GENITOURINARY GUIDELINE

GENITOURINARY EXPERT PANEL MEMBERS

Dr. Christopher Fung, Radiologist, Medical Imaging Consultants, AB

Barb Avard, Patient and Family Advisor, North York General Hospital, ON

Dr. Gary Brahm, Radiologist, Western University, ON

Dr. Daisy Fung, Family Physician, Kaye Edmonton Clinic Family Medicine Clinic, AB

Dr. Benjamin Martens, Urgent Care Physician, Island Health, BC

Dr. Lisa Miller, Nephrologist, University of Manitoba, MB

Dr. Eric Sala, Radiologist, Memorial University of Newfoundland, NL

Dr. Christopher JD Wallis, Urologist, University of Toronto, Division of Urology, Toronto, ON

Evidence reviewer and Guideline methodologist: Dr. Candyce Hamel, Senior Epidemiologist, Canadian Association of Radiologists, Ottawa, ON.

Evidence reviewer: Alan Michaud, Research Associate, Canadian Association of Radiologists, Ottawa, ON.

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Correspondence: info@car.ca

Canadian Association of Radiologists
L'Association canadienne des radiologistes

Contents

ABBREVIATIONS

ACR	American College of Radiology
AGREE-II	Appraisal of Guidelines for Research & Evaluation Instrument
AI	Artificial Intelligence
CAR	Canadian Association of Radiologists
CT	Computed Tomography
CT urography	Equivalent to CT intravenous pyelogram (CT IVP)
CTA	Computed Tomography Angiography
EP	Expert Panel
EtD	Evidence to Decision
GRADE	Grading of Recommendations Assessment, Development and Evaluation
MR	Magnetic Resonance
MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
NICE	National Institute for Health and Care Excellence
NM	Nuclear medicine
PET-CT	Positron emission tomography-Computed Tomography
RCR	Royal College of Radiologists
US	Ultrasound
XR	Radiograph

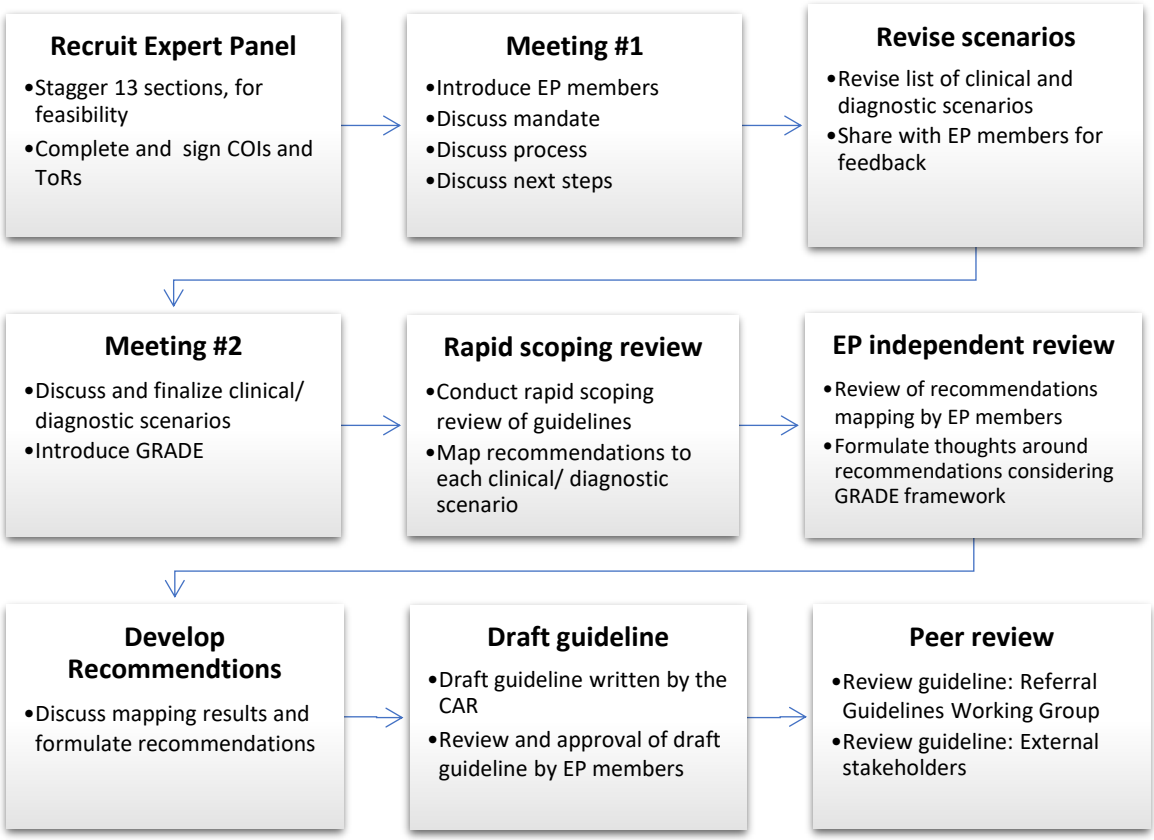
INTRODUCTION

The diagnostic imaging referral recommendations from the Canadian Association of Radiologists (CAR) were published in 2012 (https://car.ca/patient-care/referral-guidelines/). These recommendations were made up of 13 sections, of which one was Urological, adrenal, and genitourinary systems. In 2020, the CAR, funded by the Canadian Medical Association (CMA), developed a plan to update the CAR diagnostic imaging referral recommendations. The project mandate is to develop a comprehensive set of evidenced-based diagnostic imaging referral guidelines suited for integration into clinical decision support (CDS) systems.

An Expert Panel (EP) made up of physicians from the disciplines of radiology, emergency medicine, family medicine, nephrology, urology, a patient advisor, and an evidence review/ guideline methodologist from across Canada met three times on March 30th, 2023, January 20th and February 12th, 2024.

The 12 clinical/diagnostic scenarios in the 2012 CAR recommendations were used as the starting point for discussions. After a review and update of these scenarios, a list of 22 clinical/diagnostic scenarios was created, which informed the systematic search strategy and rapid scoping review.

The general process of the guideline development is presented in **Figure 1**.



Abbreviations: CAR = Canadian Association of Radiologists; **COI** = Conflict of Interest; **EP** = Expert Panel; **GRADE** = Grading of Recommendations Assessment, Development and Evaluation; **ToR** = Terms of Reference

Figure 1 - Guideline Development Process

WHO ARE THESE RECOMMENDATIONS FOR?

These recommendations are primarily for referring clinicians (e.g., physicians, nurse practitioners, and allied health providers); however, they may also be used by radiologists, patients, and/or patient representatives.

The primary objective of the recommendations is to promote the most appropriate diagnostic imaging procedure(s), so that patients receive these procedure(s) at the right time, resulting in better health outcomes.

Scope

The guideline recommendations are designed to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring.

DISCLAIMER

These recommendations are not intended to stand alone. Medical care should be based on evidence, the patient's presentation, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability.

We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

METHODS OF THE RAPID SCOPING REVIEW

The conduct of the systematic rapid scoping review was guided by empirical review guidance: the Joanna Briggs Institute scoping review guidance [1], the Cochrane Handbook [2], and the rapid review interim guidance from the Cochrane Rapid Review Methods Group [3].

Inclusion Criteria

Publications were included if they met the following criteria:

Guidelines: Providing diagnostic imaging recommendations for one or more of the clinical/diagnostic scenarios identified by the Genitourinary EP.

Study design: Guidelines that were produced using three criteria in the AGREE-II assessment tool [4]:

(1) Systematic methods were used to search for evidence: Searched and named at least 1 electronic database using an electronic search strategy (e.g., Medline, Embase, PubMed, CENTRAL);
(2) The criteria for selecting the evidence are clearly described: Described a formal process for study selection; AND reported the inclusion and exclusion criteria; OR if it is based on a systematic review even if it does not provide explicit methods; and
(3) The strengths and limitations of the body of evidence are clearly described: Performed critical appraisal on the included studies (e.g., risk of bias, describe study limitations); OR if it is based on a systematic review and GRADE is performed.

Interventions: Any diagnostic imaging modality (e.g., radiograph [XR], magnetic resonance imaging [MRI], computed tomography [CT], ultrasound [US]) were included.

Date of publication: To identify the most recent guidelines which would contain the most recently published primary studies, and for feasibility, we included guidelines that were published or updated in 2018 and onward.

Language of publication: English, for feasibility.

Search

A systematic search strategy was developed by an experience information specialist (**Appendix 1**) using the list of clinical/diagnostic scenarios identified by the Genitourinary EP members. The search was run in Medline and Embase on May 29, 2023. The search was limited to publications from 2018 onward to capture the most recent guidelines, and for feasibility. There was no language restriction in the search. Supplemental searching included searching the following national radiology and/or guideline groups: American College of Radiology (ACR), American Urological Association (AUA), Canadian Urological Association (CUA), National Institute for Health and Care Excellence (NICE), Society of Obstetricians and Gynaecologists of Canada (SOGC), TOP guidelines, and the Royal College of Radiologists (RCR) 8th Edition (2017).

Title/abstract screening

Using a standardized form in DistillerSR, an online systematic review software [5], one reviewer screened the records in prioritized order, using the artificial intelligence (AI) re-ranking tool in DistillerSR. A stop-screening approach was implemented once 95% of the predicted included studies were identified [6,7]. The AI reviewer tool in DistillerSR excluded the remaining records. The AI audit tool was run to identify any records that were excluded that had high score for inclusion (i.e., a prediction score of 0.85 and above). These records were rescreened to ensure that they should have been excluded. A second reviewer verified a random sample of 10% of the included records and 20% of the excluded records, without knowledge of the inclusion or exclusion decision by the first reviewer. Any disagreements were resolved through discussion and subsequent consensus. The AI audit tool was rerun, and any records with a prediction score of ≥0.85 were rescreened.

Full text screening

Using a standardized form in DistillerSR, one reviewer evaluated the full texts of the guidelines against the eligibility criteria described above in the Inclusion Criteria.

Mapping

Recommendations were extracted from all included guidelines by one reviewer and presented in tabular form for each clinical/ diagnostic scenario. A synopsis (i.e., a condensed version of the evidence table) for each clinical/ diagnostic scenario was created based on the information in the evidence tables. These synopses highlighted the main recommendations across guidelines, with a focus on guidelines that used GRADE, and highlighted any discordant recommendations. These synopses were produced by the guideline methodologist and distributed to the EP members to help guide discussion when formulating the recommendations.

Critical appraisal

Each guideline was assessed for the level of quality using the AGREE-II instrument [4]. This was performed by one reviewer with a quality control check on a random sample of 10% of the guidelines.

FORMULATING RECOMMENDATIONS

Over two virtual meetings (January 20th and February 12th, 2024), the EP members discussed each of the clinical scenarios using the information in the synopses as a guide. When required, the full evidence tables (**Appendix 2**) were consulted for additional information.

NOTE: Details have been removed from Appendix 2 to comply with copyright protection. For additional information on these recommendations, please access the full publications.

The focus of these recommendations was to provide the recommendation for the initial imaging modality, for the next imaging modality or an alternative to the first imaging modality, in situations where the first imaging modality is negative, indeterminate, may not be available, or if additional imaging is required.

Specifying contrast protocols

Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

Grading of Recommendations Assessment, Development and Evaluation

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) for Guidelines framework [8,9] was used as a guide to determine the strength (i.e., strong, conditional) and direction (i.e., for, against) of the recommendation. As the GRADE methodology requires an Evidence to Decision (EtD) framework for each recommendation, this would not have been feasible as:

(i) We used recommendations from existing guidelines as our evidence base, thereby not allowing for full assessment of each outcome within the primary studies, including the five GRADE domains to evaluate the certainty of the evidence: risk of bias, indirectness, imprecision, inconsistency, and publication bias [10]. Therefore, this information was inferred by the level and strength of the evidence provided in the included guidelines.

(ii) We covered 22 clinical/diagnostic scenarios in the Urology section, which could have included several diagnostic imaging modality comparisons. This would have resulted in a minimum of 22 EtD frameworks, but realistically many more, as we would have had to create an EtD for each comparison (e.g., XR vs US, XR vs CT, MRI vs CT) within each clinical/diagnostic scenario.

Therefore, in addition to the diagnostic imaging recommendations presented by each included guideline, and the clinical expertise of the EP members, additional criteria were considered specific to the Canadian healthcare context:

- Certainty of the evidence (as presented in the included guidelines);
- Consideration of benefits and harms (e.g., ionizing radiation exposure);
- Values and preferences;
- Equity, accessibility, and feasibility; and
- Resource use and costs.

The strength and direction of the recommendations are represented by arrow directions and colours. Using GRADE as a guide [8], these can be interpreted as:

- **Strong recommendation ("recommend"), for (↑↑)**: All or almost all informed people would want/recommend this intervention and only a small proportion would not. If this intervention is not offered, the patient or patient representative should request a discussion.
- **Conditional recommendation ("suggest"), for (↑)**: Most informed people would choose/recommend this intervention; however a substantial number would not. This may be conditional upon patient values and preferences, the resources available or

the setting in which the intervention will be implemented.

- **Conditional recommendation ("suggest"), against (↓)**: Most informed people would not choose/recommend this intervention; however a substantial number would. This may be conditional upon patient values and preferences, the resources available or the setting in which the intervention will be implemented.
- **Strong recommendation ("recommend"), against (↓↓)**: All or almost all informed people would not want/recommend this intervention; however a small proportion would.

When there were no guidelines to support recommendations, the EP formulated recommendations based on their clinical expertise while considering values and preferences, resources, cost, equity, and accessibility. These recommendations are denoted with (EP consensus).

The recommendations for each clinical/ diagnostic scenario are presented below, with reference to the guidelines that were included for that scenario. Recommendations are also summarized in tabular form in **Appendix 3**.

INCLUDED GUIDELINES

A total of 4205 records were identified through the electronic database searches. After reviewing 1330 records, the AI reviewer excluded the remaining records (n=2874), as 95% of the predicted included records had been identified and the likelihood for inclusion of the remaining records was low (highest remaining prediction score of 3.12%). A second reviewer screened a set of randomly selected records (n=841) for verification (~10% of included and 20% of excluded records). Among these, there were 9 conflicts between the two human screeners. These conflicts were resolved through discussion. Eighteen additional records were added from the supplemental search. The full text for two records were not retrievable. No records were excluded based on language. Among the remaining 80 full texts that were screened for eligibility, 27 were not guidelines providing diagnostic imaging recommendations for genitourinary imaging, 15 did not use systematic methods or sufficiently describe the methods used in the formulation of the guideline, and 6 were excluded for 'other' reasons. A list of excluded records with reasons is available upon request. Recommendations from 30 guidelines (32 publications) were included (Error! Reference source not found. – **PRISMA flow diagram**).

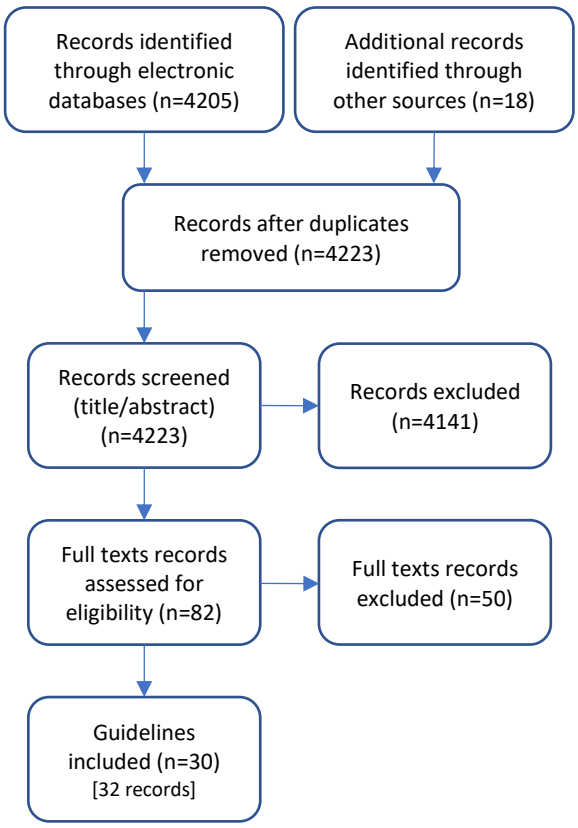


Figure 2 - PRISMA flow diagram

The number of guidelines included per clinical/diagnostic scenario ranged from zero to six. Where available, the certainty of the evidence and/or strength of the

recommendations are highlighted to provide a sense of the certainty of the evidence of the included primary studies (**Appendix 2**).

