Renal cancer

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Expert panel

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1. Introduction

This document provides an overview of the good clinical practice guidelines for **renal cancer** and covers a broad range of topics such as screening, diagnosis, treatment and follow-up.

These guidelines are developed by a **panel of experts** comprising clinicians of different specialties and designated by their respective scientific societies.

The guidelines are based on the best evidence available at the time they are derived (2022).

The aim of these guidelines is to assist all national care providers involved in the care of patients with renal cancer and serve as a base and supporting tool for the local institutional guidelines and MOC (multidisciplinary oncological consult) discussions in Belgium.

SEARCH FOR EVIDENCE

This national guideline is derived from existing international guidelines and have been updated and adapted to the Belgian context by the expert panel. The following guidelines have mostly been used: EAU guidelines (Ljubengigng et al 2022) and ESMO guidelines (Escudier et al. 2019). The expert panel consisted of experts in various settings and representatives of the relevant professional Belgian societies, implicated in the management of renal cancer.

This national guideline will be regularly updated as new evidence with practice implications emerges.

Levels of evidence and grades of recommendation have been applied using the system shown in the Table below.

Levels of evidence	
1	Evidence from at least one large randomized, controlled trial of good methodological quality (low potential for bias) or meta-analyses of well-conducted randomized trials without heterogeneity
2	Small randomized trials or large randomized trials with a suspicion of bias (lower methodological quality) or meta-analyses of such trials or of trials with demonstrated heterogeneity
3	Prospective cohort studies
4	Retrospective cohort studies or case–control studies
5	Studies without control group, case reports, experts opinions
Grades of recommendation	
Strong recommendation	
Weak recommendation	

2. List of abbreviations

AML: angiomyolipoma

AS: active surveillance

CC: clear-cell

cc-mRCC: clear-cell metastatic renal cell carcinoma

CT: computed tomography

CN: cytoreductive nephrectomy

EAU: European Association of Urology

FDG-PET/CT: fluorodeoxyglucose positron emission tomography/computed tomography

Gy: Gray

IMDC: International Metastatic RCC Database Consortium

ISUP: international society of urological pathology

LN: lymph node

MOC multidisciplinary oncological consult

MRI: Magnetic Resonance Imaging

MSKCC: Memorial Sloan-Kettering Cancer Center

NSS: nephron-sparing surgery

PN: partial nephrectomy

pRCC: papillary RCC

RCC: renal cell cancer

RECIST: Response Evaluation Criteria In Solid Tumors

RN: radical nephrectomy

SBRT: stereotactic body radiotherapy (SBRT)

TA: thermal ablation

TKI: tyrosine kinase inhibitor

TNM: tumor, node, metastasis

US: ultrasound

UICC: Union for International Cancer Control

VEGFR: vascular endothelial growth factor receptor

WBRT: whole brain radiotherapy

WG: working group

WHO: World Health Organization

1. Aetology

- Increase physical activity, eliminate cigarette smoking and in obese patients reduce weight are the primary preventative measures to decrease risk of renal cell cancer (RCC). (EAU; 2a, strong recommendation)

2. Staging and classification systems

- The Union for International Cancer Control (ICC) Tumor, Node, Metastasis (TNM) 8 staging system should be used. This can be found in Table 1 in the Appendix I. (ESMO; strong recommendation)

