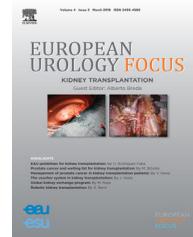


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Review – Epidemiology

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

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Article info

Article history:

Accepted May 24, 2020

Associate Editor:

Christian Gratzke

Keywords:

Association
 Coronavirus
 COVID-19
 Priority
 Society
 Urology

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

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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.

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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 Societé Internationale 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



Fig. 1 – International and European national urological associations/societies included in the review: American Urological Association (North America), Confederation Americana de Urologia (CAU; South and Central America), European Association of Urology (EAU; Europe); Urological Society of Australia and New Zealand (USANZ; Australia and New Zealand); Italian Society of Urology (SIU; Italy), Association Française d'Urologie (AFU), Deutsche Gesellschaft für Urologie (DGU; Germany), Société Belge d'Urologie (SBU; Belgium), Belgische Vereniging voor Urologie (BVU; Belgium), Associação Portuguesa de Urologia (APU; Portugal), Polskie Towarzystwo Urologiczne (PTU; Poland), and Nederlandse Vereniging voor Urologie (NVU; The Netherlands).

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 (AUA, 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 Française 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 [4–7,9,10,12–18]. 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]), priority (higher vs lower), and patient setting (outpatient vs inpatient).

	Outpatient setting			Inpatient setting				
	PCa	BCa/UTUC	RCC	PCa	BCa/UTUC	RCC	Testis/penile Ca	Adrenal Ca
<i>Oncological higher-priority procedures</i>								
EAU (Europe)	<ul style="list-style-type: none"> - Prostate biopsy (without MRI if locally advanced or highly symptomatic) - ADT (if radiological evidence of metastases; biopsy can be postponed) 	<ul style="list-style-type: none"> - Cystoscopy for macrohematuria without clots (if unequivocal lesion on US or CT-IVU 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 	<ul style="list-style-type: none"> - RTB (M + IMDC intermediate to poor risk) 	<ul style="list-style-type: none"> - RP without neoadjuvant ADT (locally advanced prostate cancer including cN1; consider long-term ADT + EBRT as an alternative to surgery) 	<ul style="list-style-type: none"> - TURB (macrohematuria and clot retention) - TURB (bladder lesion and intermittent macroscopic hematuria or history of high-risk NMIBC) - 2nd TURB - TURB (suspicion of an invasive tumor) - Radiotherapy ± chemotherapy (palliative cases or intractable hematuria with anemia) - RNU as a palliative treatment to symptomatic patients with resectable locally advanced tumors in patients with muscle-invasive UTUC - RNU (high-risk nonmetastatic UTUC) - KSS (selected patients) 	<ul style="list-style-type: none"> - Treatment: try embolization first; then surgery (actively bleeding symptomatic renal mass in M0 or M+) - Clinically advanced RCC (cT2b-4, cN0-cN1 cM0) - Advanced RCC with IVC thrombosis (Novick level 1–4) - Or other, if symptomatic 	<ul style="list-style-type: none"> - Orchidectomy - Primary RPLND (CSI NSGCT with contraindication to adjuvant chemotherapy and unwilling to accept AS [LE 1b], or teratoma with somatic-type malignancy) - RPLND or biopsy (stage IIA/B NSGCT without marker elevation, to exclude marker-negative embryonal carcinoma) - Post-CT RPLND of residual masses (NSGCT with normal/normalizing serum markers) - RPLND (growing teratoma) - Penile Surgery (≥T1G3cN0) - Radical inguinal LND (cN1–2) with ipsilateral pelvic LND (pN2/pN3) 	<ul style="list-style-type: none"> - Suspected ACC or tumors >6 cm
EAU-ERUS (Europe)				<ul style="list-style-type: none"> - RARC/RARP (at strict timing after systemic therapy) - Robotic management of postoperative complications (referral centers) 	<ul style="list-style-type: none"> - RARC (higher-risk cancers) - RARC (severe hematuria with transfusion distress) - Robotic RNU (high risk) 	<ul style="list-style-type: none"> - Robotic PN or RN (for tumor ≥ cT2a) - Robotic RN (bleeding kidney or bleeding kidney tumor) 		<ul style="list-style-type: none"> - Robotic adrenalectomy
AUA (USA)	<ul style="list-style-type: none"> - MRI and biopsy (high risk, suspicion of PCa) - If biopsy, prefer the TP approach 	<ul style="list-style-type: none"> - Cystoscopy for macrohematuria 		<ul style="list-style-type: none"> - RP (GG3–5; GG2 with >2 cores or tumor length >5 mm or PSA > 10) 	<ul style="list-style-type: none"> - RC (high risk) - TURB (high risk) - RNU for UTUC - URS (suspected high-risk UTUC) 	<ul style="list-style-type: none"> - RN - Nephrectomy (RCC with IVC thrombosis) 	<ul style="list-style-type: none"> - Orchectomy - RPLND - Surgery for penile cancer 	<ul style="list-style-type: none"> - Adrenalectomy (suspected cancer or symptomatic)

