Review – Epidemiology

Forecasting the Future of Urology Practice: A Comprehensive Review of the Recommendations by International and European Associations on Priority Procedures During the COVID-19 Pandemic

Daniele Amparore a,1, Riccardo Campi b,c,1, Enrico Checcucci a, Francesco Sessa b, c, Angela Pecoraro a, Andrea Minervini b,c, Cristian Fiori d, Vincenzo Ficarra d, Giacomo Novara e, Sergio Serni b,c,1, Francesco Porpiglia a,1,*

a Division of Urology, Department of Oncology, School of Medicine, San Luigi Hospital, University of Turin, Orbassano, Turin, Italy; b Department of Urology, Careggi Hospital, University of Florence, Florence, Italy; c Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy; d Department of Human and Pediatric Pathology “Gaetano Barresi”, Urology Section, University of Messina, Messina, Italy; e Urologic Unit, Department of Oncologic, Surgical and Gastrointestinal Sciences, University of Padua, Padua, Italy

Abstract

Context: The unprecedented health care scenario caused by the coronavirus disease 2019 (COVID-19) pandemic has revolutionized urology practice worldwide.

Objective: To review the recommendations by the international and European national urological associations/societies (UASs) on prioritization strategies for both oncological and nononcological procedures released during the current emergency scenario.

Evidence acquisition: Each UAS official website was searched between April 8 and 18, 2020, to retrieve any document, publication, or position paper on prioritization strategies regarding both diagnostic and therapeutic urological procedures, and any recommendations on the use of telemedicine and minimally invasive surgery. We collected detailed information on all urological procedures, stratified by disease, priority (higher vs lower), and patient setting (outpatient vs inpatient). Then, we critically discussed the implications of such recommendations for urology practice in both the forthcoming “adaptive” and the future “chronic” phase of the COVID-19 pandemic.

Evidence synthesis: Overall, we analyzed the recommendations from 13 UASs, of which four were international (American Urological Association, Confederation Americana de Urologia, European Association of Urology, and Urological Society of Australia and New Zealand) and nine national (from Belgium, France, Germany, Italy, Poland, Portugal, The Netherlands, and the UK). In the outpatient setting, the procedures that are likely to impact the future burden of urologists’ workload most are prostate biopsies and elective procedures for benign conditions. In the inpatient setting, the most relevant contributors to this burden are represented by elective surgeries for lower-risk prostate and renal cancers, nonobstructing stone disease, and benign prostatic hyperplasia. Finally, some UASs recommended special precautions to perform minimally invasive surgery, while

Keywords:  
Association  
Coronavirus  
COVID-19  
Priority  
Society  
Urology

1 These authors contributed equally to this work.
2 These authors contributed equally to senior authorship.
* Corresponding author. Division of Urology, Department of Oncology, School of Medicine, San Luigi Hospital, University of Turin, Regione Gonzole 10, 10043 Orbassano (Turin), Italy. Tel.: +39 1190 26558; Fax: +39 1190 38654. E-mail address: porpiglia@libero.it (F. Porpiglia).
others outlined the potential role of telemedicine to optimize resources in the current and future scenarios. 

**Conclusions:** The expected changes will put significant strain on urological units worldwide regarding the overall workload of urologists, internal logistics, inflow of surgical patients, and waiting lists. In light of these predictions, urologists should strive to leverage this emergency period to reshape their role in the future.

**Patient summary:** Overall, there was a large consensus among different urological associations/societies regarding the prioritization of most urological procedures, including those in the outpatient setting, urological emergencies, and many inpatient surgeries for both oncological and nononcological conditions. On the contrary, some differences were found regarding specific cancer surgeries (ie, radical cystectomy for higher-risk bladder cancer and nephrectomy for larger organ-confined renal masses), potentially due to different prioritization criteria and/or health care contexts. In the future, the outpatient procedures that are likely to impact the burden of urologists’ workload most are prostate biopsies and elective procedures for benign conditions. In the inpatient setting, the most relevant contributors to this burden are represented by elective surgeries for lower-risk prostate and renal cancers, nonobstructing stone disease, and benign prostatic hyperplasia.

© 2020 European Association of Urology. Published by Elsevier B.V. All rights reserved.

1. **Introduction**

The unprecedented health care scenario caused by the coronavirus disease 2019 (COVID-19) pandemic has already revolutionized urology practice worldwide [1–3]. As such, several national and international urological associations or societies (UASs) have recently released a series of recommendations to guide prioritization of clinical and surgical activities during the COVID-19 emergency, aiming at reacting to the urgent crisis impacting urological care and services [4–19].

Overall, the recommendations by all UASs were grounded on shared principles, such as the actual urgency of each diagnostic or therapeutic procedure, and the trade-off between the available resources and the risks of deferring elective interventions.

Nevertheless, despite consideration of the best available evidence so far, most recommendations are ultimately based on either level 3 evidence or expert opinions. Moreover, they might differ according to the specific geographic, socioeconomic, cultural, and health care contexts (including the status of the pandemic at the time of their publication), as well as the criteria to base such recommendations on (priority scales or time-dependent thresholds).

Notably, the consistency of such recommendations across associations on the whole spectrum of urological conditions, as well as their potential impact on urology practice in both the current “adaptation” and the forthcoming “chronic” phases of COVID-19 pandemic, has not yet been investigated.

To fill these gaps, we reviewed the recommendations of international and European national UASs on prioritization strategies for both oncological and nononcological procedures released during the current emergency scenario.

2. **Evidence acquisition**

Websites of the international and European national UASs were searched to retrieve information on prioritization strategies for the triage of urological procedures during the COVID-19 pandemic. Among the international UASs, we included the European Association of Urology (EAU; Europe), Confederation Americana de Urologia (CAU; South and Central America), Canadian Urological Association (North America), American Urological Association (AUA; North America), Pan African Urological Surgeons Association (Africa), Federation of Asian Urological Associations (Asia), Urological Association of Asia (Asia), Urological Society of Australia and New Zealand (USANZ; Australia and New Zealand), and Società Internazionale d’Urologie (Intercontinental). Then, we screened the websites of the 27 country members of the European Union and the UK [4–19].

Each UAS official website was searched independently by two authors (R.C. and D.A.) between April 8 and 18, 2020, using the keyword COVID-19 or coronavirus within the free-text search bar, and/or accessing the COVID-19 resource center (when available) to retrieve any document, publication, or position paper on prioritization strategies regarding both diagnostic and therapeutic urological procedures, and any recommendations on the use of telemedicine and minimally invasive surgery (MIS) during the COVID-19 period. We excluded from our analysis the UASs that were not providing their position papers (ie, referring to other national or international UAS recommendations for most of the topics).

After translation of all documents into English, if needed, data were extracted from relevant sources by three authors (F.S., E.C., and A.P.) in an a priori developed data extraction form.

We collected detailed information on oncological and nononcological urological procedures, stratified by disease, priority, and patient setting (out- vs inpatient for oncological diseases; outpatient for accident and emergency [A&E] department vs inpatient for nononcological diseases). We considered procedures requiring hospitalization (regardless of their length) as inpatient procedures. Based on each UAS’s criteria, we defined two distinct priority groups for each procedure: higher priority, for those considered “urgent” or with a “weak recommendation to postpone” or “deferrable within weeks,” and lower priority, for
those considered “nonessential”, with a “high recommendation to postpone,” or “deferrable within months.”