3. Diagnostic evaluation

3.1. Diagnostic assessment RCC

- Use multi-phasic contrast-enhanced computed tomography (CT) of abdomen and chest for the diagnosis and staging of renal tumors. (EAU; 2a, strong recommendation)
- Omit chest CT in patients with incidentally noted cT1a disease due to the low risk of lung metastases in this cohort. (EAU; weak recommendation)
- Use magnetic resonance imaging (MRI) to better evaluate venous involvement, reduce radiation or avoid intravenous CT contrast medium. (EAU; 2a, weak recommendation)
- Use non-ionising modalities, including MRI and contrast-enhanced US, for further characterization of small renal masses, tumor thrombus and differentiation of unclear renal masses, if the results of contrast-enhanced CT are indeterminate. (EAU; 2a, strong recommendation)
- Offer brain CT/MRI in metastatic patients when systemic therapy or cytoreductive nephrectomy (CN) is considered. (EAU; weak recommendation)
- Do not routinely use bone scan and/or fluorodeoxyglucose positron emission tomography/computed tomography (FDG-PET CT) for staging of renal cell carcinoma. A bone scan can be considered in symptomatic patients. (EAU + consensus working group (WG); weak recommendation)
- For accurate staging and contrast-enhanced chest, abdominal and pelvic CT are recommended. (ESMO; 3, strong recommendation)
- Perform a renal tumor biopsy before ablative therapy and systemic therapy without previous pathology. (EAU; 3, strong recommendation)
- Perform a percutaneous biopsy in select patients who are considering active surveillance (AS). (EAU; 3, weak recommendation)
- Use a coaxial technique when performing a renal tumor biopsy. (EAU; 3, strong recommendation)
- Do not perform a renal tumor biopsy of cystic renal masses unless a significant solid component is visible at imaging. (EAU; strong recommendation)
- Use a core biopsy technique rather than fine needle aspiration for histological characterization of solid renal tumors. (EAU; 3, strong recommendation)

3.2. Genetic assessment RCC

- Perform a genetic evaluation in patients aged < 46 years, with bilateral or multifocal tumors and/or a first or second-degree relative with RCC and/or a close blood relative with a known pathogenic variant and/or specific histologic characteristics which suggest the presence of a hereditary form of RCC. (EAU; 3, strong recommendation)
- Refer patients to a cancer geneticist or to a comprehensive clinical care centre in case of suspected hereditary kidney cancer. (EAU; 3; strong recommendation)

4. Prognostic factors

- Use the current Tumor, Node, Metastasis classification system. (EAU; 2a, strong recommendation)
- Use the World Health Organization/international society of urological pathology (WHO/ISUP) grading system and classify renal cell carcinoma type (Table 2). The latest WHO kidney tumour classification is the 5th edition, 2022). Currently it is recommended that chromophobe renal cell carcinoma not be graded with the WHO/ISUP system. (EAU + consensus WG; 2a, strong recommendation).
- Report the presence and the percentage of sarcomatoid features, the presence of rhabdoid features, the presence of necrosis, lymphovascular invasion and the surgical margin status. We recommend to use the last College of American standardized report. (CAP, strong recommendation)
- Use prognostic models in localized and metastatic disease. (EAU; strong recommendation)
- The prognosis of obese patients is better than patients who are not obese. (Consensus WG)
- Prognostic models combining independent prognostic factors have been developed and externally validated. Table 3 and Table 4 in the Appendix I summarize the current most relevant prognostic models. (EAU)

5. Disease management

5.1. Treatment of localized RCC

5.1.1 Surgical treatment

- Offer surgery to achieve cure in localized RCC. (EAU; strong recommendation)
- Offer partial nephrectomy (PN) to patients with T1 tumors. (EAU; 3b, strong recommendation)
- Offer PN to patients with T2 tumors and a solitary kidney or chronic kidney disease, if technically feasible. (EAU; weak recommendation)
- Do not perform ipsilateral adrenalectomy if there is no clinical evidence of invasion of the adrenal gland. (EAU; 3, strong recommendation)
- Do not offer an extended lymph node (LN) dissection to patients with organ-confined disease. (EAU; 2b, weak recommendation)

- Offer embolization or stereotactic body radiotherapy (SBRT) to patients unfit for surgery presenting with massive hematuria or flank pain. (EAU + consensus WG; 3, weak recommendation)

5.1.2 Radical and partial nephrectomy techniques

- Offer (robotic) laparoscopic radical nephrectomy (RN) to patients with T2 tumors and localized masses not treatable by PN (Choi et al. 2015). (EAU + consensus WG; 1b, strong recommendation)
- Do not perform minimally invasive RN in patients with T1 tumors for whom a PN is feasible by any approach, including open. (EAU; 2a, strong recommendation)
- Do not perform minimally invasive surgery if this approach may compromise oncological-, functional- and peri-operative outcomes. (EAU; strong recommendation)
- Do not perform RN in case of nephron-sparing indication. (Consensus WG; strong recommendation)
- Intensify follow-up in patients with a positive surgical margin, especially in upstaged pT3a patients. (EAU, weak recommendation)