Most guidelines were rated as moderate or high quality, using the AGREE-II tool (**Appendix 4**). Often, reasons for rating an item down were due to a lack of reporting.

LIMITATIONS OF THE RAPID SCOPING REVIEW

As the unit of inclusion for the rapid scoping review was guidelines, the recommendations were extracted as presented in the guidelines. We also extracted the level/certainty of the evidence based on the criteria presented in the completed guidelines. There were several tools/methods used to assess the level/certainty of the evidence, for example GRADE [10], the Oxford Centre for Evidence-based Medicine 2009 and 2011 [11,12], Level of Appropriateness (American College of Radiologists), consensus, or an adaptation/ modification of one or more methods. For feasibility, primary studies were not reviewed, and the level/certainty of the evidence was taken at face value from the guideline.

IONIZING RADIATION EXPOSURE

We have elected to not include any effective dose values (mSv), related metrics, or qualitative descriptors of radiation risk (e.g., symbol, risk level, approximate equivalent background radiation, lifetime additional risk of cancer induction/exam) for several reasons:

1) The Expert Panel members have considered the risks of ionizing radiation (i.e., GRADE for Guidelines benefits and harms) when formulating the recommendations.

2) The levels of ionizing radiation in modern medical imaging equipment should not unduly influence patient decision-making. The anticipated benefits of imaging to the patient, if a test is clinically indicated, are likely to outweigh any potential small risks [13].

3) Per the following points, effective dose values and related metrics such as equivalent background radiation have very large uncertainties, and their utility is thus limited:

   - There is uncertainty in the relative values of the effective dose for a reference patient with variation in the standard error [14];
   - Effective doses are measured using reference phantoms with population, age and sex-averaged tissue weighting factors [14], therefore these should not be considered as the doses received by specific individuals;
   - The publications providing data used to estimate the effective dose per scan (e.g., International Commission on Radiological Protection (ICRP) 1990 [15], 2007[16]) are occasionally updated and may impact the effective dose values;
   - There is variation in the average dose from natural background radiation by geographic location. For example, in Canada, the average is 1.8 mSv/year, which ranges from 1.3 mSv/year in Vancouver to 4.1 mSv/year in Winnipeg [17]; and
   - There are variables around the equipment (e.g., age) and facility (e.g., protocol) that may impact the actual amount of ionizing radiation exposure used for any particular exam.

EXTERNAL REVIEW

This guideline and its recommendations have been externally reviewed by members of the

CAR Diagnostic Imaging Referral Guidelines Working Group (**Box 1**), Alanna Coleman (Nurse Practitioners Association of Canada), Sangeet Ghai (Radiologist), Stephanie Henry (Nurse Practitioners Association of Canada), Shirin Vellani (Nurse Practitioners Association of Canada), and Jeffrey Wagner (Nuclear medicine radiologist).

FUTURE RESEARCH IN THIS AREA

This guideline will be updated upon the emergence of new evidence that may change the validity of the recommendations.

We plan on developing Patient Friendly Summaries for some of the clinical/diagnostic scenarios covered in this guideline. The selection of scenarios will be dependent on a prioritization exercise, as well as funding. These summaries will be made available on the CAR website (www.car.ca).

Box 1. CAR Diagnostic Imaging Referral Guideline Working Group Members

Ryan Margau (co-chair), North York General Hospital, ON
Paul Pageau (co-chair), The Ottawa Hospital, ON

Other members listed alphabetically:
Barb Avard, Patient and Family Advisor, North York General Hospital, ON
Noel Corser, Hinton Medical Clinic, AB
Kaitlin Zaki-Metias, Trinity Health Oakland Hospital, USA

Italicized name is a WG member who was also a member of the Genitourinary Expert Panel.

GENITOURINARY CLINICAL/DIAGNOSTIC SCENARIOS

There are clinical/diagnostic scenarios that may pertain to more than one CAR guideline section. For example, chronic pelvic pain in females could be relevant to both the Obstetrics & Gynecology section and the Genitourinary section. Where applicable, we have pointed to other guideline sections within the recommendations.

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

RECOMMENDATIONS

GU01. Hematuria

GU01A. Gross hematuria

Recommendations

1. In younger adults with gross hematuria, we recommend **US** as the initial imaging modality, in conjunction with urology referral (↑↑).
    - ↳ **1.1** If further imaging is required, we suggest **CT urography** as the next imaging modality (↑).
        - ↳ **1.2** If CT urography is contraindicated, we recommend **MR urography** as an alternative imaging modality (↑↑).
2. In older adults with gross hematuria, we recommend **CT urography** as the initial imaging modality in conjunction with urology referral (↑↑).
    - ↳ **2.1** If CT urography is contraindicated, we recommend **MR urography** or **US** as an alternative imaging modality (↑↑).

Note: CT urography is equivalent to CT intravenous pyelography (CT IVP).

Recommendations from three guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2020 ACR guideline on Hematuria [19], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU01A**).

GU01B. Microhematuria

Recommendations

1. In low-risk patients✧ with microscopic hematuria, we recommend **US** as the initial imaging modality with consideration to urology referral (↑↑).
2. In high-risk adults (e.g., older age, smoking history) with microhematuria, we recommend **CT urography** as the initial imaging modality (↑↑).
3. In pregnant adults with microhematuria, we recommend **US** as the initial imaging modality (↑↑).
    - ↳ **3.1** If US is inconclusive, we suggest **MR urography** as an alternative imaging modality (↑).

✧ no history of recent vigorous exercise, infection or viral illness, present or recent menstruation, renal parenchymal disease

Recommendations from four guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2020 ACR guideline on Hematuria [19], the 2020

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

AUA/SUFU guideline on microhematuria [21], the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU01B**).

GU02. Hypertension, in absence of renal disease (or kidney failure)

GU02A. Responsive to medication

Recommendations

1. In adults with hypertension who are responsive to medication, we recommend **no imaging** (↓↓).

Recommendations from two guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18] and the 2020 Hypertension Canada guideline [22] (**Appendix 2: Table GU02A**).

GU02B. Unresponsive to medication

Recommendations

1. In adults with hypertension who are unresponsive to medication,✧ we suggest **against US Doppler** as the initial imaging modality (↓).

2. In adults with hypertension who are unresponsive to medication,✧ we recommend **US** as the initial imaging modality to assess for renal size and/or size discrepancy (EP consensus).

↳ **2.1** If further imaging is indicated clinically, we recommend **CTA** as the initial imaging modality (↑↑).

↳ **2.2** If CTA is contraindicated, we suggest **MRA or NM** as an alternative imaging modality (↑).

✧ ≥ 3 medications [22]

Recommendations from three guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal [18], the 2020 Hypertension Canada guideline [22], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU02B**).

GU03. Renal disease (or failure)

GU03A. Acute kidney injury (or failure)

Recommendations

Renal and pre-renal causes of acute renal failure are more common than post-renal etiologies (e.g., stones) and should be excluded clinically and biochemically prior to consideration of any imaging.

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

1. In adults with acute kidney injury (or failure), we recommend **US** as the initial imaging modality (↑↑).
    - ↳ **1.1** If US is unavailable, we suggest **CT** as an alternative imaging modality (↑).

Recommendations from four guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2021 ACR guideline on renal failure [23], the 2019 NICE guideline on acute kidney injury [24], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU03A**).

GU03B. Chronic kidney disease

Recommendations

1. In adults with suspected chronic kidney disease, we recommend **US** as the initial imaging modality (↑↑).
    - ↳ **1.1** If characterization of US-detected hydronephrosis is needed, we suggest **CT abdomen and pelvis** as the next imaging modality (↑).
        - ↳ **1.2** If contrast-enhanced CT is contraindicated, we suggest **MRI** as an alternative imaging modality (↑).
            - ↳ **1.3** If MRI is unavailable, we suggest **non-contrast CT** as an alternative imaging modality (↑).
2. In adults with suspected renovascular cause of chronic kidney disease, see GU02. Hypertension, in absence of renal disease (or failure).

For information on the use of gadolinium-based contrast agents in kidney disease, see the 2019 CAR guideline [25].

Recommendations from three guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2021 ACR guideline on renal failure [23], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU03B**).

GU04. Renal colic

Recommendations

1. In younger adults with suspected renal colic, we recommend **US +/- abdominal XR** as the initial imaging modalities (↑↑).
    - ↳ **1.1** If further imaging is required, we recommend **CT** as the next imaging modality (↑↑).
2. In older adults with suspected renal colic, we recommend **CT** as the initial imaging modality (↑↑).

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

↳ **2.1** If CT is unavailable, we recommend **US and/or abdominal XR** as an alternative imaging modality (↑↑).

3. In pregnant adults with suspected renal colic, we recommend **US** as the initial imaging modality (↑↑).

Recommendations from six guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2019 ACEP guideline on renal colic [25], the 2023 ACR guideline on urolithiasis [26], the 2021 CUA guideline on ureteral calculi [27,28], the 2023 EAU guideline on urolithiasis [29], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU04**).

GU05. Renal calculi in absence of acute colic

Recommendations

1. In patients with known renal calculi in the absence of acute colic, we recommend **US** (↑↑).

↳ **1.1** If US is unavailable, we recommend **XR** (↑↑).

Recommendations from three guidelines were used during the discussion and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2019 NICE guideline on renal and ureteric stones [30], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU05**).

GU06. Renal lesion

Recommendations

1. In adults with suspected solid renal lesion(s) incidentally detected on US or CT requiring further characterization, we recommend a **multi-phase CT abdomen** as the initial imaging modality (↑↑).

↳ **1.1** If further imaging is required, we suggest **MRI abdomen** as the next imaging modality (↑).

↳ **1.2** If CT and MRI are contraindicated, we recommend **contrast-enhanced US** as an alternative (↑↑).

2. In adults with suspected cystic renal lesion(s) incidentally detected requiring further characterization, we recommend **US** as the initial imaging modality (↑↑).

↳ **2.1** If further imaging is required, we recommend **multi-phase CT abdomen** (↑↑).

↳ **2.2** If CT is contraindicated, we recommend **MRI abdomen** as an alternative (↑↑).

↳ **2.3** If MRI is contraindicated, we recommend **contrast-enhanced US** as an alternative (↑↑).

Recommendations from five guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the ACR 2020 guideline on indeterminate renal masses [31], the 2022 CUA guideline on small renal masses [32,33], the 2023 CUA guideline on cystic renal lesions [34], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU06**).

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

GU07. Urinary tract obstruction

GU07A. Upper (pelviectasis, hydronephrosis)

Recommendations

1. In adults with suspected upper urinary tract obstruction, we recommend **US** as the initial imaging modality (↑↑).
   - ↳ **1.1** If further imaging is required, we recommend **CT abdomen** as the next imaging modality (↑↑).
2. In pregnant adults with suspected upper urinary tract obstruction, we recommend **US** as the initial imaging modality (↑↑).
   - ↳ **2.1** If further imaging is required, we recommend **MRI abdomen** as the next imaging modality (↑↑).

If clinical concern for renal colic, see GU04; If clinical concern for infection, see GU08.

Recommendations from two guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18] and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU07A**).

GU07B. Lower (lower urinary tract syndrome)

Recommendations

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically and/or biochemically necessary to obtain imaging. If imaging is required, then:

1. In adults with male anatomy and suspected lower urinary tract obstruction, we recommend **against imaging** in the absence of renal impairment (↓↓).
   - ↳ **1.1** In patients with renal impairment, we recommend **US** (↑↑).
2. In adults with male anatomy and treatment resistant lower urinary tract obstruction, we suggest **US** in conjunction with urology referral (↑).
3. In adults with female anatomy and suspected lower urinary tract obstruction, we recommend **US** in conjunction with specialist referral (↑↑).

If clinical concern for pelvic floor dysfunction, see GU15.

Recommendations from five guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2020 CUA guideline on male urethral structures [35], the 2021 EAU guideline on urethral stricture [36], the 2017 RCR iRefer guideline Urogenital & Adrenal section [20], and the 2023 Urethral Strictures Disease guideline [37] (**Appendix 2: Table GU07B**).

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

GU08. Urinary tract infection

GU08A. Acute

Recommendations

1. In adults with acute urinary tract infection, we recommend **no imaging** (↓↓).

For acute urinary tract infection in the pediatric population, see CAR Pediatric Guideline PD38A [under development April 2024]

Recommendations from three guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2021 German Association of Scientific Medical Societies in

Germany on UTI [38]**,** and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU08A**).

GU08B. Post-treatment failure (pyelonephritis)

Recommendations

1. In adults with suspected acute pyelonephritis, we recommend **against imaging** (↓↓).
2. In adults with suspected abscess or other complications of acute pyelonephritis, we recommend **US or CT abdomen and pelvis** as the initial imaging modality (↑↑).
3. In pregnant adults with suspected abscess or other complications of acute pyelonephritis, we suggest **US** as the initial imaging modality (↑).
   - ↳ **3.1** If US is indeterminate or clinical suspicion persists, we suggest **MRI** as the next imaging modality (↑).

Recommendations from two guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18] and the 2022 ACR guideline on acute pyelonephritis [39] (**Appendix 2: Table GU08B**).

GU08C. Chronic and recurrent bladder infections

Recommendations

1. In adults with female anatomy with uncomplicated recurrent lower urinary tract infections, we recommend **against imaging** (↓↓).
2. In patients with complicated urinary tract infections, we recommend **urology referral** (↑↑).

For recurrent urinary tract infection in the pediatric population, see CAR Pediatric Guideline PD38C [under development April 2024]

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

Recommendations from three guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2020 ACR guideline on recurrent lower urinary tract infections in females [40], and the 2022 AUA guideline on recurrent uncomplicated urinary tract infections [41] (**Appendix 2: Table GU08C**).

GU09. Scrotal mass or pain, including testicular torsion and epididymitis

Recommendations

1. In adults with scrotal pathology, we recommend **US** (↑↑).
2. In adults with scrotal pain (without trauma) and clinical concern for Fournier's gangrene, we recommend **CT and surgical referral** (EP consensus).

Recommendations from four guidelines were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Urology, Adrenal, and Genitourinary systems section [18], the 2022 ACR guideline on newly diagnosed palpable scrotal abnormalities [42], the 2019 ACR guideline on acute onset of scrotal pain – without trauma, without antecedent mass [43], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU09**).

GU10. Adrenal mass

Recommendations

1. In adults with incidentally discovered indeterminate adrenal masses, we recommend **MRI or non-contrast CT** as the initial imaging modality (↑↑).
   - ↳ **1.1** If further imaging is required, we suggest **adrenal washout CT** as the next imaging modality (↑).
   - ↳ **1.2** If concern for adrenal metastasis, we suggest **NM (PET-CT)** (↑).
2. In adults with undiagnosed suspected biochemically active tumours, we suggest **MRI or CT** as the initial imaging modalities (↑↑).
   - ↳ **2.1** If further imaging is required, we suggest **NM consultation** (↑).

