].

In conclusion, despite no direct evidence for universal preoperative COVID-19 screening, most international societies have strongly recommended screening all surgical patients with the goal in protecting staff and patients from contracting COVID-19 [20,21].

## IMPACT OF CORONAVIRUS-19 ON ELECTIVE AND EMERGENCY SURGERIES

Nearly all elective urologic activities were scaled back internationally at the onset of the pandemic which meant cancellation of a significant proportion of surgeries [22<sup>■</sup>,23<sup>■</sup>]. For example, an >8-week delay was reported in 31% of urologic surgeries in a global survey [24<sup>■</sup>]. Another study found elective surgery waiting times increased by over one-third, whereas demand increased by one-fifth [25].

Teoh *et al.*'s global survey found that approximately 48% of respondent hospitals reported a 81–100% reduction in urological surgeries [24<sup>■</sup>]. The severity of service reduction was significantly related to regional COVID-19 case percentile [24<sup>■</sup>]. A US survey of urology program directors found an 83–100% decrease in surgical volume, across all urologic subspecialties [26]. A US resident survey found that within the first month of the pandemic, there were cancellations in 94% of nononcological cases and 37% of oncological cases [27].

As expected, surgeries centered around benign conditions were most affected by cut-downs globally [24<sup>■</sup>]. The most affected procedures include extracorporeal shockwave lithotripsy, cystoscopy, penoscrotal surgery and female genital surgery

[24<sup>■</sup>]. Urgent benign surgeries, such as renal transplantation and ureteric stone treatment were less affected, as guidelines placed these procedures at higher priority [23<sup>■</sup>]. Following international consensus for highest prioritization, cancer surgeries were least affected by cut-downs [24<sup>■</sup>,28].

Higher prioritization for uro-oncology patients is rationalized by their particularly increased risk during the pandemic. Typically, patients at the highest risk for COVID-19 infection are also at increased risk of uro-oncological morbidity. Uro-oncologic patients tend to be male, older and multimorbid [29]. A recent study found that among COVID-19 patients in the intensive care unit, 82% were male with a median age of 63 years and 68% were multimorbid [30]. Moreover, cancer patients have a higher incidence of COVID-19 and more severe disease manifestation [31]. These findings highlight the need for a higher prioritization of our uro-oncologic patients.

Although cancer surgeries were least affected by cut-downs, cystoscopies and prostate biopsies were significantly reduced which are mainly for suspected bladder and prostate malignancies, respectively. Given their grave natural history, testicular and bladder cancer surgery are the least delayed. Prostate cancer (CaP) surgery ranks as the most delayed of the oncological surgeries given the several nonsurgical options for patients and considering that delays, even in high-risk disease do not lead to worse outcomes [24<sup>■</sup>].

In conclusion, international guidelines have aided in the reprioritization of several urologic surgeries. Benign procedures are given the lowest priority, whereas procedures for malignancy and life-threatening conditions are given the highest priority. This strategy is based on the bioethical principles of justice and beneficence.

## Urodynamics during coronavirus-19 pandemic

Figueiredo *et al.* reviewed the International Continence Society, European Association of Urology (EAU), and American Urological Association (AUA) guidelines on urodynamic practice during COVID-19 and summarised the recommendations based on government-imposed restrictions [32]:

- (1) Lockdown: Only emergency and urgent medical procedures. Do not perform urodynamics.
- (2) High restrictions for medical practice and social/economic activities: High-risk patients to be prioritized and low-risk patients deferred for urodynamic studies.
  - (a) High-risk patients:

- (i) Risk of upper urinary tract deterioration: spinal cord injury, spinal dysraphism, multiple sclerosis and other neurologic conditions causing increased bladder pressure.
  - (ii) Patients considered for bladder reconstructive surgery (bladder augmentation, urinary diversion, or kidney transplant).
  - (iii) Patients retention and/or other complications (hydronephrosis, bladder stones, diverticulum).
- (b) Low-risk patients:
- (i) Stress urinary incontinence, overactive bladder and other nonneurogenic conditions with lower urinary tract symptoms (LUTS) that carry a risk of urinary tract deterioration.
- (3) Low restrictions for medical practice and social/economic activities: Perform urodynamics as per guideline recommendations.

Urodynamics should not be performed on suspected or confirmed active infections. In those who have had active infection, urodynamics may be performed after 14 days of hospital discharge or onset of symptoms if the patient is asymptomatic [32].

## DELAYS OF TREATMENT AND UROLOGICAL MALIGNANCY

### Prostate cancer

Ginsburg *et al.* found that delays up to 1 year did not have worse adverse pathology, up staging on radical prostatectomy or secondary treatment) for both intermediate and high-risk CaP [33].