5.1.3 Therapeutic approaches as alternative to surgery

- Offer AS or thermal ablation (TA) to frail and/or comorbid patients with small renal masses. (EAU; 3, weak recommendation)
- Perform a percutaneous renal mass biopsy prior to AS, and prior to – and not concomitantly with- TA. (EAU; strong recommendation)
- When TA or AS are offered, discuss with patients about the harms/benefits with regards to oncological outcomes and complications. (EAU; strong recommendation)
- Do not routinely offer TA for tumors > 3 cm and cryoablation for tumors > 4 cm. Tumors of > 4 cm and who are not good candidates for surgery, SBRT offers very good results (EAU + consensus WG; 3, weak recommendation).
- SBRT should be discussed if surgical treatment is not an option. Local control rates at 4 years >95% (Siva et al. 2020). (Consensus WG; strong recommendation).

5.2 Treatment of locally advanced RCC

5.2.1 Management of RCC with venous tumor thrombus

- In patients with clinically enlarged LNs, perform LN dissection for staging, prognosis and follow-up implications. (EAU; 3, weak recommendation)
- During nephrectomy, remove clinically enlarged LNs for staging, prognosis and follow-up implications. (EAU; weak recommendation)
- Remove the renal tumor and thrombus in case of venous involvement in non-metastatic disease. (EAU; 3, strong recommendation)
- In case of metastatic disease, discuss surgery within the context of a multidisciplinary team. (EAU; weak recommendation)

5.2.2 Neoadjuvant and adjuvant therapy

- Pembrolizumab as adjuvant therapy should be considered for patients with intermediate- (pT2, grade 4 or sarcomatoid, N0M0 or pT3, any grade, N0M0) or high- (pT4, any grade, N0M0 or ant pT, any grade, N+M0) risk ccRCC. Treatment should start within 3 months of surgery and continue for up to 17 cycles or 1 year. (Consensus WG; strong recommendation)

5.3 Advanced/metastatic RCC

5.3.1 Local therapy

- International Metastatic RCC Database Consortium (IMDC) or Memorial Sloan-Kettering Cancer Center (MSKCC) criteria can be used for stratification. (Consensus WG; strong recommendation)
- Do not perform CN in IMDC/MSKCC poor-risk patients (Méjean et al. 2018). (EAU + consensus WG; 1a, strong recommendation)
- Do not perform immediate CN in intermediate-risk patients who have an asymptomatic synchronous primary tumor and require systemic therapy. (EAU; 2b, weak recommendation)
- Start systemic therapy without CN in intermediate-risk patients who have an asymptomatic synchronous primary tumor and require systemic therapy. (EAU; weak recommendation)
- Discuss closure nephrectopy with patients who derive clinical benefit from systemic therapy. (EAU; weak recommendation)
- Perform immediate CN in patients with a good performance status who do not require systemic therapy. (EAU; weak recommendation)
- Perform immediate CN in patients with oligometastases when complete local treatment of the metastases can be achieved. (EAU; weak recommendation)

5.3.2 Radiotherapy

- Radiotherapy can be offered to control large tumors (local disease) (including large tumors, T1b) if SBRT and IGRT is the used radiation technology. (Consensus WG; strong recommendation)

5.3.3 Local therapy of metastases (intra and extracranial) in metastatic RCC

- Asymptomatic oligometastatic patients: offer metastasectomy if complete resection can be obtained. Alternatively, offer SBRT to delay disease progression and the initiation of systemic treatment (Tang et al. 2021). Pembrolizumab can be offered to patients after complete resection of the oligometastatic disease after agreement at the multidisciplinary meeting. (Consensus WG; weak recommendation)
- Offer SBRT for clinically relevant bone or brain metastases for local control (EAU; weak recommendation) and symptom relief (EAU; strong recommendation).
- For mRCC patients with brain metastases, the use of corticosteroids can provide temporary relief of cerebral symptoms. Whole brain radiotherapy (WBRT) between 20 and 30 Gy in 4–10 fractions is recommended for effective symptom control. (ESMO; 2, strong

recommendation)