Recommendations from four guidelines were used during the discussions and formulation of these recommendations: the 2021 ACR guideline on adrenal mass evaluation [44], the 2023 CUA guideline on incidentally discovered renal masses [45], the 2021 NCCN guideline on neuroendocrine and adrenal tumors [46], and the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU10**).

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

GU11. Incontinence, urgency, and frequency

Recommendations

1. In adults with urinary incontinence, urgency, and/or frequency, we suggest **US** to assess for post-void residual urine, if clinically indicated (↑).
   - ↳ **1.1** Where post-void residual assessment is not clinically indicated, we recommend **against imaging** (↓↓).
2. In patients with female anatomy, to evaluate for specific causes of lower urinary tract symptoms (e.g., urethral diverticulum, etc.), we suggest **MRI** (↑).

If clinical concern for lower urinary tract obstruction, see GU07B.
If clinical concern for urinary tract infection, see GU08.

For urinary incontinence (Enuresis and Continual incontinence) in the pediatric population, see CAR Pediatric Guideline PD37A and PD37B [under development April 2024]

Recommendations from two guidelines were used during the discussions and formulation of these recommendations: the 2020 EAU guideline on urinary incontinence [47] and the 2019 NICE guideline on urinary incontinence [48] (**Appendix 2: Table GU11**).

GU12. Chronic pelvic pain

GU12A. Chronic pelvic pain in females

Recommendations

Recommendations for this clinical scenario were covered by the Obstetrics and Gynecology Expert Panel. See CAR Obstetric and Gynecology Diagnostic Imaging Referral Guideline [49] for more information.

GU12B. Chronic pelvic pain in males

Recommendations

1. In adults with male anatomy with non-specific chronic pelvic pain, we suggest **CT** as the initial imaging modality (EP consensus).
2. In adults with suspected chronic prostatitis, we recommend **against routine imaging** (EP consensus).

In patients with elevated PSA, refer to GU13.

Recommendations from one guideline were used during the discussions and formulation of these recommendations: the 2012 CAR guideline Cancer section [18] (**Appendix 2: Table GU12B**).

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient. Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and the patient, and resource availability.

GU13. Elevated PSA

Recommendations

1. In adults with persistently or markedly elevated PSA*, we recommend **urology referral ± MRI** (↑↑).

Referral for MRI may differ based on regional/local practice preference.

**Refer to Canadian Urology Association Prostate screening guideline* [33]

Recommendations from one guideline were used during the discussions and formulation of these recommendations: the 2017 RCR iRefer guideline Urogenital & Adrenal section [20] (**Appendix 2: Table GU13**).

GU14. Infertility

Recommendations

Recommendations for this clinical scenario were covered by the Obstetrics and Gynecology Expert Panel. See CAR Obstetric and Gynecology Diagnostic Imaging Referral Guideline [49] for more information.

GU15. Pelvic floor

Recommendations

1. In adults with vaginal protrusion or bulge, or suspected pelvic organ prolapse, or defecatory dysfunction, we recommend **MR defecography** as the initial imaging modality (↑↑).

↳ **1.1** If MR defecography is unavailable, we suggest **fluoroscopic defecography** as an alternative imaging modality (↑).

Availability and use of MR defecography and fluoroscopic defecography may vary between provinces and between regions within a province.

If clinical concern for urinary dysfunction, see GU11.

Recommendations from one guideline were used during the discussions and formulation of these recommendations: the 2022 ACR guideline on pelvic floor dysfunction in females [50] (**Appendix 2: Table GU15**).

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APPENDIX 1. SEARCH STRATEGIES

Urology Guidelines
2023 May 29

Ovid Multifile
Database: Embase Classic+Embase <1947 to 2023 May 25>, Ovid MEDLINE(R) ALL <1946 to May 25, 2023>
Search Strategy:
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1 exp Urologic Diseases/ (2645613)
2 ((urolog* or urinary or ureter* or urethra* or genitourinar* or bladder* or kidney* or renal) adj3 (disease? or disorder? or dysfunction* or problem*)).tw,kw,kf. (640025)
3 Hematuria/ (75575)
4 (macroh?ematuria? or macro-h?ematuria? or microh?ematuria? or microh?ematuria?).tw,kw,kf. (4270)
5 h?ematuria?.tw,kw,kf. (67563)
6 ((visible discolo?r* or (visible adj3 blood) or (visible adj3 bleeding)) adj3 (urine or urinary)).tw,kw,kf. (33)
7 Hypertension/ (1032541)
8 exp Essential Hypertension/ (35843)
9 ((essential or primary) adj3 hypertens*).tw,kw,kf. (84001)
10 Kidney Diseases/ (148894)
11 exp Renal Insufficiency/ (713606)
12 ((kidney? or renal) adj3 (disease? or failure? or injur* or insufficien*)).tw,kw,kf. (883678)
13 Renal Colic/ (4397)
14 ((kidney? or renal or ureteral) adj3 colic?).tw,kw,kf. (7520)
15 exp Kidney Calculi/ (66182)
16 ((kidney? or nephron? or renal or staghorn) adj3 (calculi or calculos#s or calculus or calculogenes#s or calculo-genes#s or lithias#s or stone or stones)).tw,kw,kf. (53206)
17 (nephrolith* or nephro-lith* or renolithias#s or reno-lithias#s).tw,kw,kf. (33724)
18 Ureteral Calculi/ (15763)
19 (ureter* adj3 (calculi or calculos#s or calculus or calculogenes#s or calculo-genes#s or lithias#s or stone or stones)).tw,kw,kf. (21180)
20 ((bladder? or kidney? or renal or ureter*) adj3 lesion?).tw,kw,kf. (34332)
21 Urinary Tract/ and (obstruct* or block*).ti. (1724)
22 Ureteral Obstruction/ (26329)
23 exp Urethral Obstruction/ (14342)
24 ((bladder? or kidney? or renal or ureter* or urinary or urine) adj3 (obstruct* or block*)).ti,kw,kf. (26074)
25 (LUTO or LUTOs).tw,kw,kf. (343)
26 (UTO or UTOs).tw,kw,kf. (220)
27 Pyelectasis/ (367)
28 (pyelectas#s or pelviectas#s).tw,kw,kf. (670)
29 exp Hydronephrosis/ (42855)
30 (hydronephros* or hydro-nephros* or nephrohydros* or nephro-hydros* or hydronephrotic kidney? or hydro-nephrotic kidney?).tw,kw,kf. (36322)
31 dilated kidney?.tw,kw,kf. (100)
32 (pyonephros#s or pyo-nephros#s).tw,kw,kf. (1894)
33 exp Urinary Tract Infections/ (201628)
34 Urinary Tract/ and infection?.ti. (6546)
35 ((bladder or kidney? or nephron? or renal or ureter* or urinary or urine or urologic* or urogenitalis or uro-genitalis or genitourinary) adj3 infection?).tw,kw,kf. (172967)
36 ((UTI or UTIs) and (urinary or urine or tract or tractus or infection?)).tw,kw,kf. (39227)
37 exp Pyelonephritis/ (48209)
38 (pyelonephrit* or pyelo-nephrit*).tw,kw,kf. (37727)
39 ((scrotal or scrotum or testic* or testis) adj3 (disease? or disorder?)).tw,kw,kf. (4124)
40 Epididymitis/ (7990)
41 epididymit#s.tw,kw,kf. (5947)
42 ((scrotal or scrotum or testic* or testis) adj3 (pain* or swell* or swollen)).tw,kw,kf. (9222)
43 orchialgia*.tw,kw,kf. (424)
44 Spermatic Cord Torsion/ (6929)
45 ((spermatic or testic* or testis) adj3 torsio*).tw,kw,kf. (7704)
46 ((scrotal or scrotum or testic* or testis) adj3 (lump or lumps or mass or masses or pain*)).tw,kw,kf. (11422)
47 ((adrenal or renal) adj3 (adenoma? or incidentaloma? or lump or lumps or mass or masses or tumo?r?)).tw,kw,kf. (94532)
48 exp Urinary Incontinence/ (128028)
49 ((bladder or urinary or urine) adj3 (incontinen* or leak*)).tw,kw,kf. (96252)
50 ((chronic* or constant* or excessiv* or frequent* or incessant* or persistent*) adj3 (micturition or urinat*)).tw,kw,kf. (2262)
51 (pollakiuria? or pollakisuria?).tw,kw,kf. (1967)
52 Prostatitis/ (15857)
53 (prostatit#s adj3 (chronic* or ceaseless* or constant* or continual* or continous* or incessant* or lingering or persist* or recur* or relaps* or unremit*)).tw,kw,kf. (8545)
54 Prostate-Specific Antigen/ and (abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*).ti. (7690)
55 ((abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*) adj3 PSA).tw,kw,kf. (23532)
56 ((abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*) adj3 prostate-specific antigen?).tw,kw,kf. (8080)
57 ((greater than or more than or between) adj ("4" or four or "5" or five or "6" or six or "7" or seven or "8" or eight or "9" or nine or "10" or ten) adj5 (PSA or prostate-specific antigen?)).tw,kw,kf. (1456)
58 Pelvic Floor Disorders/ (3826)
59 ((pelvic or pelvis) adj3 (diaphragm* or floor or ground?) adj10 (condition? or disorder? or dysfunction* or problem*)).tw,kw,kf. (11001)
60 or/1-59 [CONDITIONS OF INTEREST] (3963061)
61 exp Urography/ (81418)
62 (urograph* or urogram* or uro-graph* or uro-gram*).tw,kw,kf. (25883)
63 (cystograph* or cystogram* or cysto-graph* or cysto-gram*).tw,kw,kf. (7933)
64 (pyelograph* or pyelogram* or pyelo-graph* or pyelo-gram*).tw,kw,kf. (12771)
65 (renograph* or renogram* or reno-graph* or reno-gram*).tw,kw,kf. (9569)
66 (nephrograph* or nephrogram* or nephro-graph* or nephro-gram*).tw,kw,kf. (3076)
67 (radionephrograph* or radio-nephrogram* or radio-nephro-graph* or radio-nephro-gram*).tw,kw,kf. (224)

Appendix 1. Search Strategies

68 (urethrograph* or urethrogram* or urethro-graph* or urethro-gram*).tw,kw,kf. (4637)
69 (sonourethrograph* or sonourethrogram* or sono-urethrograph* or sono-urethrogram* or sono-urethro-graph* or sono-urethro-gram*).tw,kw,kf. (168)
70 Diagnostic Imaging/ (288032)
71 dg.fs. [diagnostic imaging] (1435147)
72 (diagnos* adj3 (image? or imaging)).tw,kw,kf. (141298)
73 (x-ray* or xray*).tw,kw,kf. (982865)
74 Image Interpretation, Computer-Assisted/ (91500)
75 exp Imaging, Three-Dimensional/ (216661)
76 ((3D or 3-D or 3-dimension* or three dimension*) adj (image? or imaging)).tw,kw,kf. (49946)
77 exp Ultrasonography/ (1479763)
78 (ultrasound* or ultrasonograph* or ultra-sonograph* or ultrasonic* or ultra-sonic*).tw,kw,kf. (1147082)
79 (echograph* or echo-graph* or echotomograph* or echo-tomograph* or echosonograph* or echo sonograph*).tw,kw,kf. (26429)
80 exp Radiography/ (2673214)
81 (radiograph* or radiographic imag* or roentgenograph* or roentgeno-graph*).tw,kw,kf. (641257)
82 (fluoroscop* or fluoro-scop*).tw,kw,kf. (92502)
83 exp Radionuclide Imaging/ (450559)
84 ((radionuclide* adj2 imag*) or (radio-nuclide* adj2 imag*) or (radionuclide* adj2 scan*) or (radio-nuclide* adj2 scan*) or (radioisotope* adj2 imag*) or (radio-isotope* adj2 imag*) or (radioisotope* adj2 scan*) or (radio-isotope* adj2 scan*) or scintigra* or scinti-gra* or scintiphotograph* or scinti-photograph* or scintiscan* or scinti-scan* or scanograph* or lymphoscintigra* or lympho-scintigra*).tw,kw,kf. (158337)
85 exp Tomography/ (3440225)
86 (tomograph* or tomo-graph*).tw,kw,kf. (1215340)
87 (CAT scan* or CT scan* or PET scan* or PET imag* or PT scan* or PT imag*).tw,kw,kf. (410366)
88 (SPECTCT or SPECT CT or "SPECT/CT").tw,kw,kf. (18339)
89 (magnetic resonance imag* or MRI or MRIs or fMRI or fMRIs or NMR imag* or chemical shift imag* or magneti#ation transfer contrast imag* or spin echo imag* or zeugmatograph* or zeugmato-graph*).tw,kw,kf. (1318003)
90 (cineradiograph* or cine-radiograph* or cinefluorograph* or cine-fluorograph* or radiocinematograph* or radio-cinematograph*).tw,kw,kf. (4214)
91 Nuclear Medicine/ (45722)
92 ((nuclear or atomic) adj1 medicine?).tw,kw,kf. (48570)
93 (nuclear adj1 radiolog*).tw,kw,kf. (1335)
94 (sialogra* or salivogra* or sialoscintigra* or sialo-scintigra*).tw,kw,kf. (3377)
95 (enteroclys* or enterogra*).tw,kw,kf. (6476)
96 (esophagra* or oesophagra* or esophagogra* or oesophagogra*).tw,kw,kf. (7318)
97 ((CT or virtual) adj colonoscop*).tw,kw,kf. (1952)
98 (contrast adj (study or studies or medium)).tw,kw,kf. (47498)
99 (cholangiopancreatogra* or cholangio-pancreatogra* or ERCP or MRCP).tw,kw,kf. (58422)
100 cholecystogra*.tw,kw,kf. (5494)
101 (angiograph* or angio-graph* or angiogram* or angio-gram*).tw,kw,kf. (587128)
102 (perfusion adj3 (image? or imaging)).tw,kw,kf. (43755)
103 or/61-102 [IMAGING] (8567189)
104 60 and 103 [UROLOGICAL CONDITIONS - IMAGING] (701034)
105 exp Animals/ not Humans/ (17609578)
106 104 not 105 [ANIMAL-ONLY REMOVED] (551695)
107 (case reports or case series or address or autobiography or bibliography or biography or comment or dictionary or directory or editorial or "expression of concern" or festschrift or historical article or interactive tutorial or lecture or legal case or legislation or news or newspaper article or patient education handout or personal narrative or portrait or video-audio media or webcast or (letter not (letter and randomized controlled trial))).pt. (6994805)
108 106 not 107 [OPINION PIECES, IRRELEVANT PUBLICATION TYPES REMOVED] (476025)
109 exp Guidelines as Topic/ (884386)
110 exp Clinical Protocols/ (309362)
111 Guideline.pt. (16563)
112 Practice Guideline.pt. (30420)
113 standards.fs. (767155)
114 Consensus Development Conference.pt. (12355)
115 Consensus Development Conference, NIH.pt. (801)
116 (consensus or guideline* or guidance? or standards or recommendation*).ti,kw,kf. (556900)
117 (expert consensus or consensus statement* or consensus conference* or clinical guideline? or practice guideline? or treatment guideline? or practice parameter* or position statement* or policy statement* or CPG or CPGs).tw,kw,kf. (315429)
118 or/109-117 [GUIDELINE FILTER] (2280763)
119 108 and 118 [GUIDELINES] (14116)
120 limit 119 to yr="2018-current" (7584)
121 120 use medall [MEDLINE RECORDS] (881)
122 exp urinary tract disease/ (2645613)
123 ((urolog* or urinary or ureter* or urethra* or genitourinar* or bladder* or kidney* or renal) adj3 (disease? or disorder? or dysfunction* or problem*)).tw,kw,kf. (640025)
124 hematuria/ (75575)
125 (macroh?ematuria? or macro-h?ematuria? or microh?ematuria? or microh?ematuria?).tw,kw,kf. (4270)
126 h?ematuria?.tw,kw,kf. (67563)
127 ((visible discolo?r* or (visible adj3 blood) or (visible adj3 bleeding)) adj3 (urine or urinary)).tw,kw,kf. (33)
128 hypertension/ (1032541)
129 essential hypertension/ (35836)
130 ((essential or primary) adj3 hypertens*).tw,kw,kf. (84001)
131 kidney disease/ (234911)
132 exp kidney failure/ (713606)
133 ((kidney? or renal) adj3 (disease? or failure? or injur* or insufficien*)).tw,kw,kf. (883678)
134 kidney colic/ (5019)
135 ((kidney? or renal or ureteral) adj3 colic?).tw,kw,kf. (7520)
136 nephrolithiasis/ (46956)
137 ((kidney? or nephron? or renal or staghorn) adj3 (calculi or calculos#s or calculus or calculogenes#s or calculo-genes#s or lithias#s or stone or stones)).tw,kw,kf. (53206)
138 (nephrolith* or nephro-lith* or renolithias#s or reno-lithias#s).tw,kw,kf. (33724)
139 ureter stone/ (13016)
140 (ureter* adj3 (calculi or calculos#s or calculus or calculogenes#s or calculo-genes#s or lithias#s or stone or stones)).tw,kw,kf. (21180)
141 ((bladder? or kidney? or renal or ureter*) adj3 lesion?).tw,kw,kf. (34332)
142 urinary tract/ and (obstruct* or block*).ti. (1724)
143 ureter obstruction/ (17454)
144 urethra obstruction/ (2310)