Table 1 (Continued)

	Outpatient setting			Inpatient setting				
	PCa	BCa/UTUC	RCC	PCa	BCa/UTUC	RCC	Testis/penile Ca	Adrenal Ca
CAU (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)	- Orchietomy - Post-CT RPLND (progressive residual mass)	
SIU (Italy)	- Prostate biopsy (high clinical suspicion of PCa) - Cystoscopy (FU of high-risk TCC and for BCa diagnosis)	- 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° look for T1 or TxHG) - RNU (high-grade or multifocal or ≥ cT1 tumors, UTUC)	- Nephrectomy (cT2-T4; N+; cT1b eligible for PN) - CN	- 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 ≤ 3 NO UTUC)	- Nephrectomy (locally advanced [cT3]; renal vein or IVC thrombosis; cN + MO; 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)	- Orchidectomy - 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 ≥ 4)	- Cystoscopy and instillation (high- or intermediate-risk NMIBC)		- RP (high risk)	- RC (MIBC or high-risk NMIBC) - TURB (high-risk BCa) - 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
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)	- RN - Nephrectomy or embolization (due to bleeding)	- Testis cancer - Penile cancer	- Adrenalectomy
BVU (Belgium)	- Prostate biopsy (high PSA, PIRADS ≥ 4)	- Cystoscopy and bladder instillations (high- or intermediate-risk NMIBC)		- RP (high risk)	- RC (high-risk) - TURB (high-risk) - URS (high risk) - RNU (high risk) - RNU (for severe hematuria)	- Nephrectomy or embolization (due to bleeding) - PN/RN (for ≥ cT2 RCC ± IVC thrombectomy)	- Orchidectomy - Post-CT RPLND - Surgery for penile cancer	- Adrenalectomy (tumors >6 cm or pheno)

Table 1 (Continued)