- For good-prognosis mRCC patients with a single unresectable brain metastasis, stereotactic radiosurgery or SBRT should be preferred. (ESMO; 2, strong recommendation)
- Perform a confirmatory axial scan of disease status prior to metastasectomy or SBRT to rule out rapid progressive metastatic disease which requires systemic treatment. (EAU; weak recommendation)

5.4 Systemic therapy for advanced/metastatic RCC

5.4.1 Immunotherapy (Checkpoint inhibitors)

- Offer pembrolizumab plus axitinib, or nivolumab plus cabozantinib to treatment-naive patients in clear-cell metastatic renal cell carcinoma (cc-mRCC) irrespective of the IMDC risk groups. (EAU + consensus WG; 1b, strong recommendation)
- Offer ipilimumab plus nivolumab to treatment-naive cc-mRCC patients with IMDC intermediate- and poor-risk. (EAU; 1b, strong recommendation)
- There is no preferred combination in first-line treatment because not direct comparisons. Axitinib plus avelumab is not yet associated with an overall survival advantage. (Consensus WG; 1d, strong recommendation)
- Administer nivolumab plus ipilimumab, pembrolizumab plus axitinib, and nivolumab plus cabozantinib in centers with experience of immune combination therapy and appropriate supportive care within the context of a multidisciplinary team. (EAU + consensus WG; 4, weak recommendation)
- Immunotherapy is active in sarcomatoid renal tumors and should be strongly considered. (Consensus WG; strong recommendation)
- Patients who do not receive the full four doses of ipilimumab due to toxicity should continue on single-agent nivolumab, where safe and feasible. (EAU; 4, weak recommendation)
- Cessation of immunotherapy should be considered after 2 years of therapy. (Consensus WG; 4C, weak recommendation)
- Continue immunotherapy after disease progression on first-line is not recommended. (Consensus WG; 4D, weak recommendation)
- Do not re-challenge patients who stopped immune checkpoint inhibitors because of toxicity without expert guidance and support from a multidisciplinary team. (EAU; 4, strong recommendation)
- Offer nivolumab for VEGFR refractory patients and checkpoint inhibitors naïve. (Consensus WG; strong recommendation)

Table 1 Preferred systemic therapy for advanced ccRCC

First-line treatment	
Favorable risk group	Axitinib + Pembrolizumab Cabozantinib + Nivolumab
Intermediate / Poor risk groups	Axitinib + Pembrolizumab Cabozantinib + Nivolumab Ipilimumab + Nivolumab
Subsequent treatment	
A VEGFR therapy not previously used Cabozantinib Axitinib Sunitinib Pazopanib Consider participation in a clinical trial	

5.4.2 Targeted therapy

- Offer first-line combinations of VEGFR targeted therapies with checkpoint inhibitors (see section 5.4.1)
- Sunitinib and pazopanib are alternatives to immunotherapy-based first line combinations in favorable risk patients or when immunotherapy is contraindicated. (Consensus WG; 1A, strong recommendation)
- Cabozantinib is an alternative to immunotherapy-based first line combinations when immunotherapy is contraindicated in IMDC intermediate and poor risk patients. (Consensus WG; 2A, strong recommendation)
- Offer a VEGFR targeted therapy (cabozantinib, axitinib, sunitinib, pazopanib) not previously used after immunotherapy-based first line combinations. (Consensus WG; 3B, weak recommendation)

5.4.3 nccRCC

- Participation in a clinical trial should be considered as preferred strategy for nccRCC.
- Consider cabozantinib as preferred agent for advanced papillary RCC. Other options include sunitinib and pembrolizumab. (Consensus WG; 2B, strong recommendation)
- Chemotherapy should be considered for renal medullary carcinoma and collecting-duct carcinoma. (Consensus WG; weak recommendation)
- mTOR inhibitors could be an option in chromophobe RCC. (Consensus WG; weak recommendation)