145 ((bladder? or kidney? or renal or ureter* or urinary or urine) adj3 (obstruct* or block*)).ti,kw,kf. (26074)
146 (LUTO or LUTOs).tw,kw,kf. (343)
147 (UTO or UTOs).tw,kw,kf. (220)
148 pyelectasis/ (367)
149 (pyelectas#s or pelviectas#s).tw,kw,kf. (670)
150 hydronephrosis/ (42675)
151 (hydronephros* or hydro-nephros* or nephrohydros* or nephro-hydros* or hydronephrotic kidney? or hydro-nephrotic kidney?).tw,kw,kf. (36322)
152 dilated kidney?.tw,kw,kf. (100)
153 (pyonephros#s or pyo-nephros#s).tw,kw,kf. (1894)
154 exp urinary tract infection/ (201628)
155 urinary tract/ and infection?.ti. (6546)
156 ((bladder or kidney? or nephron? or renal or ureter* or urinary or urine or urologic* or urogenitalis or uro-genitalis or genitourinary) adj3 infection?).tw,kw,kf. (172967)
157 ((UTI or UTIs) and (urinary or urine or tract or tractus or infection?)).tw,kw,kf. (39227)
158 exp pyelonephritis/ (48209)
159 (pyelonephrit* or pyelo-nephrit*).tw,kw,kf. (37727)
160 ((scrotal or scrotum or testic* or testis) adj3 (disease? or disorder?)).tw,kw,kf. (4124)
161 epididymitis/ (7990)
162 epididymit#s.tw,kw,kf. (5947)
163 ((scrotal or scrotum or testic* or testis) adj3 (pain* or swell* or swollen)).tw,kw,kf. (9222)
164 orchialgia*.tw,kw,kf. (424)
165 testis torsion/ (4876)
166 ((spermatic or testic* or testis) adj3 torsio*).tw,kw,kf. (7704)
167 ((scrotal or scrotum or testic* or testis) adj3 (lump or lumps or mass or masses or pain*)).tw,kw,kf. (11422)
168 ((adrenal or renal) adj3 (adenoma? or incidentaloma? or lump or lumps or mass or masses or tumo?r?)).tw,kw,kf. (94532)
169 exp urine incontinence/ (91951)
170 ((bladder or urinary or urine) adj3 (incontinen* or leak*)).tw,kw,kf. (96252)
171 ((chronic* or constant* or excessiv* or frequent* or incessant* or persistent*) adj3 (micturition or urinat*)).tw,kw,kf. (2262)
172 (pollakiuria? or pollakisuria?).tw,kw,kf. (1967)
173 chronic prostatitis/ (9041)
174 (prostatit#s adj3 (chronic* or ceaseless* or constant* or continual* or continous* or incessant* or lingering or persist* or recur* or relaps* or unremit*)).tw,kw,kf. (8545)
175 prostate specific antigen/ and (abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*).ti. (7690)
176 ((abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*) adj3 PSA).tw,kw,kf. (23532)
177 ((abnormal* or borderline or elevated or high* or increas* or rise? or rising or suspicious or "not normal" or threshold*) adj3 prostate-specific antigen?).tw,kw,kf. (8080)
178 ((greater than or more than or between) adj ("4" or four or "5" or five or "6" or six or "7" or seven or "8" or eight or "9" or nine or "10" or ten) adj5 (PSA or prostate-specific antigen?)).tw,kw,kf. (1456)
179 pelvic floor disorder/ (5127)
180 ((pelvic or pelvis) adj3 (diaphragm* or floor or ground?) adj10 (condition? or disorder? or dysfunction* or problem*)).tw,kw,kf. (11001)
181 or/122-180 [CONDITIONS OF INTEREST] (3959440)
182 exp urography/ (81418)
183 (urograph* or urogram* or uro-graph* or uro-gram*).tw,kw,kf. (25883)
184 (cystograph* or cystogram* or cysto-graph* or cysto-gram*).tw,kw,kf. (7933)
185 (pyelograph* or pyelogram* or pyelo-graph* or pyelo-gram*).tw,kw,kf. (12771)
186 (renograph* or renogram* or reno-graph* or reno-gram*).tw,kw,kf. (9569)
187 (nephrograph* or nephrogram* or nephro-graph* or nephro-gram*).tw,kw,kf. (3076)
188 (radionephrograph* or radio-nephrogram* or radio-nephro-graph* or radio-nephro-gram*).tw,kw,kf. (224)
189 (urethrograph* or urethrogram* or urethro-graph* or urethro-gram*).tw,kw,kf. (4637)
190 (sonourethrograph* or sonourethrogram* or sono-urethrograph* or sono-urethrogram* or sono-urethro-graph* or sono-urethro-gram*).tw,kw,kf. (168)
191 diagnostic imaging/ (288032)
192 (diagnos* adj3 (image? or imaging)).tw,kw,kf. (141298)
193 (x-ray* or xray*).tw,kw,kf. (982865)
194 computer assisted tomography/ (887831)
195 computer assisted diagnosis/ (67800)
196 exp three-dimensional imaging/ (216661)
197 ((3D or 3-D or 3-dimension* or three dimension*) adj (image? or imaging)).tw,kw,kf. (49946)
198 exp echography/ (1479763)
199 (ultrasound* or ultrasonograph* or ultra-sonograph* or ultrasonic* or ultra-sonic*).tw,kw,kf. (1147082)
200 (echograph* or echo-graph* or echotomograph* or echo-tomograph* or echosonograph* or echo sonograph*).tw,kw,kf. (26429)
201 exp radiography/ (2673214)
202 (radiograph* or radiographic imag* or roentgenograph* or roentgeno-graph*).tw,kw,kf. (641257)
203 (fluoroscop* or fluoro-scop*).tw,kw,kf. (92502)
204 exp scintiscanning/ (215091)
205 ((radionuclide* adj2 imag*) or (radio-nuclide* adj2 imag*) or (radionuclide* adj2 scan*) or (radio-nuclide* adj2 scan*) or (radioisotope* adj2 imag*) or (radio-isotope* adj2 imag*) or (radioisotope* adj2 scan*) or (radio-isotope* adj2 scan*) or scintigra* or scinti-gra* or scintiphotograph* or scinti-photograph* or scintiscan* or scinti-scan* or scanograph* or lymphoscintigra* or lympho-scintigra*).tw,kw,kf. (158337)
206 exp tomography/ (3440225)
207 (tomograph* or tomo-graph*).tw,kw,kf. (1215340)
208 (CAT scan* or CT scan* or PET scan* or PET imag* or PT scan* or PT imag*).tw,kw,kf. (410366)
209 (SPECTCT or SPECT CT or "SPECT/CT").tw,kw,kf. (18339)
210 (magnetic resonance imag* or MRI or MRIs or fMRI or fMRIs or NMR imag* or chemical shift imag* or magneti#ation transfer contrast imag* or spin echo imag* or zeugmatograph* or zeugmato-graph*).tw,kw,kf. (1318003)
211 (cineradiograph* or cine-radiograph* or cinefluorograph* or cine-fluorograph* or radiocinematograph* or radio-cinematograph*).tw,kw,kf. (4214)
212 nuclear medicine/ (45722)
213 ((nuclear or atomic) adj1 medicine?).tw,kw,kf. (48570)
214 (nuclear adj1 radiolog*).tw,kw,kf. (1335)

215 (sialogra* or salivogra* or sialoscintigra* or sialo-scintigra*).tw,kw,kf. (3377)
216 (enteroclys* or enterogra*).tw,kw,kf. (6476)
217 (esophagra* or oesophagra* or esophagogra* or oesophagogra*).tw,kw,kf. (7318)
218 ((CT or virtual) adj colonoscop*).tw,kw,kf. (1952)
219 (contrast adj (study or studies or medium)).tw,kw,kf. (47498)
220 (cholangiopancreatogra* or cholangio-pancreatogra* or ERCP or MRCP).tw,kw,kf. (58422)
221 cholecystogra*.tw,kw,kf. (5494)
222 (angiograph* or angio-graph* or angiogram* or angio-gram*).tw,kw,kf. (587128)
223 (perfusion adj3 (image? or imaging)).tw,kw,kf. (43755)
224 or/182-223 [IMAGING] (8436864)
225 181 and 224 [UROLOGICAL CONDITIONS - IMAGING] (692888)
226 (exp animal/ or exp animal experimentation/ or exp animal model/ or exp animal experiment/ or nonhuman/ or exp vertebrate/) not (exp human/ or exp human experimentation/ or exp human experiment/) (13185872)
227 225 not 226 [ANIMAL-ONLY REMOVED] (672383)
228 (conference abstract or editorial or letter).pt. (8726138)
229 case report/ or exp case study/ or directory/ (5442628)
230 227 not (228 or 229) [OPINION PIECES, IRRELEVANT PUBLICATION TYPES REMOVED] (339049)
231 exp practice guideline/ (742056)
232 (consensus or guideline* or guidance? or standards or recommendation*).ti,kw,kf. (556900)
233 (expert consensus or consensus statement* or consensus conference* or clinical guideline? or practice guideline? or treatment guideline? or practice parameter* or position statement* or policy statement* or CPG or CPGs).tw,kw,kf. (315429)
234 or/231-233 [GUIDELINE FILTER] (1326229)
235 230 and 234 [GUIDELINES] (10991)
236 limit 235 to yr="2018-current" (4416)
237 236 use emczd [EMBASE RECORDS] (3929)
238 121 or 237 [BOTH DATABASES] (4810)
239 remove duplicates from 238 (4257) [TOTAL UNIQUE RECORDS]
240 239 use medall [MEDLINE UNIQUE RECORDS] (873)
241 239 use emczd [EMBASE UNIQUE RECORDS] (3384)

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APPENDIX 2. EVIDENCE TABLES

GU01. Hematuria

GU01A. Gross hematuria

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **US**: ultrasound	
CAR 2012 [18]	**H01. HEMATURIA, MACRO- OR MICROSCOPIC** - **US**: Indicated [B]: US is indicated after a thorough clinical workup. If microscopic hematuria persists and the diagnosis is still uncertain, US is indicated in patients 40 and under. However, US may miss some upper tract pathology, including some calculi. Bladder US may detect bladder tumours but cystoscopy is more sensitive. - **CT**: Indicated [B]: CT Urography is indicated in patients over the age of 40 with persistent hematuria.
ACR 2020 [19] (Wolfman et al.)	**HEMATURIA** ▪ Variant 4. Gross hematuria. Initial imaging.
RCR 2017 [20]	**U19. MACROSCOPIC (VISIBLE) HAEMATURIA** - US & cystoscopy [B] - CT (including low-dose CT kidneys, ureters and bladder (KUB) and CT urography) [B] - Intravenous urography (IVU) [B] - Magnetic resonance urography (MRU) [B]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU01A. Microhematuria

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MR**: magnetic resonance; **US**: ultrasound	
CAR 2012 [18]	**H01. HEMATURIA, MACRO- OR MICROSCOPIC** - **US**: Indicated [B]: US is indicated after a thorough clinical workup. If microscopic hematuria persists and the diagnosis is still uncertain, US is indicated in patients 40 and under. However, US may miss some upper tract pathology, including some calculi. Bladder US may detect bladder tumours but cystoscopy is more sensitive. - **CT**: Indicated [B]: CT Urography is indicated in patients over the age of 40 with persistent hematuria.
ACR 2020 [19] (Wolfman et al.)	**HEMATURIA** ▪ Variant 1. Microhematuria. No risk factors, or history of recent vigorous exercise, or presence of infection, or viral illness, or present or recent menstruation. Initial imaging. ▪ Variant 2. Microhematuria. Patients with risk factors, without any of the following: history of recent vigorous exercise, or presence of infection or viral illness, or present or recent menstruation, or renal parenchymal disease. Initial imaging. ▪ Variant 3. Microhematuria. Pregnant patient. Initial imaging.
AUA/SUFU 2020 [21] **(Barocas et al.)**	**MICROHEMATURIA** - Cystoscopy - Renal ultrasound - Upper tract imaging - Axial upper tract imaging - Multiphasic CT urography - MR urography - Retrograde pyelography - White light cystoscopy
RCR 2017 [20]	**U18. MICROSCOPIC (NON-VISIBLE) HAEMATURIA** - US [B] - CT [B]

Abbreviations: ACR: American College of Radiology; AUA/SUFU: American Urological Association/Society of Urodynamics, Female Pelvic Medicine, and Urogenital Reconstruction; CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU02. Hypertension, in absence of renal disease (or failure)

GU02A. Responsive to medication

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CAR 2012 [18]	**H02. HYPERTENSION WITHOUT EVIDENCE OF RENAL DISEASE, RESPONSIVE TO MEDICATION** - **All imaging**: Not indicated [B]: Imaging is not indicated if there is no evidence of renal disease.
Hypertension Canada 2020: Hypertension in Adults and Children [22] (Rabi et al.)	**ROLE OF ECHOCARDIOGRAPHY** - Routine echocardiographic (Grade D) - Echocardiogram for assessment of left ventricular hypertrophy (Grade C) - Echocardiographic assessment of left ventricular mass (Grade D) - Echocardiogram, nuclear imaging (Grade D)

Abbreviations: CAR: Canadian Association of Radiologists

GU02B. Unresponsive to medication

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CTA: computed tomography angiography; **DSA**: digital subtraction angiography; **MRA**: magnetic resonance angiography; **NM**: nuclear medicine; **US**: ultrasound	
CAR 2012 [18]	**H03. HYPERTENSION: IN PATIENTS UNRESPONSIVE TO MEDICATION** - **NM**: Indicated [B]: Captopril renography is best to check for functionally significant renal artery stenosis, if interventional procedure or surgery is contemplated. - **CTA**: Specialized investigation [B]: CTA is the imaging study of choice for visualizing the renal arteries. - **MRA**: Specialized investigation [B]: MRA may be performed where CTA is contraindicated. - **US**: Specialized investigation [B]: Doppler US can be used if special expertise is available.
Hypertension Canada 2020: Hypertension in Adults and Children [22] (Rabi et al.)	**Role of echocardiography** - Echocardiogram for assessment of left ventricular hypertrophy (Grade C) - Echocardiographic assessment of left ventricular mass (Grade D) - Echocardiogram, nuclear imaging (Grade D)
RCR 2017 [20]	**U01. HYPERTENSION IN THE YOUNG ADULT OR IN PATIENTS UNRESPONSIVE TO MEDICATION: SUSPECTED RENOVASCULAR HYPERTENSION (see also U02, U13)** - MRA [A] - CTA [A] - US [B] - NM (MAG3 precaptopril and post-captopril) [B] - DSA angiography [B]