	Outpatient setting			Inpatient setting				
	PCa	BCa/UTUC	RCC	PCa	BCa/UTUC	RCC	Testis/penile Ca	Adrenal Ca
SBU (Belgium)	- Prostate biopsy (high PSA, PIRADS ≥ 4)	- Cystoscopy and bladder instillations (high- or intermediate-risk NMIBC)		- RP in strict timing (after ADT as part of a study)	- RC (major hematuria) - RC (high risk, or after NAC) - TURB (high risk) - URS (high risk) - RNU (high risk)	- RN - RN for RCC with IVC thrombosis - Nephrectomy or embolization of a hemorrhagic RCC	Radical orchietomy	Adrenalectomy
PUA (Poland)	- Prostate biopsy			- RP (high- or intermediate-risk PCa)	- RC (high risk of progression, preferably after NAC) - TURB or re-TURB - TURB or cystectomy in case of severe bleeding - RNU (high risk of progression)	- RN for ≥ cT2 or bleeding RCC - PN for cT1b RCC - Surgery in case of solitary kidney - Planned PN/RN (cT1-T2 tumors)	- Orchietomy - RPLND - Penectomy ± LND (penile cancer)	- Adrenalectomy (suspected ACC or tumors >6 cm)
Oncological lower-priority procedures								
EAU (Europe)	- Prostate biopsy (regardless of PSA and DRE) - Prostate rebiopsy (AS protocol)	- Early postoperative instillation of chemotherapy - Intravesical BCG or chemotherapy instillations (intermediate-risk NMIBC) - Urethrocytscopy (in patients with confirmed UTUC) - Postoperative bladder instillation of chemotherapy (in patients with UTUC) - Follow-up cystoscopy (history of NMIBC without hematuria) - Follow-up cystoscopy (UTUC)	- RTB (cT1a NOMO)	- RP/EBRT/brachytherapy (low to intermediate risk) - RP (until after pandemic; if patient anxious consider ADT + EBRT)	- TURB: (1) no hematuria; (2) no history of high-risk NMIBC - TURB (small papillary recurrence/s and history of Ta/I LG tumor) - 2nd TURB (visibly complete initial TURB of T1 lesion with muscle in the specimen) - RC (highest-risk NMIBC; BCG-unresponsive NMIBC or BCG failure) - RC (T2-T4aNOMO) * - TURB within multimodal bladder-sparing protocols (selected T2NOMO patients) * - Diagnostic URS and biopsy (if imaging and cytology are not sufficient) - KSS (low risk)	- All cT1b-cT2a cN0 cM0 asymptomatic RCC - All cT1aNOMO tumors - Bosniak III cysts and AML - Cytoreductive nephrectomy ± metastasectomy - 2nd TURB (visibly complete initial TURB of T1 lesion with muscle in the specimen) - 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 - Surgery after NAC (T4 or cN3) favorable)	- 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 - Surgery after NAC (T4 or cN3) favorable)	- Adrenalectomy (<6 cm, favorable imaging characteristics)
EAU-ERUS (Europe)				- Robotic RP	- Robotic RNU (low risk) - RARC (lower risk)	Robotic PN (tumors ≤ cT1b)		

Table 1 (Continued)

	Outpatient setting			Inpatient setting				
	PCa	BCa/UTUC	RCC	PCa	BCa/UTUC	RCC	Testis/penile Ca	Adrenal Ca
AUA (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) - TURB (low risk) - URS (presumed low risk)	- PN		- Low cancer suspicion, asymptomatic
	- MRI and prostate biopsy (not high suspicion)	- Cystoscopy (microhematuria without risk factors; FU in low/intermediate-risk NMIBC) - Maintenance BCG/ chemotherapy (in intermediate-risk NMIBC)						
CAU (South and Central America)				- Brachytherapy - RP (low or intermediate risk) - RP (low risk)				
USANZ (Australia and New Zealand)					- Cystoscopy/TURB after instillation therapy (low risk of recurrence) - TURB (small recurrent NMIBC) - RNU (LG or unifocal or T1 lesion)	- PN (cT1a RCC) - RN (cT1b RCC not eligible for PN)		
SIU (Italy)	- Instillations (low-risk NMIBC)	- RTB (small renal masses)		- RP (favorable intermediate or low risk)				
AFU (France)	- MRI or prostate biopsy for AS - Brachytherapy or EBRT (intermediate risk)	- Cystoscopy for low-risk recurrence NMIBC (delay within 3 mo) - URS for positive urinary cytology without objectified lesion at cystoscopy or imaging (delay within 3 mo)			- RC without NAC (\geq T2 BCa) - RC (high-risk NMIBC) * - TURB for small, nonmultifocal, presumably low-grade NMIBC without (delay within 3 mo)		Partial diagnostic orchietomy (suspected benign lesion <2 cm with negative markers)	
DGU (Germany)				- RP (low risk)		- Nephrectomy for tumors <7 cm		
BAUS (UK)				- Brachytherapy - MDT-directed PCa surgery (high-intermediate-low risk)	- TURB (low risk, ie, NMIBC) - RNU (low risk)	- PN	- Surgery for penile cancer (low grade and premalignant)	
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) - RNU (low risk)	- PN/RFA		
BVU (Belgium)	- Brachytherapy (lower-risk PCa)	- Cystoscopy and bladder instillations (low-risk NMIBC)		- RP (low risk)	- RC (lower risk) - RNU (lower risk) - TURB (lower risk) - URS (lower risk)	- PN/RFA (cT1 tumors)		- Adrenalectomy (nonsecreting incidentaloma)
SBU (Belgium)		- Cystoscopy and bladder instillations (low-risk NMIBC)				- PN/RFA		