The objective of this review was twofold: first, to census and compare the recommendations for the triage of urological procedures across the included UASs, identifying the points of agreement and their potential differences; and second, to critically analyze them aiming to forecast the possible evolution of urology practice in the current “adaptation” and forthcoming “chronic” phases of the COVID-19 pandemic.

3. Evidence synthesis

Overall, we critically evaluated the recommendations on the triage of urological procedures from 13 UASs (Fig. 1), of which four were international (ALUA, CAU, EAU, and USANZ) and nine national (from Belgium, France, Germany, Italy, Poland, Portugal, The Netherlands, and the UK). Among these, 12/13 (92%) offered a specific COVID-19 resource center on their webpages [4–7,9–19].

While most UASs (11/13, 85%) based their recommendations predominantly according to their priority, the EAU [4] (and partly the British Association of Urological Surgeons [14] and the Association Francaise d’Urologie [AFU] [12]) used well-defined temporal thresholds to select the procedures to be maintained in time of emergency.

3.1. Oncological diseases

Table 1 summarizes the recommendations of the international and European national UASs concerning oncological procedures, stratified by cancer type, priority, and patient setting.

Overall, all UASs provided recommendations on prostate, urothelial, kidney, penile, and testis cancers, and some other societies provided recommendations also on adrenal tumors.

3.1.1. Prostate cancer

Eleven out of 13 (85%) UASs recommended maintaining prostate biopsy only in patients with suspected higher-risk prostate cancer (PCa) and locally advanced or symptomatic diseases, deferring it in all other clinical contexts [4–7,9,12–18]. As a consequence, the majority of prostate biopsies, especially in patients who are likely harboring lower-risk PCa, will be deferred, representing a substantial burden of urology outpatient practice in the near future. Notably, any potential diagnostic delay might not necessarily have a detrimental impact on prognosis in most patients [20]. Besides, even considering a possible late diagnosis, any active treatment in low- to intermediate-risk patients (if indicated) can safely be postponed [20–22].

Concerning surgical treatment, all UASs tended to recommend not to postpone radical prostatectomy (RP) for high-risk/locally advanced disease whenever indicated and to defer RP for low- to intermediate-risk PCa. Yet, several UASs highlighted the need for shared decision making, considering the availability of alternative equally effective treatments beyond timing and resources. As such, surgery being performed more often for low- to intermediate-risk PCa than for high-risk disease [23], a substantial burden of
Table 1 – Overview of the international and European national urological associations/societies’ recommendations regarding oncological procedures, stratified by cancer type (prostate cancer [PCa], bladder cancer [BCa]/upper tract urothelial carcinoma [UTUC], renal cell carcinoma [RCC], testis and penile cancer, and adrenal cancer), priority (higher vs lower), and patient setting (outpatient vs inpatient).

| Oncological higher-priority procedures | PCa | BCa/UTUC | RCC | PCa | BCa/UTUC | RCC | Testis/penile Ca | Adrenal Ca |
|---------------------------------------|-----|----------|-----|-----|----------|-----|-----------------|------------|
| **Outpatient setting**                |     |          |     |     |          |     |                 |            |
| EAU (Europe)                          |     |          |     |     |          |     |                 |            |
| - Prostate biopsy (without MRI if locally advanced or highly symptomatic) |     |          |     |     |          |     |                 |            |
| - ADT (if radiological evidence of metastases; biopsy can be postponed) |     |          |     |     |          |     |                 |            |
| - Cystoscopy for macrohematuria without clots (if unequivocal lesion on US or CT-DVU proceed immediately to TURB) |     |          |     |     |          |     |                 |            |
| - Intravesical BCG immunotherapy with 1 yr maintenance in patients with high-risk NMIBC |     |          |     |     |          |     |                 |            |
| - Follow-up cystoscopy in patients with NMIBC and intermittent hematuria |     |          |     |     |          |     |                 |            |
| - RTB (M + IMDC intermediate to poor risk) |     |          |     |     |          |     |                 |            |
| - RP without neoadjuvant ADT (locally advanced prostate cancer including cN1; consider long-term ADT + EBR as an alternative to surgery) |     |          |     |     |          |     |                 |            |
| - Treatment: try embolization first; then surgery (actively bleeding symptomatic renal mass in M0 or M+) |     |          |     |     |          |     |                 |            |
| - Clinically advanced RCC (cT2b–c>4, cN–cN1, cM+) |     |          |     |     |          |     |                 |            |
| - Advanced RCC with IVC thrombosis (Novick level 1–4) |     |          |     |     |          |     |                 |            |
| - Other, if symptomatic |     |          |     |     |          |     |                 |            |
| **Inpatient setting**                 |     |          |     |     |          |     |                 |            |
| EAU-ERUS (Europe)                     |     |          |     |     |          |     |                 |            |
| - RARC/RARP (at strict timing after systemic therapy) |     |          |     |     |          |     |                 |            |
| - Robotic management of postoperative complications (referral centers) |     |          |     |     |          |     |                 |            |
| - RARC (high-risk cancers)             |     |          |     |     |          |     |                 |            |
| - RARC (severe hematuria with transfusion distress) |     |          |     |     |          |     |                 |            |
| - Robotic RNU (high risk)              |     |          |     |     |          |     |                 |            |
| - Treatment: try embolization first; then surgery (actively bleeding symptomatic renal mass in M0 or M+) |     |          |     |     |          |     |                 |            |
| - Orchiectomy                          |     |          |     |     |          |     |                 |            |
| - Primary RPLND (CSI NSGCT with contraindication to adjacent chemotherapy and unwilling to accept AS [LE 1b], or teratoma with somatic-type malignancy) |     |          |     |     |          |     |                 |            |
| - RPIND or biopsy (Stage IA/B NSGCT without marker elevation, to exclude marker-negative embryonal carcinoma) |     |          |     |     |          |     |                 |            |
| - Post-CT RPLND of residual masses (NSGCT with normal or normalizing serum markers) |     |          |     |     |          |     |                 |            |
| - RPLND (growing teratoma)             |     |          |     |     |          |     |                 |            |
| - Penile Surgery (≥T3G3cN0)            |     |          |     |     |          |     |                 |            |
| - Radical inguinal LND (cN1–cN2) with ipsilateral pelvic LND (pN2/pN3) |     |          |     |     |          |     |                 |            |
| AUA (USA)                             |     |          |     |     |          |     |                 |            |
| - Cystoscopy for macrohematuria        |     |          |     |     |          |     |                 |            |
| - RP (GG3–5; GG2 with >2 cores or tumor length >5 mm or PSA >10) |     |          |     |     |          |     |                 |            |
| - BC (high risk)                       |     |          |     |     |          |     |                 |            |
| - TURB (high risk)                     |     |          |     |     |          |     |                 |            |
| - RNU for UTUC                         |     |          |     |     |          |     |                 |            |
| - RN                                  |     |          |     |     |          |     |                 |            |
| - Nephrectomy (RCC with IVC thrombosis) |     |          |     |     |          |     |                 |            |
| - Orchiectomy                          |     |          |     |     |          |     |                 |            |
| - RPLND                                |     |          |     |     |          |     |                 |            |
| - Surgery for penile cancer           |     |          |     |     |          |     |                 |            |
| - Suspected ACC or tumors >6 cm     |     |          |     |     |          |     |                 |            |