Abbreviations: CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU03. Renal disease (or failure)

GU03A. Acute kidney injury (or failure)

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	**H04. RENAL FAILURE** - **Renal US**: Indicated [B]: US is the best initial imaging modality in patients with renal failure to determine if there is an obstructive cause.
ACR 2021 [23] (Wong-You-Cheong et al.)	**RENAL FAILURE** ▪ Variant 1. Renal failure. Acute kidney injury (AKI), unspecified. Initial imaging. *Did not extract: Variant 3. Renal failure. Kidney disease of unknown duration. Initial imaging.; Variant 4. Renal failure. Neurogenic bladder. Initial imaging.*
NICE 2019 (NG148) [24]	**Acute Kidney Injury** ▪ Recommendations 1.4.4, 1.4.5, and 1.4.6: Ultrasound
RCR 2017 [20]	**U02. ACUTE AND CHRONIC KIDNEY INJURY (RENAL FAILURE) (see also U01)** - US [B] - NM (MAG3/DMSA) [B] - CT [B] - MRI [C] - Abdominal XR [B]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; NICE: National Institute for Health and Care Excellence; RCR: Royal College of Radiologists

GU03B. Chronic kidney disease

Guideline Group AGREE-II Assessment	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	**H04. RENAL FAILURE** - **Renal US**: Indicated [B]: US is the best initial imaging modality in patients with renal failure to determine if there is an obstructive cause.
ACR 2021 [23] (Wong-You-Cheong et al.)	**RENAL FAILURE** ▪ Variant 2. Renal failure. Chronic kidney disease (CKD). Initial imaging. *Did not extract: Variant 3. Renal failure. Kidney disease of unknown duration. Initial imaging.; Variant 4. Renal failure. Neurogenic bladder. Initial imaging.*
RCR 2017 [20]	**U02. ACUTE AND CHRONIC KIDNEY INJURY (RENAL FAILURE) (see also U01)** - US [B] - NM (MAG3/DMSA): [B] - CT [B] - MRI [C] Abdominal XR [B]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU04. Renal colic

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	**H05. RENAL COLIC** - **CT**: Indicated [B]:Low dose unenhanced CT is the preferred imaging modality for the detection of urinary tract calculi. - **US /Abdominal XR**: Indicated only in specific circumstances [B]: Combined US and abdominal XR may be used where CT is not available or under special circumstances such as pregnancy to reduce radiation exposure. US and abdominal XR are less sensitive than unenhanced CT.
ACEP 2019: Renal colic [25] **(Moore et al.)**	- **US:** May provide adequate diagnostic information. - **CT:** When CT is needed, it should be low dose.
ACR 2023 [26] (Gupta et al.)	**UROLITHIASIS** ▪ Variant 1. Acute onset flank pain. Suspicion of stone disease. No history or remote history of stone disease. Initial imaging. ▪ Variant 3. Pregnant patient. Acute onset flank pain. Suspicion of stone disease. Initial or follow-up imaging. ▪ Variant 4. Acute onset flank pain. Suspicion of stone disease. CT without contrast is inconclusive for the presence of stones. Next imaging study. *Did not extract : Variant 2. Acute onset flank pain in patient with known current stone disease, diagnosed on recent imaging. Recurrent symptoms of stone disease. Follow-up imaging.*
CUA 2021 [27,28] (Lee et al.)	**URETERAL CALCULI** - Ultrasonography with Kidney Ureter Bladder (KUB) X-ray, CT scans
EAU 2023 [29] (Skolarikos et al.)	**UROLITHASIS** - US - Kidney Ureter Bladder (KUB) (Strength: Strong) - Non-contrast CT (Strength: Strong) - Contrast CT (Strength: Strong) **Pregnant patients** - US (Strength: Strong) - MRI (Strength: Strong) - Low-dose CT (Strength: Strong)
RCR 2017 [20]	**U04. SUSPECTED URETERIC COLIC (see also U07, U10)** - CT [A] - US & abdominal XR [B] - Magnetic resonance urography (MRU) [C] - Intravenous urography (IVU) [B]

Abbreviations: ACEP: American College of Emergency Physicians; ACR: American College of Radiology; CAR: Canadian Association of Radiologists; CUA: Canadian Urological Association; EAU: European Association of Urology; RCR: Royal College of Radiologists

GU05. Renal calculi in absence of acute colic

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **NM**: nuclear medicine; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	**H06. RENAL CALCULI IN ABSENCE OF ACUTE COLIC** - **Abdominal XR**: Indicated [B]: If follow up of known renal stones is required, abdominal XR may be sufficient for those visible on XR. - **CT**: Indicated [B]: If XR does not show a calculus, CT is indicated if there is strong clinical suspicion. - **US**: Indicated only in specific circumstances [B]: US may be used if CT is not available. US is less sensitive than either abdominal XR or CT for detecting urinary tract calculi. - **NM**: Indicated only in specific circumstances [B]: Nuclear Medicine can be used to assess the function of a kidney that may be damaged by chronic renal calculi.
NICE 2019 [30]	**Renal and Ureteric Stones** - 1.1.1 low-dose non-contrast CT, ultrasound - 1.1.2 ultrasound - 1.1.3 low-dose non-contrast CT
RCR 2017 [20]	**U05. RENAL CALCULI IN ABSENCE OF ACUTE COLIC** - Abdominal XR [B] - CT [A] - US [B]

Abbreviations: CAR: Canadian Association of Radiologists; NICE: National Institute for Health and Care Excellence; RCR: Royal College of Radiologists

GU06. Renal lesion

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	**H07. RENAL MASS** - **US**: Indicated [B]: US is indicated as an initial imaging modality for a suspected renal mass. - **CT**: Indicated [B]: CT without and with contrast enhancement is indicated as the primary imaging modality for evaluating solid renal masses. - **MRI**: Specialized investigation [B]: MRI may help to assess a renal mass not adequately characterized by CT or if CT is contraindicated, e.g., known allergy to CT contrast. - **NM**: Indicated only in specific circumstances [B]: NM can be used to assess renal function prior to surgery for renal mass.
ACR 2020 [31] (Wang et al.)	**INDETERMINATE RENAL MASS** ▪ Variant 1. Indeterminate renal mass. No contraindication to either iodinated CT contrast or gadolinium-based MR intravenous contrast. Initial imaging. ▪ Variant 2. Indeterminate renal mass. Contraindication to both iodinated CT and gadolinium-based MR intravenous contrast. Initial imaging. ▪ Variant 3. Indeterminate renal mass. Contraindication only to iodinated CT intravenous contrast. Initial imaging.
CUA 2022 [32,33] (Richard et al.)	**SMALL RENAL MASSES** - multiphasic, contrast-enhanced, abdominal computed tomography (CT) or magnetic resonance imaging (MRI) scan (Clinical principle) - baseline chest XR (Conditional recommendation, low certainty in evidence of effects)
CUA 2023 [34] (Richard et al.)	**CYSTIC RENAL LESION** - contrast-enhanced, cross-sectional imaging (Strong recommendation, moderate certainty in evidence of effects)
RCR 2017 [20]	**U06. CLINICALLY SUSPECTED RENAL MASS** - US [B] - CT [B] - MRI [B] - US/CT-guided biopsy [B]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; CUA: Canadian Urological Association; RCR: Royal College of Radiologists

GU07. Urinary tract obstruction

GU07A. Upper (pelviectasis, hydronephrosis)

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound	
CAR 2012 [18]	**H08. URINARY TRACT OBSTRUCTION** - **US**: Indicated [B]: Ultrasound is the modality of choice for the initial investigation. - **NM**: Specialized investigation [B]: A diuretic renal scan may be useful to confirm the presence and level of a urinary tract obstruction. - **CT**: Indicated only in specific circumstances [B]: CT may be required for further investigation if an obstruction is identified.
RCR 2017 [20]	**U07. UPPER URINARY TRACT OBSTRUCTION: DIAGNOSIS AND CAUSES (see also U04, U10)** - US [B] - CT [B] - NM (MAG3) [A] - MRI [B] - Intravenous urography (IVU) [B]

Abbreviations: CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU07B. Lower (lower urinary tract syndrome)

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound	
CAR 2012 [18]	**H08. URINARY TRACT OBSTRUCTION** - **US**: Indicated [B]: Ultrasound is the modality of choice for the initial investigation. - **NM**: Specialized investigation [B]: A diuretic renal scan may be useful to confirm the presence and level of a urinary tract obstruction. - **CT**: Indicated only in specific circumstances [B]: CT may be required for further investigation if an obstruction is identified.
CUA 2020 [35] (Rourke et al.)	**Male Urethral Stricture** - Cystoscopy (Conditional recommendation, low certainty in evidence of effects) - Retrograde urethrography (Conditional recommendation, low certainty in evidence of effects) - Magnetic resonance imaging (Conditional recommendation, low certainty in evidence of effects)
EAU 2021 [36] (Campos-Juanatey et al.)	**Urethral Stricture** - Retrograde urethrography - Voiding cystourethrography - Cystourethroscopy - Antegrade cystoscopy - MRI urethrography
RCR 2017 [20]	**U10. LOWER URINARY TRACT SYMPTOMS (LUTS) (see also U04, U07)** - US [B] - MRI [B] - Urodynamics [B]
Urethral Stricture Disease Guideline 2023 [37] (Wessells et al.)	**Diagnosis/Initial Management** - Ultrasound - Urethro-cystoscopy, retrograde urethrography, voiding cystourethrography, ultrasound urethrography

Abbreviations: CAR: Canadian Association of Radiologists; CUA: Canadian Urological Association; EAU: European Association of Urology; RCR: Royal College of Radiologists

GU08. Urinary tract infection

GU08A. Acute

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound	
CAR 2012 [18]	**H09. URINARY TRACT INFECTION IN ADULTS** - **US**: Indicated only in specific circumstances [B]: Imaging is not indicated initially for adults with a urinary tract infection, but it is indicated (1) if infection does not resolve with appropriate antibiotic therapy and (2) in men following one proven UTI or in women with a proven recurrence of UTI. - **CT**: Specialized investigation [B]: CT may be ordered if a severe infection does not respond to treatment, or if an abscess or other complication is suspected.
German Guideline 2018 [38] (Kranz et al.)	**URINARY TRACT INFECTION** - Routine cystoscopy (B, IIb)
RCR 2017 [20]	**U08. URINARY TRACT INFECTION IN ADULTS** - US +/- Abdominal XR [B] - CT [B] - MRI [B] - NM (DMSA) [C] - Intravenous urography (IVU) [C]

Abbreviations: CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU08B. Post-treatment failure (pyelonephritis)

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **US**: ultrasound	
CAR 2012 [18]	**H09. URINARY TRACT INFECTION IN ADULTS** - **US**: Indicated only in specific circumstances [B]: Imaging is not indicated initially for adults with a urinary tract infection, but it is indicated (1) if infection does not resolve with appropriate antibiotic therapy and (2) in men following one proven UTI or in women with a proven recurrence of UTI. - **CT**: Specialized investigation [B]: CT may be ordered if a severe infection does not respond to treatment, or if an abscess or other complication is suspected.
ACR 2022 [39] (Smith et al.)	**ACUTE PYELONEPHRITIS** ▪ Variant 1. Suspected acute pyelonephritis. First-time presentation. Uncomplicated patient (eg, no history of pyelonephritis, diabetes, immune compromise, history of stones or renal obstruction, prior renal surgery, advanced age, vesicoureteral reflux, lack of response to therapy, or pregnancy). Initial imaging. ▪ Variant 2. Suspected acute pyelonephritis. Complicated patient (eg, recurrent pyelonephritis, diabetes, immune compromise, advanced age, vesicoureteral reflux, or lack of response to initial therapy). Initial imaging. ▪ Variant 3. Suspected acute pyelonephritis. History of renal stones or renal obstruction. Initial imaging. ▪ Variant 4. Suspected acute pyelonephritis. Pregnant patient with no other complications (eg, no history of diabetes, immune compromise, history of stones or renal obstruction, prior renal surgery, vesicoureteral reflux, or lack of response to therapy). Initial imaging. *Did not extract Variant 5. Suspected acute pyelonephritis. History of pelvic renal transplant with native kidneys in situ and no other complications (eg, no history of pyelonephritis, diabetes, history of stones or renal obstruction, prior renal surgery, advanced age, vesicoureteral reflux, lack of response to therapy, or pregnancy). Initial imaging.*

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists

GU08C. Chronic and recurrent bladder infections

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **US**: ultrasound	
CAR 2012 [18]	**H09. URINARY TRACT INFECTION IN ADULTS** - **US**: Indicated only in specific circumstances [B]: Imaging is not indicated initially for adults with a urinary tract infection, but it is indicated (1) if infection does not resolve with appropriate antibiotic therapy and (2) in men following one proven UTI or in women with a proven recurrence of UTI. - **CT**: Specialized investigation [B]: CT may be ordered if a severe infection does not respond to treatment, or if an abscess or other complication is suspected.
ACR 2020 [40] (Venkatesan et al.)	**RECURRENT LOWER URINARY TRACT INFECTIONS IN FEMALES** ▪ Variant 1. Recurrent lower urinary tract infections in a female. Uncomplicated with no underlying risk factors. ▪ Variant 2. Recurrent lower urinary tract infections in a female. Complicated, or patients who are nonresponders to conventional therapy, develop frequent reinfections or relapses, or have known underlying risk factors.
AUA 2022 [41] (Anger et al.)	**Recurrent Uncomplicated Urinary Tract Infections** - Cystoscopy and upper tract imaging

Abbreviations: ACR: American College of Radiology; AUA: American Urology Association; CAR: Canadian Association of Radiologists

GU09. Scrotal mass or pain, including testicular torsion and epididymitis

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
MRI: magnetic resonance imaging; **NM**: nuclear medicine; **US**: ultrasound	
CAR 2012 [18]	**H11. SCROTAL MASS OR PAIN** - **US**: Indicated [B]: US is the best imaging modality for evaluating scrotal swelling and/or scrotal pain. US can differentiate testicular from extra-testicular lesions. Symptoms requires ENT, neurological, or neurosurgical expertise. **H12. TESTICULAR TORSION** - **US with Doppler**: Indicated [B]: Testicular torsion can be diagnosed clinically. If imaging is required US is the best modality, and must be performed emergently. - **NM**: Indicated only in specific circumstances [B]: NM can be used when US is not available or inconclusive.
ACR 2022 [42] (Lyshchik et al.)	**NEWLY DIAGNOSED PALPABLE SCROTAL ABNORMALITY** ▪ Variant 1. Newly diagnosed palpable scrotal abnormality. History of trauma or infection. Initial imaging. ▪ Variant 2. Newly diagnosed palpable scrotal abnormality. No history of trauma or infection. Initial imaging.
ACR 2019 [43] (Wang et al.)	**ACUTE ONSET OF SCROTAL PAIN – WITHOUT TRAUMA, WITHOUT ANTECEDENT MASS** ▪ Variant 1. Adult or child. Acute onset of scrotal pain. Without trauma, without antecedent mass. Initial imaging.
RCR 2017 [20]	**U11. SCROTAL MASS +/- PAIN (see also U12)** - US [B] - MRI [B] **U12. ACUTE SCROTAL PAIN: SUSPECTED TESTICULAR TORSION (see also U11)** - US [B]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU10. Adrenal mass