Table 1 (Continued)

	Outpatient setting			Inpatient setting		
	PCA	BCa/UTUC	RCC	PCA	BCa/UTUC	RCC
PUA (Poland)	- Cystoscopy (FU in patients after TURB for pTa-T1 G ₁) - Cystoscopy (FU in patients after TURB for pTa HG)	- RP (low risk)	-	- RNLU (low-risk UTUC if local sparing treatment is possible)	- PN (cT1a tumors, except solitary tumors)	- Adrenalectomy (tumors < 6 cm with favorable imaging features)
	ACC = adrenocortical carcinoma; ADT = androgen deprivation therapy; AFU = Association Française d'Urologie; AML = angiomyolipoma; APU = Associação Portuguesa de Urologia; AS = active surveillance; AUU = American Urological Association; BAUS = British Association of Urological Surgeons; BCG = bacillus Calmette-Guérin; BVU = Belgische Vereniging voor Urologie; Ca = cancer; CAU = Confédération Américaine de Urologie; CN = cytoreductive nephrectomy; CSI = carcinoma <i>in situ</i> ; CT = computed tomography; DGU = Deutsche Gesellschaft für Urologie; DRE = digital rectal examination; EAU = European Association of Urology; EBRT = external beam radiotherapy; ERUS = EAU Robotic Urology Section; FU = follow-up; GG = grade group; HG = high grade; IMDC = International Metastatic RCC Database Consortium; IVC = inferior vena cava; IVU = intravenous urogram; KSS = kidney-sparing surgery; LE = level of evidence; LG = low grade; LND = lymph node dissection; MDT = metastasis-directed therapy; mRCC = metastatic RCC; MRI = magnetic resonance imaging; NAC = neoadjuvant chemotherapy; NMIBC = non-muscle-invasive bladder cancer; NSGCT = nonseminomatous germ cell tumor; NVU = Nederlandse Vereniging voor Uroologie; PI-RADS = Prostate Imaging Reporting and Data System; PN = partial nephrectomy; PSA = prostate-specific antigen; pts = patients; PUU = Polish Urological Association; RARC = robot-assisted radical cystectomy; RARP = robot-assisted radical prostatectomy; RCC = radical cystectomy; RN = radical nephrectomy; RNu = radical nephroureterectomy; RP = radical prostatectomy; RPLND = retroperitoneal lymph node dissection; RTB = renal tumor biopsy; SBU = Société Belge d'Urologie; SIU = Italian Society of Urology; TCC = transitional cell carcinoma; TP = transperitoneal; TURB = transurethral resection of bladder tumors; URS = ureteroscopy; US = ultrasound; USANZ = Urological Society of Australia and New Zealand.					

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%) UASs 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 UASs, 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 UASs [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 UASs 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 UASs recommended not to postpone transurethral resection of bladder tumors (TURB) for higher-risk NMIBCs (especially in case of a suspicion of $\geq T2$ 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 UASs (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-T4aNOMO 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 surgical 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 orchietomy 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 neurourology (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).