- MRI and biopsy (high risk, suspicious of PCa)
- If biopsy, prefer the TP approach
- Cystoscopy (macrohematuria; FU of high-risk NMIBC; microhematuria if risk factors or symptomatic)
- Induction of BCG/chemo (high-risk or intermediate-risk NMIBC)
- Maintenance of BCG/chemo (high-risk NMIBC)
- MIBI and biopsy (high risk, suspicion of PCa)
- If biopsy, prefer the TP approach
- MRI and biopsy (high risk, suspicion of PCa)
- If biopsy, prefer the TP approach
- Cystoscopy (macrohematuria; FU of high-risk NMIBC; microhematuria if risk factors or symptomatic)
- Induction of BCG/chemo (high-risk or intermediate-risk NMIBC)
- Maintenance of BCG/chemo (high-risk NMIBC)
Table 1 (Continued)

| Testis/penile Ca | Adrenal Ca |
|------------------|------------|
| PCa (South and Central America) | - Prostate biopsy - Hematuria with clots - RP (high risk) - RC | - TURB (high risk) - RNU (high risk) - Nephrectomy - Orchidectomy |
| USANZ (Australia and New Zealand) | - Prostate biopsy (suspicious prostate lesions or PIRADS 4/5) - Cystoscopy for macroscopic hematuria - RP (high risk and very high risk) - RC (MIBC) - TURB (high risk and very high risk) - RNU for UTUC - Nephrectomy (T2, trombectomy) - Orchiectomy - Post-CT RPLND (progreessive residual mass) |
| SIU (Italy) | - Prostate biopsy (high clinical suspicion of PCa) - Intravesical instillation (high-risk BCa or instillations already started) - Cystoscopy (FU of high-risk TCC and for BCa diagnosis) - RTB (M + RCC) - RP (high-risk or locally advanced PCa or in a multimodal therapy) - RP (unfavorable intermediate-risk PCa) - RC - TURB (high-risk BCa; 2/C14 look for T1 orTxHG) - RNU (high-grade or multifocal or/C21 cT1 tumors, UTUC) - Nephrectomy (cT2-T4; N+; cT1b eligible for PN) - C N - Orchidectomy - Post-CT RPLND (upon referral centers) - Partial or total penectomy |
| AFU (France) | - Prostate biopsy (emergency regimen, if spinal cord compression due to M + disease or obstructive kidney failure due to locally advanced PCa) - Prostate biopsy (T3/T4 PCa) - Cystoscopy (FU of intermediate/high-risk NMIBC) - Instillation (BCG or chemo) - RP + LND (high-risk PCa; no delay >2 mo) - TURB (within 30 d; intermediate/high-risk NMIBC) - Early postoperative instillation (low-risk NMIBCs only) - URS (within 30 d, if imperative indication) - RNU (within 30 d, for invasive T/C20 T3 N0 UTUC) - Nephrectomy (locally advanced [cT3]; renal vein or IVC thrombosis; cN + M0; signs of locoregional invasion) - Nephrectomy (symptomatic tumors) - Orchidectomy (stage I) - RPLND (especially if NSGCC or high serum markers) - Penile cancer (>T1G2, cN + or cM+). |
| DGU (Germany) | - Prostate biopsy (depending on the risk profile) - RP (high or intermediate risk) - TURB or re-TURB - RC (MIBC; early RC) - TURB (high risk) - URS (suspect UTUC) - RNU - Nephrectomy (tumors >7 cm) - Orchiectomy - Primary surgery or LND for penile carcinoma |
| BAUS (UK) | - Prostate biopsy (if PSA >20 or PSA <20 with high PSA density; prefer transperineal) - Macrohematuria (urgent; pts >45 yr, no IVU, or symptoms and signs of metastases) - Macrohematuria (within 2 wk; pts >60 yr) - RP (patients on surgical waiting list while capacity available) - TURB (high-risk BCa) - RC (high-risk BCa [ie, MIBC]) - RNU (high-risk UTUC) - PN (single kidney) - Nephrectomy (time-sensitive) - Nephrectomy with IVC exploration - Surgery for nephroblastoma (pediatric) - Penile cancer (all stages) - Testis cancer (all stages) |
| APU (Portugal) | - Prostate biopsy (high PSA and/or PIRADS/C21 4) - Cystoscopy and instillation (high- or intermediate-risk NMIBC) - RP (high risk) - RC (high-risk) - TURB (high-risk PCa - US/C14) - URS (suspect high-risk UTUC) - RNU (high-risk UTUC) - RN (cT3 RCC) - RN with IVC thrombosis - Penile cancer (all stages) - Testis cancer (all stages) - Adrenalectomy (tumors >6 cm pheo) |
| NVU (The Netherlands) | - Prostate biopsy (high risk of PCa) - Cystoscopy (high risk) - RP (high risk) - RC - RC (uncontrollable bleeding) - TURB (high risk) - URS (high risk) - RNU (high risk) - RNU (for severe hematuria) - RN (cT3 RCC) - RN with IVC thrombosis - Penile cancer (all stages) - Testis cancer (all stages) - Adrenalectomy |
| BVU (Belgium) | - Prostate biopsy (high PSA, PIRADS/C21 4) - Cystoscopy and bladder instillations (high- or intermediate-risk NMIBC) - RP (high risk) - RC (high-risk) - TURB (high-risk PCa - US/C14) - URS (suspect high-risk UTUC) - RNU (high-risk UTUC) - RNU (for severe hematuria) - RN (cT3 RCC) - RN with IVC thrombosis - Penile cancer (all stages) - Testis cancer (all stages) - Adrenalectomy (tumors >6 cm pheo) |
| **Table 1 (Continued)** | **Outpatient setting** | **PCa** | **BCa/UTUC** | **RCC** | **Inpatient setting** | **PCa** | **BCa/UTUC** | **RCC** | **Testis/penile Ca** | **Adrenal Ca** |
|-------------------------|-----------------------|---------|--------------|--------|-----------------------|---------|--------------|--------|---------------------|--------------|
| **SBU (Belgium)**       | - Prostate biopsy (high PSA, PI-RADS ≥ 4) | - Cystoscopy and bladder instillations (high- or intermediate-risk NMIBC) | - RP in strict timing (after ADT as part of a study) | - RC (major hematuria) | - RN for RCC with IVC thrombosis | - RC (high risk, or after NAC) | - TURB (high risk) | - URS (high risk) | - BMJ (high risk) | - Radical orchiectomy |
|                         |                       |         |              |        |                       |         |              |        |                     |              |                      |
| **PUA (Poland)**        | - Prostate biopsy     |         |              |        |                       |         |              |        |                     |              |                      |
|                         |                       |         |              |        |                       |         |              |        |                     |              |                      |
| **EAU (Europe)**        | - Prostate biopsy     | - Early postoperative instillations of chemotherapy (presumably low- or intermediate-risk tumors) | - Intravesical BCG or chemotherapy instillations (intermediate-risk NMIBC) | - RTB (≤cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2b-cT4aN0M0 tumors) | - RC (T2-T4aN0M0)  | - TURB: (1) no hematuria; (2) no history of high-risk NMIBC | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | (regardless of PSA and DRE) | - Intravesical BCG or chemotherapy instillations (intermediate-risk NMIBC) | - TURB (small papillary recurrences and history of Ta/T1 LG tumor) | - TURB (low to intermediate risk) | - RP (high- or intermediate-risk PCa) | - TURB or re-TURB | - TURB or cystectomy in case of severe bleeding | - RC (T2-T4aN0M0)  | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Early postoperative instillation of chemotherapy in patients with confirmed UTUC | - Follow-up cystoscopy (history of NMIBC without hematuria) | - TURB (visibly complete initial TURB of T1 lesion with muscle in the specimen) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Prostate biopsy     | - Postoperative bladder instillation of chemotherapy (in patients with UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Early postoperative instillation of chemotherapy (UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Prostate biopsy     | - Early postoperative instillation of chemotherapy (UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Prostate biopsy     | - Early postoperative instillation of chemotherapy (UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Early postoperative instillation of chemotherapy (UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
|                         | - Early postoperative instillation of chemotherapy (UTUC) | - Follow-up cystoscopy (UTUC) | - RTB (cT1a N0M0) | - TURB (≥cT1b N0M0) | - RC (T2-T4aN0M0) | - TURB within multimodal bladder-sparing protocols (selected T2N0M0 patients) | - Biopsy of the contralateral testis (history of testis Ca and high risk of contralateral germ cell neoplasia in situ) | - Biopsy/treatment for cTis cN0, ≤cT1N0 | - Adrenalectomy (>6 cm, favorable imaging characteristics) |
| Outpatient setting | Inpatient setting | **Inpatient setting** |
|--------------------|------------------|----------------------|
| **PCa** | **BCa/UTUC** | **RCC** | **Testis/penile Ca** | **Adrenal Ca** |
| **Continued** | | | | |
| **UAU (USA)** | - Prostate biopsy | - Cystoscopy for suspect BCa or microhematuria | - RP (GG1 or GG2 with 2 or fewer cores of max length < 5 mm) | - RC (not high risk) | - PN |
| | - MRI and prostate biopsy (not high suspicion) | - Cystoscopy (microhematuria without risk factors; FU in low/intermediate-risk NMIBC) | - TURB (low risk) | - URS (presumed low risk) | - Low cancer suspicion, asymptomatic |
| **CAMI (South and Central America)** | | | - PN | | |
| **USANZ (Australia and New Zealand)** | - Instillations (low-risk NMIBC) | - RTB (small renal masses) | - RP (favorable intermediate or low risk) | - PN (<T1a RCC) | - RN (<T1b RCC not eligible for PN) |
| **SIU (Italy)** | - MRI or prostate biopsy for AS - Brachytherapy or EBRT (intermediate risk) | - Cystoscopy for low-risk recurrence NMIBC (delay within 3 mo) | - Cystoscopy/TURB after instillation therapy (low risk of recurrence) | - TURB (small recurrent NMIBC) | |
| | | - URS for positive urinary cytology without objective lesion at cystoscopy or imaging (delay within 3 mo) | - BC without NAC (<T2 BCa) * - RC (high-risk NMIBC) * | - TURB for small, nonmetastatic, presumably low-grade NMIBC without (delay within 3 mo) | Partial diagnostic orchectomy (suspected benign lesion <2 cm with negative markers) |
| **AFU (France)** | - Brachytherapy or EBRT (intermediate risk) | - Cystoscopy for low-risk recurrence NMIBC (delay within 3 mo) | - RC without NAC (<T2 BCa) * - RC (high-risk NMIBC) * | - TURB (small recurrent NMIBC) | |
| | | - URS for positive urinary cytology without objective lesion at cystoscopy or imaging (delay within 3 mo) | - TURB (low risk) | - URS (low risk) | |
| **DGU (Germany)** | | | - RP (low risk) | - PN/RFA | - Surgery for penile cancer (low grade and nonmalignant) |
| **BAUS (UK)** | | | - Brachytherapy - MDT-directed PCa surgery (high-intermediate-low risk) | - TURB (low risk, ie, NMIBC) | - PN |
| | | | - BMJ (low risk) | - BMJ (low risk) | |
| **APU (Portugal)** | - Cystoscopy and instillations (low-risk NMIBC) | - Brachytherapy - RP (low risk) | - RC (low risk) - TURB (low risk) - Diagnostic URS (low risk) | - PN |
| | | | | | |
| **NVU (The Netherlands)** | - Brachytherapy (lower-risk PCa) | - RP (low risk) | - TURB (low risk) | - URS (low risk) | - PN/RFA |
| | | | - BMJ (low risk) | - BMJ (low risk) | |
| **BVU (Belgium)** | - Brachytherapy (lower-risk PCa) | - Cystoscopy and bladder instillations (low-risk NMIBC) | - PCa (lower risk) | - TURB (lower risk) | - PN/RFA (<T1 tumors) - Adrenalectomy (nonsecreting incidentaloma) |
| | | | - BMJ (low risk) | - BMJ (low risk) | |
| **SBU (Belgium)** | - Cystoscopy and bladder instillations (low-risk NMIBC) | - RP (low risk) | - TURB (lower risk) | - URS (lower risk) | - PN/RFA |