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography computed tomography; **US**: ultrasound	
CAR 2012 [18]	This scenario was not covered in the 2012 CAR guideline.
ACR 2021 [44] (Mody et al.)	**Adrenal Mass Evaluation** ▪ Variant 1. Indeterminate adrenal mass, less than 1 cm on initial imaging. No diagnostic benign imaging features. No history of malignancy. ▪ Variant 2. Indeterminate adrenal mass, 1 to 2 cm on initial imaging. No diagnostic benign imaging features. No history of malignancy. Follow-up imaging in 12 months. ▪ Variant 3. Indeterminate adrenal mass, greater than 2 cm and less than 4 cm on initial imaging. No diagnostic benign imaging features. No history of malignancy. Adrenal specific imaging. ▪ Variant 4. Indeterminate adrenal mass, greater than or equal to 4 cm on initial imaging. No diagnostic benign imaging features. No history of malignancy. Adrenal specific imaging. ▪ Variant 5. Adrenal mass, less than 4 cm on initial imaging. No diagnostic benign imaging features. History of malignancy. Adrenal specific imaging. ▪ Variant 6. Adrenal mass, greater than or equal to 4 cm on initial imaging. No diagnostic benign imaging features. History of malignancy. Adrenal specific imaging. *Did not extract: Biopsy recommendations.*
CUA 2023 [45] (Rowe et al.)	**INCIDENTALLY DISCOVERED RENAL MASSES** - non-contrast CT - contrast-enhanced washout CT - chemical-shift MRI
NCCN 2021 [46] (Shah et al.)	**NEUROENDOCRINE AND ADRENAL TUMORS** - CT, or MRI with or without contrast
RCR 2017 [20]	**U13. SUSPECTED FUNCTIONING ADRENAL MEDULLARY TUMOUR (see also U01)** - MRI/CT [B] - NM – MIBG, SRS [B] - PET-CT [B] - US [B] **U17. INCIDENTALLY DETECTED NON-FUNCTIONING ADRENAL MASS** - MRI/CT [B] - PET-CT [B] - US [C]

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; CUA: Canadian Urological Association; NCCN: National Comprehensive Cancer Network; RCR: Royal College of Radiologists

GU11. Incontinence, urgency, and frequency

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **US**: ultrasound; **XR**: radiography	
CAR 2012 [18]	This scenario was not covered in the 2012 CAR guideline.
EAU 2020 [47] (Burkhard et al.)	**Urinary incontinence** - US
NICE 2019 [48]	**Urinary incontinence** - MRI - CT - XR - US

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists; NICE: National Institute for Health and Care Excellence; RCR: Royal College of Radiologists

GU12. Chronic pelvic pain

GU12A. Chronic pelvic pain in females

See CAR Obstetrics and Gynecology Diagnostic Imaging Referral Guideline [49] (see **OG09. Evaluation of chronic pelvic pain of presumed gynecologic origin**).

GU12B. Chronic pelvic pain in males

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **US**: ultrasound	
CAR 2012 [18]	**K50. PROSTATITIS: MALE CHRONIC PELVIC PAIN SYNDROME** [Cancer section] - **Pelvic US**: Special indication [B]: Imaging generally not indicated unless patients refractory to treatment. - **Transrectal US**: Special indication [B]: TRUS can be used to evaluate for and aspirate prostate abscesses in patients refractory to treatment. - **CT**: Special indication [B]: Rarely useful in patients refractory to treatment. - **MRI**: Not indicated [B]: Rarely useful in patients refractory to treatment.

Abbreviations: CAR: Canadian Association of Radiologists

GU13. Elevated PSA

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
MRI: magnetic resonance imaging; **US**: ultrasound	
CAR 2012 [18]	This scenario was not covered in the 2012 CAR guideline.
RCR 2017 [20]	**U20. ASYMPTOMATIC MEN WITH ELEVATED PSA** - MRI [B] - Transrectal US (TRUS) and biopsy [B]

Abbreviations: CAR: Canadian Association of Radiologists; RCR: Royal College of Radiologists

GU14. Male infertility

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CT: computed tomography; **MRI**: magnetic resonance imaging; **US**: ultrasound	
CAR 2012 [18]	**K49. MALE INFERTILITY** [Cancer section] - **Pelvic US**: Special indication [C]: If pelvic mass suspected. - **Transrectal US**: Special indication [B]: For evaluation of seminal ducts in the region of the prostate when indicated by clinical investigation. Rarely may be helpful to aspirate sperm from seminal ducts. - **Scrotal US**: Indicated [B]: To evaluate for varicocele and testicular morphology. - **MRI**: Special indication [B]: In occasional patients, to assess intraabdominal segments of seminal ducts. - **CT**: Not indicated [C]: No role at this time.

Abbreviations: CAR: Canadian Association of Radiologists

See CAR Obstetrics and Gynecology Diagnostic Imaging Referral Guideline [49] (see **OG06. Infertility assessment, recommendation #3**).

GU15. Pelvic floor

Guideline Group	Imaging modality addressed in guideline recommendations and/or clinical scenarios covered (Note: When published recommendations will not included, except for the 2012 CAR guideline)
CAR 2012 [18]	This scenario was not covered in the 2012 CAR guideline.
ACR 2022 [50] (Khatri et al)	**PELVIC FLOOR DYSFUNCTION IN FEMALES** ▪ Variant 1. Vaginal protrusion or bulge, or clinically suspected pelvic organ prolapse. Initial imaging. ▪ Variant 2. Female. Urinary dysfunction (involuntary leakage of urine, or frequent urination, or urgency, or straining to void, or incomplete voiding, or splinting, or digital maneuvers to void). Initial imaging. ▪ Variant 3. Female. Defecatory dysfunction (incontinence of stool or liquid or gas, or straining during defecation, or difficulty initiating defecation, or incomplete evacuation, or splinting or digital maneuvers to defecate). Initial imaging. *Did not extract: Variant 4. Female. Follow-up imaging after pelvic floor surgery. Subacute or chronic complications other than recurrent pelvic floor dysfunction. Initial imaging*.

Abbreviations: ACR: American College of Radiology; CAR: Canadian Association of Radiologists

APPENDIX 3A. GENITOURINARY SUMMARY OF RECOMMENDATIONS (ENGLISH)

Clinical/ Diagnostic Scenario	Recommendation	Strength of Rec.
CT: computed tomography; **CTA**: CT angiography; **MR**: magnetic resonance; **MRA**: MR angiography; **MRI**: MR imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography-CT; **US**: ultrasound; **XR**: radiography **Strength of Recommendation:** ↑↑: strong for; ↑: conditional for; ↓↓: strong against; ↓: conditional against; **EPc**: Expert Panel consensus		
GU01. HEMATURIA		
GU01A. Gross hematuria **Note**: CT urography is equivalent to CT intravenous pyelography (CT IVP).	**1.** In younger adults with gross hematuria, we recommend **US** as the initial imaging modality, in conjunction with urology referral.	↑↑
	↳ **1.1** If further imaging is required, we suggest **CT urography** as the next imaging modality.	↑
	↳ **1.2** If CT urography is contraindicated, we recommend **MR urography** as an alternative imaging modality.	↑↑
	2. In older adults with gross hematuria, we recommend **CT urography** as the initial imaging modality in conjunction with urology referral.	↑↑
	↳ **2.1** If CT urography is contraindicated, we recommend **MR urography** or **US** as an alternative imaging modality (↑↑).	↑↑
GU01B. Microhematuria	**1.** In low-risk patients✧ with microscopic hematuria, we recommend **US** as the initial imaging modality with consideration to urology referral. ✧ no history of recent vigorous exercise, infection or viral illness, present or recent menstruation, renal parenchymal disease	↑↑
	2. In high-risk adults (e.g., older age, smoking history) with microhematuria, we recommend **CT urography** as the initial imaging modality.	↑↑
	3. In pregnant adults with microhematuria, we recommend **US** as the initial imaging modality.	↑↑
	↳ **3.1** If US is inconclusive, we suggest **MR urography** as an alternative imaging modality.	↑
GU02. HYPERTENSION, IN ABSENCE OF RENAL DISEASE (OR KIDNEY FAILURE)		
GU02A. Responsive to medication	**1.** In adults with hypertension who are responsive to medication, we recommend **no imaging**.	↓↓
GU02B. Unresponsive to medication	**1.** In adults with hypertension who are unresponsive to medication,✧ we suggest **against US Doppler** as the initial imaging modality. ✧ ≥ 3 medications [22]	↓
	2. In adults with hypertension who are unresponsive to medication,✧ we recommend **US** as the initial imaging modality to assess for renal size and/or size discrepancy. ✧ ≥ 3 medications [22]	EPc
	↳ **2.1** If further imaging is indicated clinically, we recommend **CTA** as the initial imaging modality.	↑↑
	↳ **2.2** If CTA is contraindicated, we suggest **MRA or NM** as an alternative imaging modality.	↑

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

Clinical/ Diagnostic Scenario	Recommendation	Strength of Rec.
CT: computed tomography; **CTA**: CT angiography; **MR**: magnetic resonance; **MRA**: MR angiography; **MRI**: MR imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography-CT; **US**: ultrasound; **XR**: radiography **Strength of Recommendation:** ↑↑: strong for; ↑: conditional for; ↓↓: strong against; ↓: conditional against; **EPc**: Expert Panel consensus		
GU03. RENAL DISEASE (OR FAILURE)		
GU03A. Acute kidney injury (or failure)	Renal and pre-renal causes of acute renal failure are more common than post-renal etiologies (e.g., stones) and should be excluded clinically and biochemically prior to consideration of any imaging.	
	1. In adults with acute kidney injury (or failure), we recommend **US** as the initial imaging modality.	↑↑
	↳ **1.1** If US is unavailable, we suggest **CT** as an alternative imaging modality.	↑
GU03B. Chronic kidney disease *For information on the use of gadolinium-based contrast agents in kidney disease, see the 2019 CAR guideline* [25].	**1.** In adults with suspected chronic kidney disease, we recommend **US** as the initial imaging modality.	↑↑
	↳ **1.1** If characterization of US-detected hydronephrosis is needed, we suggest **CT abdomen and pelvis** as the next imaging modality.	↑
	↳ **1.2** If contrast-enhanced CT is contraindicated, we suggest **MRI** as an alternative imaging modality.	↑
	↳ **1.3** If MRI is unavailable, we suggest **non-contrast CT** as an alternative imaging modality.	↑
	2. In adults with suspected renovascular cause of chronic kidney disease, see GU02. Hypertension, in absence of renal disease (or failure).	
GU04. RENAL COLIC		
	1. In younger adults with suspected renal colic, we recommend **US +/- abdominal XR** as the initial imaging modalities.	↑↑
	↳ **1.1** If further imaging is required, we recommend **CT** as the next imaging modality.	↑↑
	2. In older adults with suspected renal colic, we recommend **CT** as the initial imaging modality.	↑↑
	↳ **2.1** If CT is unavailable, we recommend **US and/or abdominal XR** as an alternative imaging modality.	↑↑
	3. In pregnant adults with suspected renal colic, we recommend **US** as the initial imaging modality.	↑↑
GU05. RENAL CALCULI IN ABSENCE OF RENAL COLIC		
	1. In patients with known renal calculi in the absence of acute colic, we recommend **US**.	↑↑
	↳ **1.1** If US is unavailable, we recommend **XR**.	↑↑
GU06. RENAL LESION		
	1. In adults with suspected solid renal lesion(s) incidentally detected on US or CT requiring further characterization, we recommend a **multi-phase CT abdomen** as the initial imaging modality.	↑↑
	↳ **1.1** If further imaging is required, we suggest **MRI abdomen** as the next imaging modality.	↑
	↳ **1.2** If CT and MRI are contraindicated, we recommend **contrast-enhanced US** as an alternative (↑↑).	

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

Clinical/ Diagnostic Scenario	Recommendation	Strength of Rec.
CT: computed tomography; **CTA**: CT angiography; **MR**: magnetic resonance; **MRA**: MR angiography; **MRI**: MR imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography-CT; **US**: ultrasound; **XR**: radiography **Strength of Recommendation:** ↑↑: strong for; ↑: conditional for; ↓↓: strong against; ↓: conditional against; **EPc**: Expert Panel consensus		
	2. In adults with suspected cystic renal lesion(s) incidentally detected requiring further characterization, we recommend **US** as the initial imaging modality.	↑↑
	↳ **2.1** If further imaging is required, we recommend **multi-phase CT abdomen**.	↑↑
	↳ **2.2** If CT is contraindicated, we recommend **MRI abdomen** as an alternative.	↑↑
	↳ **2.3** If MRI is contraindicated, we recommend **contrast-enhanced US** as an alternative.	↑↑
GU07. URINARY TRACT OBSTRUCTION		
GU07A. Upper (pelviectasis, hydronephrosis) *If clinical concern for:* *- renal colic, see GU04* *- infection, see GU08*	**1.** In adults with suspected upper urinary tract obstruction, we recommend **US** as the initial imaging modality.	↑↑
	↳ **1.1** If further imaging is required, we recommend **CT abdomen** as the next imaging modality.	↑↑
	2. In pregnant adults with suspected upper urinary tract obstruction, we recommend **US** as the initial imaging modality.	↑↑
	↳ **2.1** If further imaging is required, we recommend **MRI abdomen** as the next imaging modality.	↑↑
GU07B. Lower (lower urinary tract syndrome) *If clinical concern for pelvic floor dysfunction, see GU15.*	The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically and/or biochemically necessary to obtain imaging. If imaging is required, then:	
	1. In adults with male anatomy and suspected lower urinary tract obstruction, we recommend **against imaging** in the absence of renal impairment.	↓↓
	↳ **1.1** In patients with renal impairment, we recommend **US**.	↑↑
	2. In adults with male anatomy and treatment resistant lower urinary tract obstruction, we suggest **US** in conjunction with urology referral.	↑
	3. In adults with female anatomy and suspected lower urinary tract obstruction, we recommend **US** in conjunction with specialist referral.	↑↑
GU08. URINARY TRACT INFECTION (UTI)		
GU08A. Acute *See PD38A in Pediatric guideline*	**1.** In adults with acute urinary tract infection, we recommend **no imaging**.	↓↓
GU08B. Post-treatment	**1.** In adults with suspected acute pyelonephritis, we recommend **against imaging**.	↓↓

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

Clinical/ Diagnostic Scenario	Recommendation	Strength of Rec.
CT: computed tomography; **CTA**: CT angiography; **MR**: magnetic resonance; **MRA**: MR angiography; **MRI**: MR imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography-CT; **US**: ultrasound; **XR**: radiography **Strength of Recommendation:** ↑↑: strong for; ↑: conditional for; ↓↓: strong against; ↓: conditional against; **EPc**: Expert Panel consensus		
failure (pyelonephritis)	**2.** In adults with suspected abscess or other complications of acute pyelonephritis, we recommend **US or CT abdomen and pelvis** as the initial imaging modality.	↑↑
	3. In pregnant adults with suspected abscess or other complications of acute pyelonephritis, we suggest **US** as the initial imaging modality.	↑
	↳ **3.1** If US is indeterminate or clinical suspicion persists, we suggest **MRI** as the next imaging modality.	↑
GU08C. Chronic and recurrent bladder infections *See PD38C in Pediatric guideline*	**1.** In adults with female anatomy with uncomplicated recurrent lower urinary tract infections, we recommend **against imaging**.	↓↓
	2. In patients with complicated urinary tract infections, we recommend **urology referral**.	↑↑
GU09. SCROTAL MASS OR PAIN, INCLUDING TESTICULAR TORSION AND EPIDIDYMITIS		
	1. In adults with scrotal pathology, we recommend **US**.	↑↑
	2. In adults with scrotal pain (without trauma) and clinical concern for Fournier's gangrene, we recommend **CT and surgical referral**.	EPc
GU10. ADRENAL MASS		
	1. In adults with incidentally discovered indeterminate adrenal masses, we recommend **MRI or non-contrast CT** as the initial imaging modality.	↑↑
	↳ **1.1** If further imaging is required, we suggest **adrenal washout CT** as the next imaging modality.	↑
	↳ **1.2** If concern for adrenal metastasis, we suggest **NM (PET-CT)**.	↑
	2. In adults with undiagnosed suspected biochemically active tumours, we suggest **MRI or CT** as the initial imaging modalities.	↑↑
	↳ **2.1** If further imaging is required, we suggest **NM consultation**.	↑
GU11. INCONTINENCE, URGENCY, AND FREQUENCY		
If clinical concern for: - *lower urinary tract obstruction, see GU07B.* - *urinary tract infection, see GU08.* *See PD37A and PD37B in*	**1.** In adults with urinary incontinence, urgency, and/or frequency, we suggest **US** to assess for post-void residual urine, if clinically indicated.	↑
	↳ **1.1** Where post-void residual assessment is not clinically indicated, we recommend **against imaging**.	↓↓
	2. In patients with female anatomy, to evaluate for specific causes of lower urinary tract symptoms (e.g., urethral diverticulum, etc.), we suggest **MRI**.	↑