Outpatient setting (incl. A&E Dept.)	Inpatient setting							
	BPH/BPO	Andrology	Functional/female urology	Stone disease	Kidney transplant	Urological trauma	Urological infections	Pediatric urology
<i>Nononcological higher-priority procedures</i>								
EAU(Europe)	- Suprapubic catheter if residual urine/obstructive (acute bacterial prostatitis) - Transurethral or suprapubic urinary diversion (urethral injury)	- Sperm cryopreservation (prior to planned orchidectomy) - oncotesticular sperm extraction at the time of radical orchidectomy (men with testis cancer and azoospermia or severe abnormalities in their semen)	- Urinary tract fistulae (if need of systemic CT or intracavity RT)	- Urgent decompression of the collecting system (PCN or stent; sepsis due to obstructing stones, anuria) - Urgent decompression or endourological stone removal (renal insufficiency, renal failure, bilateral obstruction, solitary kidney) - Interventional treatment (in situ SWL, URS, or decompression; obstructing/symptomatic ureteral stone not suitable for MET) - First decompression, then interventional stone removal as early as possible (renal stone with recurrent infection and obstruction, staghorn stones)	- Combined transplants - Angioembolization (high-grade renal injury with active bleeding if hemodynamically stable) - Urgent surgical exploration plus nephrectomy (high-grade injuries and persistent hemodynamic instability) - Urinary diversion (ureteral injury, acute setting) - Surgical exploration and repair (bladder rupture/bladder injury by penetrating trauma; female pelvic fracture urethral injury; testicular injury with tunical rupture, penile fracture, and penetrating genital injury are all organ threatening)	- Surgical debridement (Fournier's gangrene) - Pyeloplasty in UPJ obstruction (progressive loss of function or severe symptoms—consider drainage with JJ of nephrostomy) - PUV - POM with progressive loss of function - Urolithiasis with recurrent infections - Urosepsis with obstruction - PUV if urethral or suprapubic catheter cannot be placed - Oncology - Acute ischemia (incl. testicular torsion) - Paraphimosis - Pediatric trauma (hemodynamic instability or urinoma formation)		
AUA(USA)	- Clot retention - Urinary retention - Urethral stricture (obstruction) - Cystoscopy + Botox (if established) - Retrograde pyelogram - Stent removal or insertion - Urethral evaluation (ie, cuff erosion)	- BPH requiring indwelling catheter	- Priapism	- Adult ureteral reimplant/pyeloplasty - Urogenital/colovesical fistulas - Stage 2 sacral neuromodulation	- Obstructed kidney/infection - Pregnant with obstruction - Stent change	- Cadaveric KT - Transplant kidney biopsy (for cause)	- Torsion	- Urological abscess/wound washout - Infected prosthesis/device
CAU (South and Central America)	- Acute urinary retention			- Renal colic - "Urgent" urinary stone		- Penile or testicular fracture - Testicular torsion	- Renal abscess - Fournier's gangrene	
USANZ (Australia and New Zealand)	- Chronic or acute urinary retention			- Symptomatic stones - Obstructed (\pm infected) kidneys, stent in situ		- Testicular torsion - Penile and urethral trauma	- Infected kidneys	

Table 2 (Continued)

	Outpatient setting (incl. A&E Dept.)	Inpatient setting						
		BPH/BPO	Andrology	Functional/female urology	Stone disease	Kidney transplant	Urological trauma	Pediatric urology
SIU (Italy)	- Clot removal due to hematuria - Urethral/suprapubic catheter (acute urine retention) - Priapism - Urethral/suprapubic catheter substitution	- Hemostatic TUR if recurrent or major bleeding coming from prostate or bladder	- Priapism (not responsive to drugs or drainage)		- Ureteral stent/nephrostomy (sepsis) - Obstructive stones (especially in solitary kidney or bilateral or renal failure)	- Kidney transplant (deceased donors)	- Scrotal exploration, orchidopexy - Acute torsion - Major trauma with hemodynamic instability	- Scrotal abscess - Fournier's gangrene - Prosthesis infection
AFU (France)								- Scrotal exploration (± orchidopexy) for acute torsion
DGU (Germany)	- Macrohematuria - Urinary retention - Colic, febrile UTI - Priapism - Infected lymphocele				- Infected urinary obstruction	- Organ donation postmortem	- Testicular torsion - Trauma	- Urosepsis - Fournier's gangrene - Kidney abscess
BAUS (UK)	- Acute urinary retention - Bladder neck stenosis post RP	- Priapism			- Obstructed/infected kidney (drainage first) - Nonpassage of ureteric stone or HDN in malignancy (nephrostomy/stent) - Stent change (risk of sepsis) - Acute ureteric stones (ESWL)	- Pediatric kidney transplant	- Emergency urology (including hematuria/uncontrolled hemorrhage and urological trauma) - Testicular torsion - Penile fracture	- Abscesses, washouts - Fournier's gangrene - Infected prostheses - Trauma - Circumcision (severe BXO) - Posterior urethral valves - Renal stent removal/exchange
APU (Portugal)	- Placement or removal of nerve stimulators (phase 2)	- Postsurgical bleeding			- Ureteral obstruction with infection (nephrostomy or JJ stent)	- Kidney transplant (urgent cases)	- Testicular torsion	- Abscess - Gangrene
NVU (The Netherlands)	- Clot retention				- JJ or nephrostomy for obstruction (with fever/renal insufficiency/bleeding)		- Testicular torsion - Trauma (ie, bladder perforation) - Kidney trauma (hemodynamic instillation)	- Abscess
BVU (Belgium)		- Priapism			- Urinary obstruction (fever, acute renal failure, single kidney)		- Testicular torsion - Urological trauma	- Abscess - Gangrene - Infected implants
SBU (Belgium)	- Acute urinary retention with fever				- Obstructive renal failure - URS with JJ placement for stone		- Testicular torsion - Intraperitoneal bladder perforation - Renal trauma	- Obstructive pyelonephritis - Abscess - Gangrene
PUA (Poland)	- Clot removal due to recurrent hematuria - Acute urinary retention - 2 nd stage nerve stimulator placement or removal	- Shunts in priapism			- Obstructed kidney if risk of sepsis (preferred procedures nephrostomy or stenting)	- Kidney transplant from deceased donors	- Testicular torsion - Surgical treatment of life-threatening GU traumas - Penile/testicular injuries	- Fournier's gangrene - Testicular/renal abscess - Removal of infected devices
	Out-patient setting (incl. A&E dept.)	In-patient setting BPH/BPO	Andrology	Functional/female urology	Stone disease	Kidney transplant	Pediatric urology	Other