*Note: * Abbreviations and conditions may vary by region and are subject to local guidelines and practices.
patients scheduled for RP will have to be managed during the future phases of the COVID-19 pandemic, posing challenges in rescheduling surgical waiting lists. However, the abovementioned potential reduction of newly diagnosed PCa patients in the near future, coupled with a possible shift to other treatment strategies, might relieve the impact of this burden. Yet it should be considered that the waiting lists for external beam radiotherapy will also likely be overloaded in the near future due to the forced changes in urological practices caused by the COVID-19 pandemic [24].

3.1.2. Urothelial cancer

A different scenario emerges for bladder cancer (BCa). Looking at the outpatient procedures, 11/13 (85%) UAAs provided recommendations on maintaining cystoscopy (for both diagnosis and follow-up) and intravesical instillations in selected patients [4,6–10,12,14–18].

Despite slight differences among UAAs, diagnostic cystoscopy should not be postponed in patients with macrohematuria, as well as follow-up cystoscopies and intravesical instillations in those with a history of higher-risk non-muscle-invasive bladder cancer (NMIBC). On the contrary, investigations should be postponed in patients with microhematuria and/or a history of low-risk NMIBC, according to most UAAs [4,6,7,10,12,15,17–19]. This is based on the available evidence on the predictive value of microhematuria for the diagnosis of BCa [25] and on the low recurrence rate in patients with low-risk NMIBC [20]. Notably, the EAU recommended postponing follow-up cystoscopy also in patients with a history of upper-tract urothelial carcinoma (UTUC) [26].

Therefore, in light of these indications, a minimal variation is expected in the burden of urology outpatient practice for BCa in the near future. Indeed, the procedures considered a priority by most UAAs accounted for a large portion of our daily activities even before the COVID-19 pandemic. Moreover, while representing a non-negligible proportion of BCa, low-risk diseases require less stringent follow-up schedules [27].

Focusing on inpatient procedures, most UAAs recommended not to postpone transurethral resection of bladder tumors (TURB) for higher-risk NMIBCs (especially in case of a suspicion of >T2 disease), including those for macrohematuria and re-TURB [4,6,8–10,12–19]. Conversely, TURB for (presumed) low-risk tumors could be deferred.

Eleven UAAs (85%) considered radical cystectomy (RC) as a priority surgery for higher-risk BCa and uncontrollable bleeding, with some recommending not deferring early cystectomies, including BCG-unresponsive disease [28].