5.5 Locally recurrent RCC after treatment of localized disease

- Offer local treatment of locally recurrent disease when technically possible and after balancing adverse prognostic features, comorbidities and life expectancy. (EAU; weak recommendation)

6. Follow-up

- A follow-up algorithm for monitoring patients after treatment for RCC is needed, recognising not only the patient's risk of recurrence profile, but also the efficacy of the treatment given (Table 5). (EAU)
- Follow-up for high-risk patients includes CT scans of thorax and abdomen every 3–6 months for the first 2 years; an annual CT scan is recommended for low-risk patients. (ESMO)
- For asymptomatic mRCC patients who are not receiving systemic therapy, watch and wait approach can be followed (thoracic-abdominal CT or MRI scan every three months). (Consensus WG; weak recommendation)
- For mRCC patients during systemic therapy, 2- to 4-month follow-up with CT/MRI scan is advised. (ESMO)
- Response Evaluation Criteria In Solid Tumors (RECIST) is the most frequent used method to assess drug efficacy.
- Base follow-up after treatment of localized RCC on the risk of recurrence. (EAU; strong recommendation)
- Perform functional follow-up (renal function assessment and prevention of cardiovascular events) both in nephron-sparing surgery (NSS) and RN patients. (EAU; weak recommendation)
- Intensify follow-up (every three months in the first year) in patients after NSS for tumors > 7 cm or in patients with a positive surgical margin (follow-up as a high risk patient). (EAU; weak recommendation)
- Consider curtailing follow-up when the risk of dying from other causes is double that of recurrence risk. (EAU; weak recommendation)
- Base risk of recurrence stratification on validated subtype-specific models such as the Leibovich Score for ccRCC or the University of California Los Angeles integrated staging system for non-ccRCC. (EAU; weak recommendation)

7. Recommendations management other renal tumors

- Bosniak IIF should be followed by AS for five years. (Consensus WG; weak recommendation)
- Manage Bosniak type III cysts the same as localized RCC, or offer AS. (EAU; weak recommendation)
- Manage Bosniak type IV cysts the same as localized RCC. (EAU; strong recommendation)
- In selected patients with complex renal cysts, contrast enhanced ultrasound (CEUS) may be beneficial for further lesion characterization. (Consensus WG; weak recommendation)

- Treat angiomyolipoma (AML) with selective arterial embolization or NSS, in: (EAU; weak recommendation)
    - large tumors (a recommended threshold of intervention does not exist);
    - large intralesional aneurysm-like blood vessels;
    - females of childbearing age;
    - patients in whom follow-up or access to emergency care may be inadequate;
    - persistent pain or acute or repeated bleeding episodes.
- Offer systemic therapy to patients in need of therapy with surgically unresectable AMLs not amendable to embolization or surgery. (EAU; weak recommendation)
- Offer AS to patients with biopsy-proven oncocytomas, as an acceptable alternative to surgery or ablation. (EAU; weak recommendation)
- Offer RN to patients with localized renal medullary carcinoma. (EAU; weak recommendation)

8. REFERENCES

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9. APPENDIX I

Table 1 TNM classification system

Stage	Definition	Subdivision
Tumor stage		
T0	No evidence of primary tumor	
T1	< 7 cm in greatest dimension, confined to the kidney	1a: < 4 cm (►**Fig. 1**) 1b: > 4 cm and < 7 cm
T2	> 7 cm in greatest dimension, confined to the kidney	2a: > 7 cm < 10 cm (►**Fig. 2**) 2b: > 10 cm
T3	Extends into major veins or perinephric tissues but not into the ipsilateral adrenal gland or beyond Gerota fascia	3a: Tumor extends into renal vein branches, or invades perirenal and/or renal sinus fat (►**Fig. 3**)
		3b: Tumor extends into the subdiaphragmatic inferior vena cava
		3c: Tumor extends into the supradiaphragmatic inferior vena cava
T4	Tumor invades beyond the Gerota fascia and/or contiguous extension into the ipsilateral adrenal gland (►**Figs. 4** and **5**)	
Regional lymph nodes		
N0	No regional lymph node metastasis	
N1	Metastasis to regional lymph nodes	
Distant metastasis		
M0	No distant metastasis	