Another study did not note differences in biochemical recurrence, pathologic outcomes, or metastasis-free survival for those receiving Radical Prostatectomy (RP)  $\leq$  3 months vs those waiting 3–6 months [34,35]. In addition, a three-month course of neoadjuvant chemohormonal therapy does not negatively impact long-term survival and may allow safe delay [35].

### Low-risk prostate cancer (very low, low and favorable-intermediate risk groups)

The introduction of active surveillance (AS) for low-risk CaP has shown >98% long-term survival [36].

Kokorovic *et al.* recommend asymptomatic patients with low-risk CaP have investigations and treatments deferred until routine clinical activities return [37]. Men electing for surgery or radiation therapy, a delay of  $\leq$  1 year shows no evidence of worse outcomes [37]. Neoadjuvant androgen

deprivation therapy (ADT) was not recommended to bridge the treatment gap [37].

### Unfavorable-intermediate and high-risk prostate cancer

When stratified by Gleason grade group, the adverse pathologic outcomes, biochemical recurrence, and survival are not associated with 3–6-month treatment delays [34,38<sup>a</sup>].

Kokorovic *et al.* recommend not delaying diagnostic workups for new consults [37]. Patients electing for radiotherapy should undergo 4–6 months of neoadjuvant ADT followed by hypofractionated radiotherapy protocols [37]. Those electing surgery can safely withstand 3-month delays in limited resource centres [37].

### Bladder cancer

Tulchiner *et al.* evaluated outcomes of COVID-19 pandemic and bladder cancer. They found a significant reduction in diagnostic and therapeutic procedures performed during the pandemic [39]. They found an overall increase in high-grade tumors and higher tumor stages with fewer pTa tumors and more pT1 tumors during the pandemic [39]. That being said, patients with recurrent cancer, no adverse staging, grading, or histology outcomes were detected [39].

### Low-grade, nonmuscle invasive bladder cancer

Low-grade nonmuscle invasive bladder cancer (NMIBC) is an idle disease with favorable long-term results on AS (long-term mortality rates of 1–2%) [40,41]. Thus, treatment delay for low-grade NMIBC is generally safe during the pandemic [38<sup>a</sup>].

### High-grade nonmuscle invasive bladder cancer

High-grade NMIBC is a highly progressive malignancy with metastases and muscle invasion occurring in 15–40% of patients and a mortality rate of 10–20% [42,43]. Treatment delay >6 weeks is not recommended [44].

### Muscle-invasive bladder cancer

Survival dramatically decreases with time between MIBC diagnosis and treatment. A 90-day delay in cystectomy increases pathological nodal status and rate, decreases overall and progression-free survival and is associated with increased stage [45–47]. The EAU recommends offering RC in T2–T4a N0M0 patients within 3 months [48]. With respect to neoadjuvant chemotherapy (NAC), cystectomy should



occur within 10 weeks of last NAC cycle; delays beyond 10 weeks were associated with worse survival across all patient variables [46]. The EAU recommends omitting NAC in T2/3 focal NOMO patients, and to individualize risk in high burden T3/4 NOMO patients [48].

### Kidney cancer

Srivastava *et al.*, examined the effects of surgical delay on upstaging to T3a and overall survival in cT1b-T2b Renal Cell Carcinoma (RCC) in the context of COVID-19 found surgery occurring 1–3 months after diagnosis did not increase upstaging risk for any clinical stage [49]. In addition, >3 month wait time did not increase risk of pT3a upstaging for cT1b, cT2a, or cT2b cancers. In relation to survival, surgical wait times of 1–3 months and >3 months were associated with worse Overall Survival (OS) for cT1b tumors. Worse OS was not seen for cT2a or cT2b tumors [49].

### Localized renal cancer

A treatment delay of 3–6 months has not been shown to decrease survival in patients with T1b and T2 disease [38<sup>o</sup>]. The EAU recommends all cT1a tumors cN0 cM0 be deferred 6 months, and all asymptomatic cT1b-cT2a cN0 cM0 be treated within 3 months [50].

### Locally advanced renal cancer

A paucity of data exists for the effect of delayed treatment on morbidity and mortality in patients with locally advanced renal cancer [38<sup>o</sup>]. The EAU recommends treatment within 6 weeks for clinically advanced renal cancer, cT2b-4, and cN0-N1 cM0 disease [50].