On the contrary, the EAU and the AFU indicated that all RCs for T2–T4aNOM0 cancers might be postponed for up to 3 mo [4,12]. However, it should be noted that this temporal threshold has been defined mainly on the basis of level 3 evidence [4,20]. Moreover, although delaying RC was indeed found to have a detrimental effect on overall survival, there is huge heterogeneity in the BCa literature regarding how this delay is defined [29].
Further, recommendations by international and national UASs are also controversial regarding the use of neoadjuvant chemotherapy (NAC) during the COVID-19 pandemic. The ultimate reasons for this lack of consensus might be, on the one hand, the sparse evidence on the impact of delay in RC after NAC on patient survival [29] and, on the other hand, the potential increased risk of adverse events due to NAC-related immunosuppression [20].

Regarding UTUC, all UASs considered radical nephroureterectomy (RNU) and ureteroscopy (URS) a priority for higher-risk or symptomatic diseases [4–6,8–10,12–19]. Conversely, all surgeries for presumed low-risk tumors are considered “deferrable.”

In light of these recommendations, a vast proportion of surgeries for urothelial cancer will be maintained in the upcoming phases of the COVID-19 pandemic, not significantly the burden of urologists’ workload in our future daily practice. This is an important issue, considering that most of the procedures mentioned above (ie, TURB, URS, and even RNU) have both a diagnostic and a therapeutic, value and provide the very first prognostic information to guide risk stratification [27,30].

3.1.3. Kidney cancer
Regarding outpatient procedures for kidney cancer, tumor biopsy was recommended for metastatic patients only by two UASs, deferring it for all other indications [4,10].

Concerning the inpatient setting, all UASs recommended proceeding with surgery in patients with bleeding tumors, ct2 tumors, and locally advanced disease (including kidney cancer with inferior vena cava thrombosis) [4–6,8–10,12–19]. Notably, the EAU recommended embolization as the first option in case of actively bleeding renal masses with symptoms [4] and did not include surgery for T1b/T2a tumors as well as cytoreductive nephrectomy among the higher-priority procedures. There was also no consensus regarding postponing surgeries for ct1b lesions among the other UASs, for which the choice must be made case by case based on both patient and tumor characteristics [2]. On the contrary, almost all UASs considered nephrectomy for ct1a tumors to be deferrable [4–6,10,13–19].

Considering these findings, while the impact of the COVID-19 pandemic is unlikely to change the inflow of patients for bigger and more aggressive tumors [23], the burden of patients with small renal masses to manage in our future daily practice is expected to increase significantly.

However, this burden could be mitigated for two reasons. First, the new diagnoses of small renal masses could be reduced as a consequence of the restricted access to radiological investigations during the COVID-19 period [1,31]. Second, a shift of indication from surgery to alternative treatment strategies (ie, active surveillance or ablative therapies), possibly without impacting patients’ prognosis [32], is also possible. Finally, it has to be underlined that interventions for renal tumors represent a smaller proportion of our daily surgical practice if compared with PC and BCa [23], especially in nonreferral centers.

3.1.4. Testis and penile cancer
Overall, all UASs recommended not to postpone orchiectomy for suspected testis cancer and surgery for penile cancer. Moreover, 10/13 (77%) UASs also considered retroperitoneal lymph node dissection a priority in selected patients, such as those with postchemotherapy residual masses [4,6,9,10,12,14–17,19].

Taken together, these recommendations suggest that testis and penile cancers will not have a significant impact on the burden of patients to be managed in the forthcoming period, also considering their low incidence [33].

3.1.5. Adrenal tumors
Finally, seven of 13 (54%) UASs gave recommendations on the management of adrenal tumors, indicating adrenalectomy to be not deferrable for lesions >6 cm or for suspected adrenocortical cancer [4–6,15–19]. Even in this case, no changes in the future urological daily practice are expected after the COVID-19 pandemic, in light of the low prevalence of this disease and the possible referral to other surgical specialties [34].

3.2. Nononcological diseases

Table 2 summarizes the recommendations of the international and European national UASs regarding nononcological procedures, stratified by disease, priority, and patient setting (outpatient/A&E department vs inpatient).

Overall, all UASs provided recommendations on urological trauma, infections, stone disease, benign prostatic hyperplasia (BPH), functional urology, andrology, kidney transplantation (KT), and pediatric urology.

3.2.1. Outpatient or A&E procedures

Eleven (85%) UASs provided guidance on high-priority outpatient procedures that should be maintained during the COVID-19 pandemic [4–10,13–16,18,19]. These usually represent emergencies (thus performed in the setting of the A&E department) and include mostly the procedures for acute urinary retention, hematuria with clots, and priapism. On the contrary, the consensus reached by most of the UASs is that cystoscopies for benign conditions; nephrostomy as well as ureteral, suprapubic, or transurethral catheter substitution; external shock wave lithotripsy (ESWL); and all procedures for functional and neuourology (including urodynamics), andrology, and infertility should be deferred (Table 2).

Although their “lower priority” during the COVID-19 pandemic can be understandable, the real problem for the future stems from their significant diffusion in the urological practice, and the broad spectrum of diseases involved. Deferment of these procedures represents one of the most significant challenges for our upcoming workload for different reasons [1]. On the one hand, such procedures cannot be replaced entirely by alternative strategies such as telemedicine [35]. On the other hand, a considerable treatment delay is expected, given the benign nature and widespread diffusion in the population, with a subsequent overload of the entire system. As such, patients may...
### Table 2 – Overview of the international and European national urological associations/societies’ recommendations regarding nononcological procedures, stratified by disease (benign prostatic hyperplasia/obstruction [BPH/BPO], andrology, functional/female urology, stone disease, kidney transplant, urological trauma, pediatric urology, and other) priority (higher vs lower) and patient setting (outpatient/A&E department vs inpatient).