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

Clinical/ Diagnostic Scenario	Recommendation	Strength of Rec.
CT: computed tomography; **CTA**: CT angiography; **MR**: magnetic resonance; **MRA**: MR angiography; **MRI**: MR imaging; **NM**: nuclear medicine; **PET-CT**: positron emission tomography-CT; **US**: ultrasound; **XR**: radiography **Strength of Recommendation:** ↑↑: strong for; ↑: conditional for; ↓↓: strong against; ↓: conditional against; **EPc**: Expert Panel consensus		
Pediatric guideline		
GU12. CHRONIC PELVIC PAIN		
GU12A. Chronic pelvic pain in females	Recommendations for this clinical scenario were covered by the Obstetrics and Gynecology Expert Panel. See CAR Obstetric and Gynecology Diagnostic Imaging Referral Guideline [49] for more information.	
GU12B. Chronic pelvic pain in males *In patients with elevated PSA, see GU13.*	**1.** In adults with male anatomy with non-specific chronic pelvic pain, we suggest **CT** as the initial imaging modality.	EPc
	2. In adults with suspected chronic prostatitis, we recommend **against routine imaging**.	EPc
GU13. ELEVATED PSA		
	1. In adults with persistently or markedly elevated PSA*, we recommend **urology referral ± MRI**. *Referral for MRI may differ based on regional/local practice preference.* **Refer to Canadian Urology Association Prostate screening guideline* [33]	↑↑
GU14. INFERTILITY		
	Recommendations for this clinical scenario were covered by the Obstetrics and Gynecology Expert Panel. See CAR Obstetric and Gynecology Diagnostic Imaging Referral Guideline [49] for more information.	
GU15. PELVIC FLOOR		
If clinical concern for urinary dysfunction, see GU11.	**1.** In adults with vaginal protrusion or bulge, or suspected pelvic organ prolapse, or defecatory dysfunction, we recommend **MR defecography** as the initial imaging modality.	↑↑
	↳ **1.1** If MR defecography is unavailable, we suggest **fluoroscopic defecography** as an alternative imaging modality. *Availability and use of MR defecography and fluoroscopic defecography may vary between provinces and between regions within a province.*	↑

The guideline recommendations are to assist the choice of imaging modality in situations where it is felt clinically necessary to obtain imaging. Imaging should not delay definitive management. Whether or not imaging is indicated is outside the scope of this guideline. Additionally, we did not cover serial imaging, and time intervals for follow-up of known disease and/or treatment monitoring. These recommendations are not intended to stand alone. Medical care should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, and preferences, and resource availability. We recognize that not all imaging modalities are available in all locations, particularly in rural or remote areas of Canada. Decisions about whether to recommend that a patient travel for recommended imaging or perform alternate imaging locally can be difficult, and should consider the expected benefits of recommended imaging, risks of travel, patient preference, and other factors. This guideline is based on evidence related to diagnostic imaging tests only, not the clinical management of a patient.

APPENDIX 3B. GENITOURINARY SUMMARY OF RECOMMENDATIONS (FRENCH)

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
GU01. HÉMATURIE		
GU01A. Hématurie macroscopique **Remarque** : pyélo-TDM est équivalente à la pyélographie descendante.	**1.** Chez les jeunes adultes atteints d'hématurie macroscopique, nous recommandons une **ÉCHO** comme modalité d'imagerie initiale, en association avec une orientation en urologie.	↑↑
	↳ **1.1** Si un examen d'imagerie supplémentaire est nécessaire, nous suggérons une **pyélo-TDM** comme modalité d'imagerie subséquente.	↑
	↳ **1.2** Si la pyélo-TDM est contre-indiquée, nous recommandons une **pyélo-IRM** comme modalité d'imagerie alternative.	↑↑
	2. Chez les adultes plus âgés atteints d'hématurie macroscopique, nous recommandons une **pyélo-TDM** comme modalité d'imagerie initiale, en association avec une orientation en urologie.	↑↑
	↳ **2.1** Si la pyélo-TDM est contre-indiquée, nous recommandons une **pyélo-IRM** ou **l'ÉCHO** comme modalité d'imagerie alternative.	↑↑
GU01B. Hématurie microscopique	**1.** Chez les patients à faible risque✧ atteints d'hématurie microscopique, nous recommandons une **ÉCHO** comme modalité d'imagerie initiale, avec possibilité d'orientation en urologie. ✧ pas d'antécédent d'exercice rigoureux récent, d'infection ou de maladie virale, de menstruation présente ou récente, de maladie du parenchyme rénal	↑↑
	2. Chez les adultes à haut risque (p. ex. âge avancé, antécédent de tabagisme) présentant une hématurie microscopique, nous recommandons une **pyélo-TDM** comme modalité d'imagerie initiale.	↑↑
	3. Chez les adultes enceintes présentant une hématurie microscopique, nous recommandons l'**ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **3.1** Si l'ÉCHO est contre-indiquée, nous suggérons une **pyélo-IRM** comme modalité d'imagerie alternative.	↑
GU02. HYPERTENSION, EN L'ABSENCE DE MALADIE (OU D'INSUFFISANCE) RÉNALE		
GU02A. Avec réponse aux traitements	**1.** Chez les adultes atteints d'hypertension présentant une réponse aux traitements, nous recommandons de **ne pas réaliser d'examen d'imagerie**.	↓↓
GU02B. Sans réponse aux	**1.** Chez les adultes atteints d'hypertension et ne répondant pas aux traitements✧, nous **déconseillons le recours à l'ÉCHO Doppler** comme modalité d'imagerie initiale.	↓

Ces recommandations ne sont pas conçues pour être utilisées seules. Les soins médicaux doivent reposer sur des données probantes, le jugement expert d'un clinicien, la situation, les valeurs et les préférences d'un patient, ainsi que sur la disponibilité des ressources. Nous sommes conscients que certaines modalités d'imagerie ne sont pas disponibles partout, en particulier dans les zones rurales et isolées du Canada. Il peut être difficile de décider s'il vaut mieux recommander à un patient de se déplacer pour obtenir l'imagerie recommandée ou d'effectuer localement un autre type d'imagerie; à cet égard, il faut tenir compte des avantages attendus de l'imagerie recommandée, des risques liés au déplacement, des préférences du patient et d'autres facteurs. La présente ligne directrice repose sur des données probantes liées uniquement aux tests d'imagerie diagnostique et non à la gestion clinique du patient.

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
traitements	✧ ≥ 3 traitements [22]	
	2. Chez les adultes atteints d'hypertension qui ne répondent pas aux traitements✧, nous recommandons une **ÉCHO** comme modalité d'imagerie initiale pour évaluer la taille et/ou la divergence de taille des reins. ✧ ≥ 3 traitements [22]	CE
	↳ **2.1** Si des examens d'imagerie supplémentaires sont indiqués, nous recommandons une **angio-TDM** comme modalité d'imagerie initiale.	↑↑
	↳ **2.2** Si l'angio-TDM est contre-indiquée, nous suggérons une **angio-IRM ou la MN** comme modalité d'imagerie alternative.	↑
GU03. MALADIE (OU INSUFFISANCE) RÉNALE		
GU03A. Lésion (ou insuffisance) rénale aiguë	Les causes rénales et prérénales de l'insuffisance rénale aiguë sont plus fréquentes que les étiologies post-rénales (p. ex. calculs) et doivent être exclues par moyens cliniques et biochimiques avant d'envisager tout examen d'imagerie.	
	1. Chez des adultes atteints de lésion (ou insuffisance) rénale aiguë, nous recommandons l'**ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si l'ÉCHO n'est pas disponible, nous suggérons la **TDM** comme modalité d'imagerie alternative.	↑
GU03B. Maladie rénale chronique *Pour en savoir plus sur l'utilisation d'agents de contraste à base de gadolinium en cas de maladie rénale, voir les* lignes directrices 2019 de la CAR [25].	**1.** Dans le cas des adultes chez qui l'on soupçonne une maladie rénale chronique, nous recommandons l'**ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si la caractérisation d'une hydronéphrose détectée par échographie est nécessaire, nous suggérons une **TDM abdomino-pelvienne** comme modalité d'imagerie subséquente.	↑
	↳ **1.2** Si la TDM avec produit de contraste est contre-indiquée, nous suggérons l'**IRM** comme modalité d'imagerie alternative.	↑
	↳ **1.3** Si l'IRM n'est pas disponible, nous suggérons la **TDM sans produit de contraste** comme modalité d'imagerie alternative.	↑
	2. Dans le cas des adultes chez qui on soupçonne une maladie rénale chronique d'origine rénovasculaire, voir la section GU02.Hypertension, en l'absence de maladie (ou d'insuffisance) rénale.	
GU04. COLIQUE NÉPHRÉTIQUE		
	1. Chez les jeunes adultes chez qui on soupçonne une colique néphrétique, nous recommandons **l'ÉCHO avec ou sans RX abdominale** comme modalité d'imagerie initiale.	↑↑

Ces recommandations ne sont pas conçues pour être utilisées seules. Les soins médicaux doivent reposer sur des données probantes, le jugement expert d'un clinicien, la situation, les valeurs et les préférences d'un patient, ainsi que sur la disponibilité des ressources. Nous sommes conscients que certaines modalités d'imagerie ne sont pas disponibles partout, en particulier dans les zones rurales et isolées du Canada. Il peut être difficile de décider s'il vaut mieux recommander à un patient de se déplacer pour obtenir l'imagerie recommandée ou d'effectuer localement un autre type d'imagerie; à cet égard, il faut tenir compte des avantages attendus de l'imagerie recommandée, des risques liés au déplacement, des préférences du patient et d'autres facteurs. La présente ligne directrice repose sur des données probantes liées uniquement aux tests d'imagerie diagnostique et non à la gestion clinique du patient.

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
	↳ **1.1** Si des examens supplémentaires sont nécessaires, nous recommandons la **TDM** comme modalité d'imagerie subséquente.	↑↑
	2. Dans le cas des adultes plus âgés chez qui l'on soupçonne une colique néphrétique, nous recommandons la **TDM** comme modalité d'imagerie initiale.	↑↑
	↳ **2.1** Si la TDM n'est pas disponible, nous recommandons **l'ÉCHO et/ou la RX abdominale** comme modalité d'imagerie alternative.	↑↑
	3. Chez les adultes enceintes chez qui on soupçonne une colique néphrétique, nous recommandons **l'ÉCHO** comme modalité d'imagerie initiale.	↑↑
GU05. CALCULS RÉNAUX SANS COLIQUE NÉPHRÉTIQUE		
	1. Chez les patients présentant des calculs rénaux connus sans colique néphrétique, nous recommandons une **ÉCHO**.	↑↑
	↳ **1.1** Si l'ÉCHO n'est pas disponible, nous recommandons la **RX**.	↑↑
GU06. LÉSION RÉNALE		
	1. Chez les adultes chez qui l'on soupçonne une ou plusieurs lésions rénales solides détectées fortuitement à l'ÉCHO ou à la TDM et nécessitant une caractérisation plus poussée, nous recommandons une **TDM abdominale multiphase** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si un examen d'imagerie supplémentaire est nécessaire, nous suggérons une **IRM abdominale** comme modalité d'imagerie subséquente.	↑
	↳ **1.2** Si la TDM et l'IRM sont contre-indiquées, nous recommandons une **ÉCHO de contraste** comme modalité d'imagerie alternative (↑↑).	
	2. Dans le cas des adultes chez qui l'on soupçonne une ou plusieurs lésions rénales kystiques détectées fortuitement nécessitant une caractérisation plus poussée, nous recommandons l'**ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **2.1** Si un examen d'imagerie supplémentaire est nécessaire, nous recommandons une **TDM abdominale multiphase**.	↑↑
	↳ **2.2** Si la TDM est contre-indiquée, nous recommandons une **IRM abdominale** comme modalité d'imagerie alternative.	↑↑
	↳ **2.3** Si l'IRM est contre-indiquée, nous recommandons une **ÉCHO de contraste** comme modalité d'imagerie alternative.	↑↑
GU07. OBSTRUCTION DES VOIES URINAIRES		

Ces recommandations ne sont pas conçues pour être utilisées seules. Les soins médicaux doivent reposer sur des données probantes, le jugement expert d'un clinicien, la situation, les valeurs et les préférences d'un patient, ainsi que sur la disponibilité des ressources. Nous sommes conscients que certaines modalités d'imagerie ne sont pas disponibles partout, en particulier dans les zones rurales et isolées du Canada. Il peut être difficile de décider s'il vaut mieux recommander à un patient de se déplacer pour obtenir l'imagerie recommandée ou d'effectuer localement un autre type d'imagerie; à cet égard, il faut tenir compte des avantages attendus de l'imagerie recommandée, des risques liés au déplacement, des préférences du patient et d'autres facteurs. La présente ligne directrice repose sur des données probantes liées uniquement aux tests d'imagerie diagnostique et non à la gestion clinique du patient.

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
GU07A. Voies urinaires supérieures (pyélectasie, hydronéphrose) *En cas de préoccupation clinique liée à :* - *une colique néphrétique, voir la section GU04* - *une infection, voir la section GU08*	**1.** Dans le cas des adultes chez qui l'on soupçonne une obstruction des voies urinaires supérieures, nous recommandons l'**ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si des examens supplémentaires sont nécessaires, nous recommandons la **TDM abdominale** comme modalité d'imagerie subséquente.	↑↑
	2. Chez les adultes enceintes chez qui l'on soupçonne une obstruction des voies urinaires supérieures, nous recommandons **l'ÉCHO** comme modalité d'imagerie initiale.	↑↑
	↳ **2.1** Si un examen d'imagerie supplémentaire est nécessaire, nous recommandons une **IRM abdominale** comme modalité d'imagerie subséquente.	↑↑
GU07B. Voies urinaires inférieures (infection urinaire basse) *Si l'existence d'un dysfonctionnement du plancher pelvien constitue une préoccupation clinique, voir la section GU15.*	Les recommandations ont pour but de guider le choix de la modalité d'imagerie dans les cas où le praticien estime qu'il est nécessaire, en vue d'une évaluation clinique ou biochimique, d'obtenir des images. Si un examen d'imagerie est nécessaire, alors :	
	1. Chez les adultes présentant une anatomie masculine chez qui on soupçonne une obstruction des voies urinaires inférieures, nous **déconseillons le recours à l'imagerie** en l'absence d'insuffisance rénale.	↓↓
	↳ **1.1** Chez les patients atteints d'insuffisance rénale, nous recommandons une **ÉCHO**.	↑↑
	2. Chez les adultes présentant une anatomie masculine et atteints d'une obstruction des voies urinaires inférieures résistante au traitement, nous suggérons l'**ÉCHO** en association avec une orientation en urologie.	↑
	3. Chez les adultes présentant une anatomie féminine chez qui on soupçonne une obstruction des voies urinaires inférieures, nous recommandons une **ÉCHO** en association avec une orientation vers un spécialiste.	↑↑
GU08. INFECTION DES VOIES URINAIRES (IVU)		
GU08A. Aiguë *Voir PD38A pour les lignes directrices en pédiatrie*	**1.** Chez les adultes atteints d'infection aiguë des voies urinaires, nous **déconseillons le recours à l'imagerie**.	↓↓
GU08B. Insuffisance post-traitement (pyélonéphrite)	**1.** Dans le cas des adultes chez qui on soupçonne une pyélonéphrite aiguë, nous **déconseillons le recours à l'imagerie**.	↓↓
	2. Dans le cas des adultes chez qui on soupçonne un abcès ou d'autres complications de la pyélonéphrite aiguë, nous recommandons **l'ÉCHO ou la TDM abdomino-pelvienne** comme modalité d'imagerie initiale.	↑↑
	3. Dans le cas des adultes enceintes chez qui on soupçonne un abcès ou d'autres complications de la pyélonéphrite aiguë, nous suggérons **l'ÉCHO** comme modalité d'imagerie initiale.	↑
	↳ **3.1** Si l'échographie n'est pas concluante ou si le soupçon clinique persiste, nous suggérons une **IRM** comme modalité	↑

Ces recommandations ne sont pas conçues pour être utilisées seules. Les soins médicaux doivent reposer sur des données probantes, le jugement expert d'un clinicien, la situation, les valeurs et les préférences d'un patient, ainsi que sur la disponibilité des ressources. Nous sommes conscients que certaines modalités d'imagerie ne sont pas disponibles partout, en particulier dans les zones rurales et isolées du Canada. Il peut être difficile de décider s'il vaut mieux recommander à un patient de se déplacer pour obtenir l'imagerie recommandée ou d'effectuer localement un autre type d'imagerie; à cet égard, il faut tenir compte des avantages attendus de l'imagerie recommandée, des risques liés au déplacement, des préférences du patient et d'autres facteurs. La présente ligne directrice repose sur des données probantes liées uniquement aux tests d'imagerie diagnostique et non à la gestion clinique du patient.