### Adrenal tumors

Treatment delay can negatively affect resectability and survival due to rapid progression of adrenal cortical carcinoma [51]. Given the high carcinoma rate of adrenal tumors >6 cm, it is not advisable to delay treatment [23<sup>o</sup>].

Due to the aggressive nature of adrenocortical carcinoma with an estimated median disease-specific survival of 34 months, there is a paucity of data on delayed treatment for these malignancies [52]. It is suggested that patients adrenal cancer be prioritized [35].

### Upper tract urothelial cancer

A 3-month delay in nephroureterectomy is associated with disease progression (worse stage and

lymph node involvement) [53]. As such, treatment delay is not recommended.

It has been shown that low grade Upper tract urothelial cancer (UTUC) is safe to keep on surveillance and undergo endoscopic management due to its low risk of progression [35]. Lee *et al.* demonstrated that delays in RNU due to ureteroscopy did not have an effect on survival for patients with predominately low-grade disease or mixed disease [35]. However, further delaying RNU for second ureteroscopic treatments did demonstrate increased risk of recurrence in patients with predominantly high-grade disease [53].

Studies have shown that delay of RNU  $\geq 3$  months was associated with worse pathologic stage, lymph node involvement, tumor necrosis, and tumor infiltration when directly compared to RNU performed  $\leq 3$  months; No difference in recurrence and cancer-specific mortality was found [54]. Xia *et al.* did not find significant difference in overall survival for patients who underwent RNU at 31–60, 61–90, and 91–120 when compared to  $\leq 30$  days after diagnosis in those with predominantly high-risk disease [55]. That being said, there was worse overall survival in those with a delay of 121–180 days [55].

The EAU categorizes UTUC treatment during COVID-19 into four categories [56]:

#### Low priority

Procedures can be postponed by 6 months with unlikely clinical harm.

The EAU recommends peri-operative chemotherapy to patients with Muscle invasive UTUC with postoperative bladder instillation of chemotherapy to lower the intravesical recurrence rate.

#### Intermediate priority

Clinical harm possible if care postponed 3–4 months but unlikely.

The EAU recommends kidney-sparing management as a primary treatment option to patients with low-risk tumors. These strategies include ureteroscopy (ablation), percutaneous access, segmental ureteral resection, and/or instillation of Bacillus Calmette-Guerin (BCG) or mitomycin C. In metastatic disease, cisplatin-containing combination chemotherapy with CV, MVAC, preferably with G-CSF, HD-MVAC with G-CSF or PCG. Checkpoint inhibitors pembrolizumab or atezolizumab depending on PD-L1 status may be used. The impact of these inhibitors on COVID-19 outcome is unknown and treatment should be postponed for a few weeks whenever possible.

#### High priority

Clinical harm and cancer-related mortality likely if postponed >6 weeks.

Radical nephroureterectomy (RNU) should be performed within 6 weeks for high-risk-non metastatic UTUC. Patients with muscle invasive UTUC should have template-based lymphadenectomy with the removal of bladder cuff entirely. Kidney-sparing management can be offered to patients on a case-by-case basis in those with a solitary kidney and/or renal insufficiency.

### Emergency

Life-threatening situation or opioid-dependent pain. Should be treated within 24 h. RNU should be offered to patients as a palliative treatment to symptomatic patients, (hematuria/clots) with resectable locally advanced tumors in patients with muscle invasive UTUC. Patients with metastatic disease along with excruciating pain, spinal compression, brain metastases and other neurological loss of function fit in this EAU category as well.

### Testicular cancer

The EAU recommends orchiectomy within 24–72 h during the pandemic [57]. With respect to metastatic testicular cancer, the risk of immunosuppression with chemotherapy and subsequent COVID-19 infection is a concern. However, due to the curative nature of treatment, it should not be delayed [58]. Furthermore, in patients with retroperitoneal mass postchemotherapy, the limited available data for nonseminomatous germ cell tumor indicates that  $\geq 3$ -month delays hinder survival, whereas residual retroperitoneal masses in postchemotherapy seminoma tumors  $< 3$  cm can be serially imaged due to low risk of viable tumor [59–61].

Patients with testicular cancer who had a delay of 4–6 months in the diagnosis had increased probability of metastasis [62]. Specifically, 55% of patients with a delay of  $> 4$  months had metastases compared to 20% of patients with a delay  $< 30$  days [62].

### Penile cancer

Penile cancers are rare and aggressive tumors with a high mortality rate within 2 years [63]. Additionally, a  $> 6$ -month treatment delay was associated with 43% of men having locally advanced disease. As such, surgical resection should not be delayed [64].