| Nononcological Higher-priority procedures | Outpatient setting (incl. A&E Dept.) | Inpatient setting |
|------------------------------------------|-------------------------------------|-------------------|
| **BPH/BPO**                              |                                      |                   |
| EAU (Europe)                             | - Suprapubic catheter if residual urine/obstructive (acute prostatic or bladder neck obstruction) | - Urgent decompression of the collecting system (PCN or stent; repair due to obstructing stones, anastomosis) |
|                                          | - Transurethral or suprapubic urinary diversion (urethral injury) | - Urogynecological (high-grade renal injury with active bleeding if hemodynamically unstable) |
|                                          | - Sperm cryopreservation (prior to planned orchidectomy) | - Urgent surgical exploration plus nephrectomy (high-grade injuries and proximal hemodynamic instability) |
|                                          | - Open radical prostatectomy | - Urethral or suprapubic urinary diversion in the setting of stone removal (renal insufficiency, renal failure, bilateral obstruction, sterile kidney) |
|                                          | - Urinary tract infection (if need for systemic CT or intracavity BT) | - Interventional treatment (as in AUA, URO, or decompression; obstructing) |
|                                          | - Urinary tract infection | - Symptomatic stenoses not suitable for MET |
|                                          | - BPH/BPO andrology | - First decompression, then interventional stone removal as early as possible (renal stone with recurrent infection and obstruction, staghorn stones) |
|                                          | - Functional/female urology | - Combined transplants |
|                                          | - Stone disease | - Angioplasty (high-grade renal injury with active bleeding if hemodynamically unstable) |
|                                          | - Kidney transplant | - Urgent surgical exploration plus nephrectomy (high-grade injuries and proximal hemodynamic instability) |
|                                          | - Urological trauma | - Urological diversion (cystic renal injury, acute setting) |
|                                          | - Urological infections | - Surgical exploration and repair (bladder rupture/ bladder injury by penetrating trauma; female pelvic fracture urethral injury; tourniquet injury with local rupture, pelvic fracture, and penetrating genital injury are all organ threatening) |
|                                          | - Pediatric urology | - Surgical debridement (Fournier’s gangrene) |
|                                          | - AUA (USA) | - Pyeloplasty in UPJ obstruction (progressive loss of function or severe symptoms—consider drainage with JJ of nephrostomy) |
|                                          | - Clot retention | - PCN with progressive loss of function |
|                                          | - Urinary retention | - Urolithiasis with recurrent infections |
|                                          | - Urethral stricture (obstruction) | - Uroepithelial with obstruction |
|                                          | - Cystoscopy + Biops (if equivocal) | - Uroepithelial with obstruction |
|                                          | - Retrograde pyelogram | - PCN if uroepithelial catheter cannot be placed |
|                                          | - Stress removal or insertion | - Oncology |
|                                          | - Urethral evaluation (ie, cuff erosion) | - Acute ischemia (testicular torsion) |
|                                          | - BPH requiring indwelling catheter | - Testicular torsion |
|                                          | - Priapism | - Penile and urethral trauma |
|                                          | - Adult acute renal transplant | - Infected kidneys |
|                                          | - Pyeloplasty | - Infected kidneys |
|                                          | - Unilateral/vesical/renal stones | - Infected kidneys |
|                                          | - Stage 3 renal neurevoulvulation | - Infected kidneys |
|                                          | - Obstructed kidney/infection | - Urosepsis with obstruction |
|                                          | - Pregnant with obstruction | - Acute ischemia (testicular torsion) |
|                                          | - Stone change | - Penile and urethral trauma |
|                                          | - Cadaveric KT | - Urological abscess/wound washout |
|                                          | - Transplant kidney biopsy (if cause) | - Infected prosthetic device |
| **CAU (South and Central America)**      | - Acute urinary retention |                   |
|                                          | - Chronic or acute urinary retention |                   |
| **USANZ (Australia and New Zealand)**    | - Acute renal retention |                   |
|                                          | - Adult acute renal transplant |                   |
|                                          | - Pyeloplasty |                   |
|                                          | - Unilateral/vesical/renal stones |                   |
|                                          | - Stage 3 renal neurevoulvulation |                   |
|                                          | - Obstructed kidney/infection |                   |
|                                          | - Pregnant with obstruction |                   |
|                                          | - Stone change |                   |
|                                          | - Cadaveric KT |                   |
|                                          | - Transplant kidney biopsy (if cause) |                   |
|                                          | - Penile and urethral trauma |                   |
|                                          | - Urological abscess |                   |
|                                          | - Testicular torsion |                   |
|                                          | - Penile and urethral trauma |                   |
|                                          | - Fournier’s gangrene |                   |
## Table 2 (Continued)

| Outpatient setting (incl. A&E Dept.) | Inpatient setting |
|-------------------------------------|-------------------|
| **BPH/BPO** | **Andrology** | **Functional/female urology** | **Stone disease** | **Kidney transplant** | **Urological trauma** | **Urological infections** | **Pediatric urology** |
| SIU (Italy) | Outpatient setting (incl. A&E Dept.) | Hematuria | Priapism (not responsive to drugs or drainage) | Hematocrit TUR if recurrent or major bleeding coming from prostate or bladder | Priapism | Priapism | Priapism (not responsive to drugs or drainage) | Priapism | Priapism | Priapism | Priapism |
| AFU (France) | Macrohematuria | Urinary retention | Priapism | Infected lymphoceles | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| DGU (Germany) | Acute urinary retention | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| BAUS (UK) | Acute urinary retention | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| APU (Portugal) | Placement or removal of nerve stimulators (phase 2) | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| NVU (The Netherlands) | Outpatient setting | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| RVU (Belgium) | Acute urinary retention | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| SBU (Belgium) | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |
| PUCA (Poland) | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism | Priapism |

### Outpatient setting (incl. A&E Dept.)

- Outpatient setting (incl. A&E Dept.)

### Inpatient setting

- Hematocrit TUR if recurrent or major bleeding coming from prostate or bladder
- Priapism (not responsive to drugs or drainage)
- Priapism (not responsive to drugs or drainage)
### Table 2 (Continued)

| Outpatient setting (incl. A&E Dept.) | BPH/BPO | Andrology | Functional/female urology | Stone disease | Kidney transplant | Urological trauma | Urological infections | Pediatric urology |
|-------------------------------------|---------|-----------|---------------------------|--------------|------------------|------------------|----------------------|------------------|
| Neurological lower-priority procedures |         |           |                           |              |                  |                  |                      |                  |
| EAU (Europe)                        |         |           |                           |              |                  |                  |                      |                  |
| - Diuretics for neurological reasons (incl. urodynamics) | Surgical management of male LUTS (incl. patients with urinary retention) | - Elective sperm retrieval and fertility procedures | - Orchidectomy | - Surgery for female UI, urethral diverticula, post-AF UI, nonobstructive urinary tract female | - Surgery for neurological reasons | - Intravesical stone removal or JJ placement (nonobstructing urolithiasis) | - Standard candidate to KT with expected long waiting time with deceased donor | - Bladder exstrophy correction |
| EAU-ERUS (Europe)                   |         |           |                           |              |                  |                  |                      |                  |
| - Circumcision | - Urodynamics | - Urohy | - Urodynamic exams | - Urethral diverticula, post-AF UI, nonobstructive urinary tract female | - Surgery for neurological reasons | - Intravesical stone removal or JJ placement (renal stones causing intermittent obstruction) | - Standard candidate to KT with expected long waiting time with deceased donor | - Bladder exstrophy correction |
| AUA (USA)                           |         |           |                           |              |                  |                  |                      |                  |
| - Circumcision | - Urodynamics | - Urohy | - Urodynamic exams | - Urethral diverticula, post-AF UI, nonobstructive urinary tract female | - Surgery for neurological reasons | - Intravesical stone removal or JJ placement (renal stones causing intermittent obstruction) | - Standard candidate to KT with expected long waiting time with deceased donor | - Bladder exstrophy correction |
| AU (France)                         |         |           |                           |              |                  |                  |                      |                  |
| - BPH on self-catheterization or safe voiding | - BPH on self-catheterization or safe voiding | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) |
| SIU (Italy)                         |         |           |                           |              |                  |                  |                      |                  |
| - Urodynamic exams | - ESWL for asymptomatic patients | - Urohy | - Urodynamic exams | - Urethral diverticula, post-AF UI, nonobstructive urinary tract female | - Surgery for neurological reasons | - Intravesical stone removal or JJ placement (renal stones causing intermittent obstruction) | - Standard candidate to KT with expected long waiting time with deceased donor | - Bladder exstrophy correction |
| ANF (France)                        |         |           |                           |              |                  |                  |                      |                  |
| - BPH on self-catheterization or safe voiding | - BPH on self-catheterization or safe voiding | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) | - BPO surgery procedures (incl. stone removal) |
| DGU (Germany)                       |         |           |                           |              |                  |                  |                      |                  |
| - DJ/PCN change | - Infertility procedures | - Urohy | - Urodynamic exams | - Urethral diverticula, post-AF UI, nonobstructive urinary tract female | - Surgery for neurological reasons | - Intravesical stone removal or JJ placement (renal stones causing intermittent obstruction) | - Standard candidate to KT with expected long waiting time with deceased donor | - Bladder exstrophy correction |