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
	d'imagerie subséquente.	
GU08C. Infections chroniques et récurrentes de la vessie *Voir PD38C pour les lignes directrices en pédiatrie*	**1.** Chez les adultes présentant une anatomie féminine atteints d'infections des voies urinaires inférieures récurrentes sans complications, nous **déconseillons le recours à l'imagerie**.	↓↓
	2. Chez les patients atteints d'infection des voies urinaires avec complication, nous recommandons une **orientation en urologie**.	↑↑
GU09. MASSE OU DOULEUR SCROTALE, Y COMPRIS TORSION TESTICULAIRE ET ÉPIDIDYMITE		
	1. Chez des adultes présentant une maladie scrotale, nous recommandons une **ÉCHO**.	↑↑
	2. Pour les adultes présentant une douleur scrotale (sans traumatisme) et un risque de maladie de Fournier, nous recommandons une **TDM et une orientation en chirurgie**.	CE
GU10. MASSE SURRÉNALIENNE		
	1. Pour les adultes présentant des masses surrénaliennes indéterminées découvertes fortuitement, nous recommandons **une IRM ou une TDM sans produit de contraste** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si un examen d'imagerie supplémentaire est nécessaire, nous suggérons une **TDM surrénale avec calcul du lavage** comme modalité d'imagerie subséquente (↑).	↑
	↳ **1.2** En cas de crainte de métastases surrénaliennes, nous suggérons la **MN (TEP-TDM)** (↑).	↑
	2. Dans le cas des adultes chez qui l'on soupçonne des tumeurs actives sur le plan biochimique et non diagnostiquées, nous recommandons **l'IRM ou la TDM** comme modalité d'imagerie initiale (↑↑).	↑↑
	↳ **2.1** Si un examen d'imagerie complémentaire est nécessaire, nous suggérons une **consultation en MN**.	↑
GU11. INCONTINENCE, URGENCE ET MICTIONS FRÉQUENTES		
En cas de préoccupation clinique liée à : - *une obstruction des voies urinaires inférieures, voir la section GU07B.* - *une infection des voies urinaires, voir la section GU08.*	**1.** Chez les adultes atteints d'incontinence urinaire, d'urgence urinaire et/ou de mictions fréquentes, nous recommandons l'**ÉCHO** pour évaluer l'urine résiduelle post-mictionnelle, selon l'indication clinique.	↑
	↳ **1.1** Lorsque l'évaluation de l'urine résiduelle post-mictionnelle n'est pas indiquée sur le plan clinique, nous **déconseillons le recours à l'imagerie**.	↓↓
	2. Chez les patients présentant une anatomie féminine, en vue d'évaluer les causes spécifiques de symptômes des voies urinaires inférieures (p. ex. diverticule urétral, etc.), nous recommandons l'**IRM**.	↑

Ces recommandations ne sont pas conçues pour être utilisées seules. Les soins médicaux doivent reposer sur des données probantes, le jugement expert d'un clinicien, la situation, les valeurs et les préférences d'un patient, ainsi que sur la disponibilité des ressources. Nous sommes conscients que certaines modalités d'imagerie ne sont pas disponibles partout, en particulier dans les zones rurales et isolées du Canada. Il peut être difficile de décider s'il vaut mieux recommander à un patient de se déplacer pour obtenir l'imagerie recommandée ou d'effectuer localement un autre type d'imagerie; à cet égard, il faut tenir compte des avantages attendus de l'imagerie recommandée, des risques liés au déplacement, des préférences du patient et d'autres facteurs. La présente ligne directrice repose sur des données probantes liées uniquement aux tests d'imagerie diagnostique et non à la gestion clinique du patient.

Scénario clinique/diagnostique	Recommandation	Force
angio-IRM : angiographie par imagerie résonance magnétique; **angio-TDM** : angiographie par tomodensitométrie; **ÉCHO** : échographie; **IRM** : imagerie par résonance magnétique; **MN** : médecine nucléaire; **pyélo-IRM :** pyélographie par imagerie résonance magnétique**; pyélo-TDM** : pyélographie par tomodensitométrie; **RM** : résonance magnétique; **RX** : radiographie; **TEP-TDM** : tomographie par émission de positrons-tomodensitométrie; **TDM** : tomodensitométrie **Force de la recommandation :** ↑↑ : fortement recommandé; ↑ : recommandé dans certains cas; ↓↓ : fortement déconseillé; ↓ : déconseillé dans certains cas; **CE** : consensus d'un groupe d'experts		
Voir PD37A et PD37B pour les lignes directrices en pédiatrie		
GU12. DOULEUR PELVIENNE CHRONIQUE		
GU12A. Douleur pelvienne chronique chez la femme	Les recommandations pour ce scénario clinique ont été traitées par le groupe d'experts en obstétrique et gynécologie. Voir les lignes directrices relatives aux demandes d'examen en imagerie diagnostique obstétrique et gynécologique de la CAR[49] pour en savoir plus.	
GU12B. Douleur pelvienne chronique chez l'homme *Dans le cas de patients présentant un taux sanguin d'APS élevé, voir la section GU13.*	**1.** Chez des adultes présentant une anatomie masculine atteints de douleur pelvienne chronique non spécifique, nous suggérons la **TDM** comme modalité d'imagerie initiale.	CE
	2. Dans le cas des adultes chez qui on soupçonne une prostatite chronique, nous **déconseillons le recours à un examen usuel d'imagerie**.	CE
GU13. TAUX SANGUIN ÉLEVÉ D'APS		
	1. Chez les adultes présentant une élévation persistante ou marquée du taux sanguin d'APS*, nous recommandons **une orientation en urologie avec ou sans IRM**. *La demande d'IRM peut varier en fonction des pratiques régionales/locales.* **Voir les lignes directrices de l'Association des urologues du Canada sur le dépistage du cancer de la prostate* [33]	↑↑
GU14. INFERTILITÉ		
	Les recommandations pour ce scénario clinique ont été traitées par le groupe d'experts en obstétrique et gynécologie. Voir les lignes directrices relatives aux demandes d'examen en imagerie diagnostique obstétrique et gynécologique de la CAR[49] pour en savoir plus.	
GU15. PLANCHER PELVIEN		
Si l'existence d'un trouble urinaire constitue une préoccupation clinique, voir la section GU11 :	**1.** Dans le cas des adultes présentant une protrusion ou un renflement vaginal, ou chez qui on soupçonne un prolapsus des organes pelviens ou un trouble de la défécation, nous recommandons la **déféco-IRM** comme modalité d'imagerie initiale.	↑↑
	↳ **1.1** Si la déféco-IRM n'est pas disponible, nous suggérons la **défécographie**comme modalité d'imagerie alternative. *La disponibilité et l'utilisation de la déféco-IRM et de la défécographie peuvent varier selon les provinces, voire d'une région à l'autre au sein d'une même province.*	↑

APPENDIX 4. AGREE-II ASSESSMENTS

Guideline	Domain 1				Domain 2				Domain 3									Domain 4				Domain 5					Domain 6			Overall quality
	1	2	3	Score (%)	4	5	6	Score (%)	7	8	9	10	11	12	13	14	Score (%)	15	16	17	Score (%)	18	19	20	21	Score (%)	22	23	Score (%)	
ACR 2020 [19] Hematuria	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	1	2	1	5 (42)	3	3	6 (100)	Moderate
RCR 2017 [20]	3	3	3	9 (100)	3	3	3	9 (100)	3	3	3	3	3	1	3	1	20 (83)	3	3	3	9 (100)	3	2	3	1	9 (75)	2	2	4 (67)	High
AUA/SUFU 2020 [21]	3	1	3	7 (78)	3	3	3	9 (100)	3	3	3	3	3	3	3	3	24 (100)	3	3	3	9 (100)	3	3	3	1	10 (83)	3	3	6 (100)	High
Hypertension Can. 2020 [22]	3	1	3	7 (78)	3	1	3	7 (78)	3	1	3	3	3	3	3	1	20 (83)	3	3	2	8 (89)	1	1	1	3	6 (50)	3	3	6 (100)	High
ACR 2021 [23] Renal failure	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	2	2	1	6 (50)	3	3	6 (100)	Moderate
NICE (NG148) 2019 [24]	1	3	3	7 (78)	3	3	3	9 (100)	3	3	3	3	3	3	1	1	20 (83)	2	1	2	5 (56)	1	1	3	1	6 (50)	3	3	6 (100)	High
ACEP 2019 [25]	3	3	3	9 (100)	3	1	3	7 (78)	3	3	3	3	3	3	3	1	22 (92)	3	3	2	8 (89)	1	1	1	1	4 (33)	3	3	6 (100)	Moderate
ACR 2023 [26] Urolithiasis	1	1	3	5 (56)	3	1	3	7 (78)	3	1	3	1	3	3	3	1	18 (75)	3	3	3	9 (100)	1	3	2	1	7 (58)	1	3	4 (67)	Moderate
CUA 2021 [27,28]	3	1	3	7 (78)	3	1	3	7 (78)	3	1	3	3	3	3	3	1	20 (83)	3	3	3	9 (100)	1	1	2	1	5 (42)	3	3	6 (100)	Moderate
EAU 2023 [29]	3	1	3	7 (78)	3	3	3	9 (100)	3	3	3	3	3	3	3	1	22 (92)	3	3	3	9 (100)	3	1	3	1	8 (67)	3	3	6 (100)	High
NICE (NG118) 2019 [30]	1	3	3	7 (78)	3	3	3	9 (100)	3	3	3	3	3	3	3	1	22 (92)	3	3	3	9 (100)	1	1	3	1	6 (50)	3	3	6 (100)	High
ACR 2020 [31] Renal mass	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	2	2	1	6 (50)	3	3	6 (100)	Moderate
CUA 2022 [32,33]	3	1	3	7 (78)	3	3	1	7 (78)	3	3	3	3	3	3	3	1	22 (92)	3	3	3	9 (100)	2	1	3	1	7 (58)	3	3	6 (100)	High
CUA 2023 [34]	3	1	3	7 (78)	3	1	3	7 (78)	3	3	3	3	1	3	3	1	20 (83)	3	1	3	7 (78)	1	1	1	3	6 (50)	1	3	4 (67)	Moderate
CUA 2020 [35]	3	3	3	9 (100)	2	1	3	6 (67)	3	1	3	3	3	3	3	1	20 (83)	3	2	3	8 (89)	3	1	3	1	8 (67)	1	3	4 (67)	High
EAU 2021 [36]	3	2	1	6 (67)	3	3	3	9 (100)	3	1	3	3	3	3	3	2	21 (88)	3	3	3	9 (100)	3	3	3	2	11 (92)	3	3	6 (100)	High
Wessells 2023 [37]	3	1	3	7 (78)	3	1	3	7 (78)	3	3	3	3	1	3	3	1	20 (83)	3	3	3	9 (100)	1	2	1	1	5 (42)	3	3	6 (100)	High
German Gdln 2018 [38]	3	1	3	7 (78)	3	3	3	9 (100)	3	3	3	3	2	3	3	1	21 (88)	2	3	1	6 (67)	1	1	1	1	4 (33)	1	3	4 (67)	Moderate
ACR 2022 [39] Pyelonephritis	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	2	2	1	6 (50)	3	3	6 (100)	High
ACR 2020 [40] Lower UTI	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	2	1	2	1	6 (50)	3	3	6 (100)	Moderate

Appendix 4: AGREE-II assessments

Guideline	Domain 1				Domain 2				Domain 3									Domain 4				Domain 5					Domain 6			Overall quality
	1	2	3	Score (%)	4	5	6	Score (%)	7	8	9	10	11	12	13	14	Score (%)	15	16	17	Score (%)	18	19	20	21	Score (%)	22	23	Score (%)	
AUA/CUA/SUFU 2022 [41]	3	1	3	7 (78)	3	3	2	8 (89)	3	3	3	3	3	3	3	1	22 (92)	3	1	3	7 (78)	1	1	1	1	4 (33)	3	3	6 (100)	Moderate
ACR 2022 [42] Scrotal abnor.	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	2	1	2	1	6 (50)	3	3	6 (100)	High
ACR 2019 [43] Scrotal pain	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	1	2	1	5 (42)	3	3	6 (100)	Moderate
Mody (2021) [44]	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	1	1	2	1	5 (42)	3	3	6 (100)	Moderate
CUA 2023 [45]	3	3	3	9 (100)	3	1	3	7 (78)	3	1	3	3	1	3	3	1	18 (75)	3	3	3	9 (100)	2	3	3	1	9 (75)	1	1	2 (33)	Moderate
NCCN 2021 [46] Tumours	3	1	3	7 (78)	3	3	3	9 (100)	3	1	3	3	3	3	1	1	18 (75)	3	3	1	7 (78)	1	3	1	1	6 (50)	1	3	4 (67)	Moderate
EAU 2020 [47]	3	3	3	9 (100)	3	1	3	7 (78)	3	3	3	3	3	3	3	2	23 (96)	3	1	3	7 (78)	1	1	3	1	6 (50)	3	3	6 (100)	High
NICE (NG123) 2019 [48]	2	3	2	7 (78)	3	1	3	7 (78)	3	3	3	3	3	3	3	3	24 (100)	3	1	3	7 (78)	1	1	1	1	4 (33)	3	3	6 (100)	High
ACR 2022 [50] Pelvic floor	2	3	3	8 (89)	3	1	3	7 (78)	3	2	3	2	3	3	3	1	20 (83)	3	3	3	9 (100)	2	1	2	1	6 (50)	3	3	6 (100)	High

Abbreviations: **ACR**: American College of Radiology; **AUA/SUFU**: American Urology Association/ Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction; **CAR**: Canadian Association of Radiologists; **CUA**: Canadian Urological Association; **EAU**: European Association of Urology; **NCCN**: National Comprehensive Cancer Network; **NICE**: National Institute for Health and Clinical Excellence; **RCR**: Royal College of Radiologists