Table 2 (Continued)

	Inpatient setting							
	BPH/BPO	Andrology	Functional/ female urology	Stone disease	Kidney transplant	Urological trauma	Urological infections	Pediatric urology
<i>Nononcological lower-priority procedures</i>								
EAU (Europe)	<ul style="list-style-type: none"> - Invasive procedures for neurological reasons (incl. urodynamics) - Diagnostic procedures for male infertility 	<ul style="list-style-type: none"> - Surgical management of male LUTS (incl. patients with urinary retention) 	<ul style="list-style-type: none"> - Elective sperm retrieval and fertility procedures - Orchidectomy (cryptorchidism in men with unilateral undescended testis and normal hormonal function/spermatogenesis) 	<ul style="list-style-type: none"> - Surgery for female UI, urethral diverticula, post-RP UI, nonobstructive urinary tract fistulae - Surgery for neurological reasons 	<ul style="list-style-type: none"> - Interventional stone removal - Interventional stone removal (or JJ placement renal stones causing intermittent obstruction) - Interventional stone removal (others, asymptomatic/oligosymptomatic renal stones; indwelling DJ stent due to stone) 	<ul style="list-style-type: none"> - Standard candidate to KT with expected long waiting time with deceased donor - Renal transplants with complex medical, surgical, and immunological situations (which require increased resource use, prolonged hospital stay, and/or more intense immunosuppression) - Living donor KT 	<ul style="list-style-type: none"> - Benign scrotal and penile surgery - Functional surgery - Genital reconstructive surgery - Benign (hemi) nephrectomy. - Bladder augmentation, catheterizable stoma, appendicocectomy - Bladder extrophy correction - Surgery for VUR - Pyeloplasty if no loss of function - Urolithiasis if no infection or obstruction - Botulinum toxin injections for neurogenic bladder only in selected cases 	<ul style="list-style-type: none"> - Urethroplasty (urethral trauma)
EAU-ERUS (Europe)					- Functional and reconstructive robotic surgery			<ul style="list-style-type: none"> - Robotic radical nephrectomy for benign pathologies
AUA (USA)	<ul style="list-style-type: none"> - Circumcision - Urodynamics - Urolift - Vasectomy - Trigger point injection - Cystoscopy (bulking agents, dilation) - Penile Doppler - Hydrocele drainage - Retrograde urethrogram - TRUS - Pessary exchange 	<ul style="list-style-type: none"> - BPH on self-catheterization or safe voiding - Rezum 	<ul style="list-style-type: none"> - Penile prosthesis - Infertility - Non-CA scrotal surgery - Vasectomy - Circumcision - Buried penis - Peyronies 	<ul style="list-style-type: none"> - Slings - Pelvic organ prolapse - Sacral neuromodulation - (stage 1 or total) - Artificial urethral sphincter - Cystoscopy (neurogenic/ Botox) - Urethral diverticula - Mesh removal/sling incision 	<ul style="list-style-type: none"> - Asymptomatic nonobstructing renal stone and ureteral stone - Stone with stent/ nephrostomy tube 	<ul style="list-style-type: none"> - Living donor renal transplant - Kidney biopsy (protocol) 	<ul style="list-style-type: none"> - Reimplant - Penile and benign testicular cases 	<ul style="list-style-type: none"> - Urethral stricture (no imminent obstruction) - Ureterolysis - Recto/pubourethral fistula
CAU (South and Central America)		- Elective surgery for BPH	- Scrotal and andrological surgery	- Reconstructive/functional surgery	- Elective surgery for stones			
USANZ (Australia and New Zealand)								
SIU (Italy)	<ul style="list-style-type: none"> - Urodynamic exams - ESWL for asymptomatic patients - Urteral catheter or nephrostomy substitution 	- BPO surgery procedures (indwelling catheter)		<ul style="list-style-type: none"> - Detrusor overactivity (consider the risk of UUT injury) - Pelvic organ prolapse (consider hydronephrosis or elevated PVR) 	<ul style="list-style-type: none"> - Nonobstructive renal or urteral stones (normal renal function or urinary stent) 	- Living donor renal transplant		<ul style="list-style-type: none"> - Urogenital fistula
AFU (France)						- Kidney transplant (preferably dialysis)		
DGU (Germany)	<ul style="list-style-type: none"> - DJ/MJ/PCN change - Infertility procedures - Urodynamics - FU cystoscopy - Neurourology - Andrology 	<ul style="list-style-type: none"> - BPH surgery - Surgery for bladder diverticula 	<ul style="list-style-type: none"> - Gender reassignment surgery - TESE 	<ul style="list-style-type: none"> - Surgery for UI - Reconstructive surgery 	<ul style="list-style-type: none"> - Stone treatment if asymptomatic - DJ change 	<ul style="list-style-type: none"> - Living donor Kidney transplant 	<ul style="list-style-type: none"> - Undesc. testicles - Varicocele - Hydrocele - Circumcision 	<ul style="list-style-type: none"> - Urethrotomy - Urethral plastic surgery - Pyeloplasty