*Note: EAU = European Association of Urology, AUA = American Urological Association, SIU = Italian Urological Society, ANF = French National Association of Urology, DGU = German Urological Society.*
| Outpatient setting (incl. A&E Dept.) | BPH/BPO | Andrology | Functional/ female urology | Stone disease | Kidney transplant | Urological trauma | Urological infections | Pediatric urology |
|-----------------------------------|--------|-----------|--------------------------|--------------|-----------------|-----------------|----------------------|--------------------|
| BAUS (UK)                         | Cytopscopy | Transperineal prostate biopsy | - Vasectomy | - Functional and reconstructive surgery | - Elective URS and PCNL (uncomplicated stones) | - Pediatric loop nephrostomy for vesicoureteric reflex | - Surgery for vesicoureteric reflex | - Surgery for hydrocoele |
|                                   |        | - Andrology | - Circumcision | - Bladder stones | - ESWL (renal stones) | - Surgery for congenital anomalies | - Bladder augmentation | - Surgery for hydroureter |
|                                   |        | - Inpatient setting | - Urethral stricture | - Surgery for urologic conditions | - Stone removal/exchange | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |
|                                   |        | - Functional/ female urology | - Testicular sperm extraction | - Kidney transplantation | - Urolithotomy | - Surgery for vesicoureteral reflux | - Bladder augmentation | - Surgery for hydroureter |
|                                   |        | - Stone disease | - Ureteral reimplantation | - Ureteral reimplantation | - Ureteral reimplantation | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |
|                                   |        | - Kidney transplant | - Ureteral reimplantation | - Ureteral reimplantation | - Ureteral reimplantation | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |
|                                   |        | - Urological trauma | - Ureteral reimplantation | - Ureteral reimplantation | - Ureteral reimplantation | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |
|                                   |        | - Urological infections | - ESWL (renal stones) | - Ureteral reimplantation | - Ureteral reimplantation | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |
|                                   |        | - Pediatric urology | - Stone removal/exchange | - Ureteral reimplantation | - Ureteral reimplantation | - Bladder augmentation | - Surgery for congenital anomalies | - Surgery for hydroureter |

A&E = accident and emergency; AFU = Association Francaise d’Urologie; APU = Associação Portuguesa de Urologia; AUA = American Urological Association; BAUS = British Association of Urological Surgeons; BVU = Belgische Vereniging voor Urologie; CAU = Confederation Americana de Urologia; CT = computed tomography; DGU = Deutsche Gesellschaft für Urologie; EAU = European Association of Urology; ED = erectile dysfunction; ERUS = EAU Robotic Urology Section; ESWL = external shock wave lithotripsy; FU = follow-up; GU = genitourinary; HDN = hydronephrosis; KT = kidney transplantation; LUTS = lower urinary tract symptoms; MET = medical expulsive therapy; NVU = Nederlandse Vereniging voor Urologie; PCN = percutaneous nephrostomy; PCNL = percutaneous nephrolithotomy; POM = primary obstructive megaureter; PUA = Polish Urological Association; PUV = posterior urethral valve; PVR = postvoid residual; RP = radical prostatectomy; RT = radiotherapy; SBU = Société Belge d’Urologie; SIU = Italian Society of Urology; SWL = shock wave lithotripsy; TESE = testicular sperm extraction; TRUS = transrectal ultrasound; TUR = transurethral resection; UI = urinary incontinence; UPE = ureteropelvic junction; URS = ureteroscopy; USANZ = Urological Society of Australia and New Zealand; UTI = urinary tract infection; UUT = upper urinary tract; VUR = vesicoureteral reflux.
experience consistent progressive worsening not only of their quality of life, but also of the underlying disease, making their management more troublesome for urologists (ie, the potential increased risks of even recurrent/ccomplicated urinary tract infections and antibiotic resistance, especially in patients with indwelling catheters) [36].

3.2.2. Urinary trauma and infections
Surgical procedures for urological trauma (renal injury, bladder perforation, testicular torsion, penile/urethral trauma, etc.), as well as urological infections (Fournier’s gangrene, abscesses requiring drainage, infected implants, etc.), were considered a high priority. In light of the “emergency” nature of these relatively rare conditions, these surgeries will always be regarded as nondeferrable.

3.2.3. Stone disease
There was a clear consensus among all UASs on which procedures should not be postponed in light of their potential emergency. These included obstructed kidneys with or without signs of infection or sepsis, especially in patients at a higher risk of rapid renal impairment (ie, single kidney or chronic renal failure) [4,6,8,10,13–19]. According to most recommendations, these patients should undergo urgent decompression by either ureteral stent insertion or placement of a nephrostomy tube, deferring stone removal. All the other clinical conditions, including elective treatment of asymptomatic nonobstructing renal/ureteral stones, residual stones after previous surgery, and periodic changes of ureteral stents, should be postponed.

Based on these recommendations, there will be a compelling need to reschedule all the elective surgeries for stone disease in a timely fashion [36]. However, also considering the reduction of outpatient ESWLs [37], this will represent a massive burden in our future daily practice and a significant issue for patients’ quality of life. In addition, it needs to be considered that patients requiring emergency surgery will need “elective” procedures for stone removal after that. In this context, not only there will be an accumulation of patients to treat, but their clinical conditions (while in the waiting list) might also worsen significantly and even suddenly, becoming medical emergencies or leading to relevant sequelae (such as chronic renal failure) [38], with potential medicolegal implications. In this regard, the possible decrease of new diagnoses (due to the restricted access to radiological investigations during the pandemic) and of the “overtreatment” of selected patients will not necessarily counterbalance our future workload. Indeed, these patients might need emergency surgery at any time. Notably, the multifaceted nature of stone disease includes several nuanced clinical scenarios that swing between electinon and emergency, making the tradeoff between postponement and prioritization of surgery highly complex [36].

3.2.4. Benign prostatic hyperplasia
All UASs recommended postponing elective surgery for BPH or BPH-related complications (ie, bladder diverticula and acute/chronic urinary retention requiring indwelling catheter) during the COVID-19 pandemic [4,6,8,10,13–19].

As for stone disease, BPH represents one of the most significant organizational and clinical challenges that urologists will need to face in the upcoming times. That is due to many reasons: high prevalence of the disease in the population, accumulation of elective surgeries that need to be postponed [1], potential worsening of the underlying clinical condition that may lead to relevant sequelae requiring additional therapeutic efforts, and finally, likely significant deterioration of patients’ quality of life. In this specific setting, considering that several patient-related factors trigger the indication for surgery, it is rather difficult to estimate the proportion of those patients who may be spared surgery safely in the long-term period. As such, an additional challenge for urologists is and will be to identify patients with a higher risk of BPH-related complications that require more prompt surgical treatment. To cope with this burden, these patients should be monitored more closely (eventually via telemedicine) [35] to prevent potential complications, optimizing medical therapy and conservative treatments [39]. Moreover, alternative MIS strategies requiring fewer hospital resources might be implemented to provide definitive therapeutic solutions [40].

3.2.5. Functional urology and andrology
Overall, 11/13 (85%) UASs recommended postponing all surgical procedures for functional/reconstructive conditions (pyeloplasty, ureteral reimplantation, etc.), urogonigmatic (pelvic organ prolapse, urinary incontinence, etc.), and andrological diseases (including infertility) [4–8,10,13–19], as well as other interventions for miscellaneous diseases (Table 2). The only exception was represented by emergency surgical treatment of priapism [41].