Prior to the pandemic, many patients had delayed diagnosis and care of penile cancer. Gao *et al.* found sexual function issues at 3 months and worse survival outcomes at 6 months if initial consultation from diagnosis was delayed 116 days [65].

In addition, 3 months between primary surgery to Inguinal Lymph Node Dissection (ILND), recurrence-free survival was documented to be 77% at

5 years vs 37.8% for  $\geq 3$  months [35,66]. The disease-specific survival for cN0 disease at 5 years was 78.6% for patients undergoing ILND within 3 months vs 45.8% in those who had ILND delayed  $\geq 3$  months [R, 67, H35]. Patients with aggressive cN+ disease, 5-year disease-specific survival for those who received ILND within 3 months was 31.8% compared to 35.3% for those who had delayed ILND  $\geq 3$  months [35,67].

## DELAYS OF TREATMENT AND NON-ONCOLOGIC CONDITIONS

### Men's health

#### Erectile dysfunction

As suggested by Witherspoon *et al.* surgical interventions for erectile dysfunction (ED) are nonemergent and can be postponed until the resumption of routine elective cases [67]. Priapism secondary to intracavernosal injections is a rare but morbid condition leading to long-term functional decline; thus, urgent treatment should not be delayed [67].

#### Peyronie's disease

Witherspoon *et al.* suggest supportive therapies for patients in the active phase of the disease characterized by penile pain with erections or morphological change within 6 months [67].

#### Benign prostatic hypertrophy

The risk of acute urinary retention (AUR) with moderate to severe LUTS is estimated at 0.6–1.8% /year [67]. The rates of upper tract deterioration, bladder stones and infections are similar [67–69]. Witherspoon *et al.* recommend that men with AUR should undergo clean intermittent catheterization education to prevent in-person visits during COVID-19 [67]. BPH is benign and can be surgically treated once routine elective procedures resume [67].

### Nephrolithiasis

#### Emergency stone management

Studies reporting an increase in ED visits by acutely unwell stone patients are conflicting [70–72]. Some studies suggest an increased number of patients requiring urgent treatment (e.g. urosepsis), whereas others found no significant difference during this time period [70–72]. The EAU recommends urgent intervention in stone patients presenting with sepsis, anuria, renal insufficiency, acute flank pain, failed medical therapy, and/or recurrent obstruction and infection [73].

## Nonemergency management of staghorn calculi

Abdel Raheem *et al.* conducted a thorough review of pandemic-era recommendations regarding the treatment of urolithiasis [74]. Their review found a significant increase in the rate of conservative stone management across the US, with the rate of nephrostomy tube insertion and ureteric stenting increasing from 38.2% to 81% [75]. Additionally, they found a consequent decrease in the rates of ureteroscopy and percutaneous nephrolithotomy from 60.8% to 19% [75].

For the principles of urolithiasis management during the pandemic, the authors delineate two groups of patients to consider. Either those not requiring any urologic intervention (<7 mm nonstruvite, noncysteine stones) or those that do require intervention (whether it be urgent or not). For those requiring intervention, one needs to consider stone size, location, severity of symptoms, urinary tract obstruction, infection or underlying kidney disease [76]. There remains a debate among endourologists as to whether definitive stone treatment should be undertaken, with the argument made that definitive treatment would reduce emergency room visits [23<sup>\*\*\*</sup>].

When specifically discussing staghorn calculi, one needs to determine the patient's clinical status. If acutely unwell, this patient's case would be triaged as an emergency, with the recommendation being to provide temporary urinary tract drainage within 24 h. If a patient with an obstructing staghorn is not acutely unwell, their case would be triaged at a high priority with the recommendation for treatment within 2–8 weeks. With treatment, several recommendations are made and include choosing a treatment with lower auxiliary retreatments (i.e. URS vs ESWL), using no stent or stents with strings, avoid intubation (i.e. favor procedural sedation, local anesthetic) and if possible perform surgery as day surgery [74]. Given the fact that standard Percutaneous nephrolithotomy (PCNL) requires both a general anesthetic and admission to hospital, it would be preferable to defer this treatment to a later date. Thus, stable patients with an obstructing staghorn should undergo ureteric stenting or nephrostomy tube insertion with delayed PCNL [74].

## Female Urology and Urinary Incontinence

### Incontinence

Urinary incontinence, bladder pain syndrome, overactive bladder, and neurogenic bladder are bothersome and limit quality of life; however, they are considered benign, and it is recommended to delay

procedures until routine elective cases resume [23<sup>\*\*\*</sup>]. Nonetheless, there are malignant causes of incontinence (e.g. malignant fistula); investigations to rule out malignant etiology should be prioritized [77]. The EAU recommends early fistula repair on a case-by-case basis [77].