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
BAUS (UK)	- Cystoscopy - Transperineal prostate biopsy - Andrology	- BPH surgery - Bladder stones	- Vasectomy - Circumcision - Scrotal surgery - Surgery for ED, infertility, urethral stricture, gender reassignment	- Functional and reconstructive surgery - Elective URS and PCNL (uncomplicated stones) - ESWL (renal stones) - Stent removal/exchange	- Orchidopexy for undescended testis - Hypospadias repair - Pyeloplasty - Surgery for vesicoureteric reflux - Bladder augmentation - Surgery for benign lesions	- Nephrectomy (nononcological)		
APU (Portugal)	- Andrology - Neurourology	- BPH surgery	- Vasectomy - Circumcision - Scrotal surgery	- Functional and reconstructive surgery - Elective stone surgery - Nonobstructive kidney stones - Ureretal obstruction without infection	- Living donor Kidney transplant	- Nephrectomy (nononcological)		
NVU (The Netherlands)	- Andrology	- BPH surgery	- Andrological surgery (vasectomy, circumcision, scrotal surgery)	- Functional and reconstructive surgery - Elective stone surgery		- Nephrectomy (nononcological)		
BVU, SBU (Belgium)	- Andrology and infertility - Functional and reconstructive urology - Cystoscopy and bladder instillations (benign)	- BPH surgery	- Elective minor surgery (vasectomy, circumcision, scrotal, etc.)	- Functional and reconstructive surgery - Elective URS/PCNL	- Living donor kidney transplant	- Nephrectomy (nononcological)		
PUA (Poland)	- ESWL (kidney stones) - Urethral stricture - Urodynamic and neurourolological studies - Catheter substitution	- BPH surgery	- Andrological surgery	- Functional and reconstructive surgery - PCNL - Diagnostic URS for nononcological reasons - Stone disease (previous PCN or DJ)	- Living donor kidney transplant	- Nephrectomy (nononcological)		

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/compli-cated urinary tract infections and antibiotic resistance, especially in patients with indwelling catheters) [36].

3.2.2. Urological 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 election 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.), urogynecological (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.

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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.

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