In light of these recommendations, these patients will add further challenges to reorganization strategies in the forthcoming period, similar to those with urinary stones or BPH, with an even more pronounced impact on patients’ quality of life [42,43]. Nevertheless, the number of patients affected by these conditions requiring surgery is much lower than those with BPH and stone disease.

3.2.6. Kidney transplantation
All UASs considered KT from living donors as an elective intervention that should be deferred during the COVID-19 pandemic. On the contrary, KT from deceased donors was regarded as priority surgery and therefore recommended not to be postponed.

Notably, KT from deceased donors being an “emergency” surgery, this activity could theoretically not represent a significant burden after the “acute” phase of the COVID-19 pandemic. On the contrary, it is currently posing enormous challenges for urologists, given the higher risks for the recipients, and the need to adapt logistics to such emergency scenario while ensuring safety and clinical efficacy [11,44].

3.2.7. Pediatric urology
In the context of pediatric urology, the only surgeries recommended during the COVID-19 pandemic were emergency procedures (including testicular torsion, paraphimosis, and decompression of obstructed urinary collecting
systems). All elective surgeries were considered to be of lower priority and, therefore, deferrable [4,6,13,14].

Overall, this urology branch might not impact future urologists’ workload significantly, given the relatively low incidence of the diseases and their referral to a few centers of excellence [1,45].

3.3. **Minimally invasive surgery**

After a recent report by Zheng et al [46], it has been postulated that MIS might lead to the risk of COVID-19 transmission through surgical smoke. Despite a lack of data demonstrating an aerosol presence of the virus released during abdominal MIS, this issue is still the object of debate among urological surgeons [47].

Overall, some UASs provided recommendations on this topic, concluding that, based on the available evidence, urological procedures should be performed using the approach the surgeon is more confident with [4,5,10]. However, additional precautionary measures should be taken to keep this risk to a minimum. In particular, a list of maneuvers that surgeons should follow when performing MIS has been recommended [4,5,10,12]. Beyond appropriate personal protective equipment, these include the use of specific smoke evacuation systems and CO₂ insufflation with a closed system and appropriate filtering of aerosolized particles, use of the lowest allowed intra-abdominal pressure through intelligent integrated insufflation systems during laparoscopic or robotic procedures, and lowering of electrocautery power setting as much as possible to reduce surgical smoke production [47].

3.4. **Telemedicine**

In the COVID-19 scenario, telehealth and telemedicine are emerging as possible options for urologists [48,49]. A recent study found that a large proportion of patients may indeed be eligible and willing to keep a telemedical appointment if scheduled during the COVID-19 pandemic [35].

Overall, some UASs supported the use of telemedicine as a strategy to optimize resources in the current emergency and upcoming times in different contexts (ie, first clinical assessments, multidisciplinary tumor boards, and follow-up visits) [4,6,7,9,10,12,14].

While telemedicine might also be of value in the future for everyday reorganization of the whole diagnostic and therapeutic pathway of care, its ultimate impact on urology practice still needs to be investigated.

4. **Conclusions**

In the present comprehensive review, we censored and compared the recommendations for the triage of urological procedures across several UASs. Overall, there was a large consensus among the UASs regarding the prioritization of most urological procedures, including those in the outpatient setting, urological emergencies, and many inpatient surgeries for both oncological and nononcological conditions. On the contrary, some differences were found regarding specific cancer surgeries (ie, RC for higher-risk BCa and nephrectomy for larger organ-confined renal masses), potentially due to different prioritization criteria and/or health care contexts.

In the future, the outpatient procedures that are likely to most impact the burden of urologists’ workload are prostate biopsies and elective procedures for benign conditions. In the inpatient setting, the most relevant contributors to this burden are represented by elective surgeries for lower-risk prostate and renal cancers, nonobstructing stone disease, and BPH.

These expected changes will put significant strain on urological units worldwide, primarily from a logistical standpoint (urologists’ workload, inflow of surgical patients, and waiting lists).

Moreover, from a clinical perspective, while patients with lower-risk tumors may not suffer variations in oncological outcomes, for those with nononcological diseases, the overloaded health care scenario caused by the COVID-19 pandemic might lead to worse quality of life and long-term sequelae.

In light of these predictions, we should strive to leverage this emergency period to reshape the role of urologists in the future.

**Author contributions:** Giacomo Novara had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Porpiglia, Serni, Ficarra, Novara.

**Acquisition of data:** Amparore, Campi, Checcucci, Sessa, Pecoraro.

**Analysis and interpretation of data:** All authors.

**Drafting of the manuscript:** Amparore, Campi, Minervini, Fiori.

**Critical revision of the manuscript for important intellectual content:** All authors.

**Statistical analysis:** None.

**Obtaining funding:** None.

**Administrative, technical, or material support:** None.

**Supervision:** Serni, Porpiglia.

**Other:** None.

**Financial disclosures:** Giacomo Novara certifies that all conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject matter or materials discussed in the manuscript (eg, employment/affiliation, grants or funding, consultancies, honoraria, stock ownership or options, expert testimony, royalties, or patents filed, received, or pending), are the following: None.

**Funding/Support and role of the sponsor:** None.

**References**

[1] Ficarra V, Novara G, Abrate A, et al. Urology practice during COVID-19 pandemic. Minerva Urol Nefrol 2020. http://dx.doi.org/10.23736/S0393-2249.20.03846-1, [published online ahead of print, 2020 Mar 23].

[2] Stensland KD, Morgan TM, Moinzadeh A, et al. Considerations in the triage of urologic surgeries during the COVID-19 pandemic. Eur Urol 2020;77(6):663–6. http://dx.doi.org/10.1016/j.eururo.2020.03.027.
What is the required certainty of evidence for the implementation of novel techniques for the treatment of benign prostatic obstruction? Eur Urol Focus 2019;5:351–6.

Management of stuttering priapism: a nonsystematic review. Minerva Urol Nefrol 2020;72:173–86.

When should we use urodynamic testing? Recommendations of the Italian Society of Urodynamics (SIUD). Part 1—female population. Minerva Urol Nefrol 2020;72:58–65.

Pelvic floor dysfunction and its effect on quality of sexual life. Sex Med Rev 2019;7:559–64.

Coronavirus disease pneumonia in immunosuppressed renal transplant recipients: a summary of 10 confirmed cases in Wuhan, China. Eur Urol 2019;77(6):748–54. http://dx.doi.org/10.1016/j.euro.2020.03.039.

Impact of the COVID-19 pandemic on paediatric urology practice in Europe: a reflection from the European Association of Urology Young Academic Urologists. Eur Urol 2020. http://dx.doi.org/10.1016/j.eurouro.2020.04.019, S0302-2838(20)30251-7 [published online ahead of print, 2020 Apr 15].

Minimally invasive surgery and the novel coronavirus outbreak: lessons learned in China and Italy. Ann Surg 2020. http://dx.doi.org/10.1097/SLA.0000000000003924, [published online ahead of print, 2020 Mar 26].

Risk of SARS-CoV-2 diffusion when performing minimally invasive surgery during the COVID-19 pandemic. Eur Urol 2020, S0302-2838(20)30247-5 [published online ahead of print, 2020 Apr 13].

Implementing telemedicine in response to the COVID-19 pandemic. J Urol 2020. http://dx.doi.org/10.1097/JU.0000000000001033, [published online ahead of print, 2020 Apr 3].

Is virtual urology clinic the answer to keeping the cancer pathway moving? BJU Int 2020;125(6):E3–4. http://dx.doi.org/10.1111/bju.15061.