## Reconstructive surgery

### Artificial urinary sphincter explant

Infected sphincters can be life-threatening with treatment delay. Thus, treatment is emergent and should not be delayed [23<sup>\*\*\*</sup>].

### Urethral stricture

It is recommended to delay definitive surgical procedures for urethral obstruction in the setting of COVID-19 since suprapubic or urethral catheters can temporize the situation without increasing risk of COVID-19 contagion [23<sup>\*\*\*</sup>].

### Renal transplant

The EAU recommends that patients with urgent dialysis-access problems receive renal transplantation, and patients undergoing combined transplant (heart-kidney or liver-kidney) should have high priority for transplantation due to increased morbidity if postponed >6 weeks [78]. Intermediate priority patients, in whom harm is unlikely if postponed 3–4 months, include a 'standard candidate' with a long wait-time and a deceased donor [78]. Low priority patients, in whom harm is unlikely if postponed 6 months, are recommended to be deferred [78]. These include nonurgent renal transplantation with living donor and transplants that require increased resources, prolonged admissions, or intensive immunosuppression [78].

### Pediatric urology

The EAU triaged pediatric urology cases into four categories. Low priority (harm unlikely if postponed 6 months), intermediate priority (harm possible if postponed 3–4 months), high priority (harm very likely if postponed >6 weeks), and emergency (life-threatening situation, do not postpone) [79].

- (1) Low priority cases: benign scrotal and penile surgery, functional surgery, genital reconstructive surgery, benign nephrectomy, bladder augmentation, catheterizable stoma, appendicocostomy, and bladder exstrophy [79].

- (2) Intermediate priority cases include vesicoureteral reflux surgery, pyeloplasty, stable urolithiasis and Botox injections for neurogenic bladder [79].
- (3) High priority surgeries include pyeloplasty in symptomatic ureteropelvic junction obstruction (or with loss of function), posterior urethral valve, primary obstructed megaureter, and infected urolithiasis [59,79]. Emergency cases should be treated within 24 h and are unchanged from pre-pandemic [79].
- (4) Emergency cases include macroscopic hematuria after trauma, inguinal hernia repair with onset of scrotal pain, suspected bowel obstruction or intestinal perforation in conjunction with bladder augmentation, urolithiasis with septic signs and/or obstruction, PUV with retention, local wound infection or abscess formation after surgery, and/or febrile UTI/urosepsis after surgery [79].

### Telehealth

With the reallocation of hospital resources toward the care of COVID-19 patients, there has been a growing interest in telehealth. The accepted definition of telehealth is any healthcare activity conducted via telecommunication [80]. Telehealth encompasses an array of modalities including live video conferencing, asynchronous recorded materials and mobile health (i.e. activities over mobile devices, tablet computers or wearable devices) [81]. Pre-pandemic, telehealth was seen as an option for those that could not otherwise access hospital- or clinic-based care (i.e. rural populations, incarcerated persons, military personnel) [80]. Now, more than ever before, telehealth represents a safe option for patients to access care without increased risk of COVID-19 contagion. A recent study found that among 400 urology patients scheduled for an office visit in Germany, 95% had increased risk of severe COVID-19 complications and 85% preferred telehealth consultation during the pandemic [82].

A recent systematic review of 45 studies, including 12 RCTs, found that telehealth had been successfully implemented in several common urologic clinical cases [80]. According to this review, telehealth was safely utilized in the follow-up care for CaP, urinary stones, uncomplicated UTIs and postsurgical care of SUI. Additionally, telehealth proved to be safe for the workup of hematuria and urinary incontinence [80]. The authors also hypothesized that follow-up imaging or patients (i.e. postpartial nephrectomy, post-ESWL or ureteroscopy, postablative therapies, post-RPLND for

testicular cancer) could be safely conducted virtually [80]. The conclusion of this study was that, given the potential for a prolonged pandemic, telehealth should be strongly considered as a safe alternative to in-person visits for a wide array of urological presentations [80].

### CONCLUSION

The COVID-19 pandemic has forced urology departments worldwide to restructure care in the face of limited resources and workforce. Being able to continue to provide care whereas prioritizing the safety of healthcare workers and preventing morbidity or mortality in patients is paramount. This can be done by following ethical principles of triaging, implementing preoperative COVID-19 screening, and prioritizing surgery for specific oncological and some benign urological conditions.

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### Conflicts of interest

*There are no conflicts of interest.*

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Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

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