Table 2 WHO/ISUP grading system (CAP 2021)

+ **Histologic Grade (World Health Organization [WHO] / International Society of Urological Pathol [ISUP] Grade) (Note C)**
+ ___ G1: Nucleoli absent or inconspicuous and basophilic at 400x magnification
+ ___ G2: Nucleoli conspicuous and eosinophilic at 400x magnification, visible but not prominent at 10 magnification
+ ___ G3: Nucleoli conspicuous and eosinophilic at 100x magnification
+ ___ G4: Extreme nuclear pleomorphism and/or multinuclear giant cells and/or rhabdoid and/or sarco differentiation
+ ___ GX: Cannot be assessed
+ ___ Not applicable

Table 3 Prognostic models for localized RCC

Prognostic model	Subtype*	Risk factors/prognostic factors
UISS** [246]	All	1. ECOG PS 2. T classification 3. N classification (N+ classified as metastatic) 4. Grade T1N0M0G1–2, ECOG PS 0: low-risk disease T3N0M0G2–4, ECOG PS ≥ 1 OR T4N0M0: high-risk disease Any other N0M0: intermediate-risk disease
Leibovich score/model 2003 [238]	CC	1. T classification (pT1a: 0, pT1b: 1, pT2:3, pT3-4: 4 points) 2. N classification (pNx/N0: 0, pN+: 2 points) 3. Tumour size (< 10 cm: 0, ≥ 10 cm: 1 point) 4. Grade (G1-2: 0, G3: 1, G4: 3 points) 5. Tumour necrosis (absent: 0, present: 1 point) 0–2 points: low-risk disease 3–5 points: intermediate-risk disease 6 or more points: high-risk disease
Leibovich score/model 2018 [247]	CC, P, CH	ccRCC • Progression (9 factors): constitutional symptoms, grade, tumour necrosis, sarcomatoid features, tumour size, perinephric or sinus fat invasion, tumour thrombus level, extension beyond kidney, nodal involvement. • Cancer-specific survival (12 factors): age, ECOG PS, constitutional symptoms, adrenalectomy, surgical margins, grade, tumour necrosis, sarcomatoid features, tumour size, perinephric or sinus fat invasion, tumour thrombus, nodal involvement. • No risk groups/prognostic groups. pRCC • Low risk (group 1): grade 1–2, no fat invasion, no tumour thrombus. • Intermediate risk (group 2): grade 3, no fat invasion, no tumour thrombus. • High risk (group 3): grade 4 or fat invasion or any level tumour thrombus. chRCC • Low risk (group 1): no fat invasion, no sarcomatoid differentiation, no nodal involvement. • Intermediate risk (group 2): fat invasion and no sarcomatoid differentiation and no nodal involvement. • High risk (group 3): sarcomatoid differentiation or nodal involvement.
VENUSS score/model*** [191]	P	1. T classification (pT1: 0, pT2: 1, pT3-4: 2 points) 2. N classification (pNx/pN0: 0, pN1: 3 points) 3. Tumour size (≤ 4 cm: 0, > 4 cm: 2 points) 4. Grade (G1/2: 0, G3/4: 2 points) 5. Tumour thrombus (absent: 0, present: 2 points) 0–2 points: low-risk disease 3–5 points: intermediate-risk disease 6 or more points: high-risk disease
GRANT score/model**** [248]	All	1. Age > 60 years 2. T classification = T3b, pT3c or pT4 3. N classification = pN1 4. (Fuhrman) grade = G3 or G4 0–1 factors: favourable-risk disease 2 or more factors: unfavourable-risk disease

* *ccRCC = clear-cell RCC; ECOG = Eastern Cooperative Oncology Group; pRCC = papillary RCC; chRCC = chromophobe RCC; PS = performance status.*

** *University of California Integrated Staging system. Available at https://www.mdcalc.com/ucla-integrated-staging-system-uiss-renal-cell-carcinoma-rcc.*

*** *Venous extension, Nuclear grade, Size, Stage. Available at https://www.evidencio.com/models/show/2369.*

**** *Grade, Age, Nodes and Tumour.*

Table 4 Prognostic models for metastatic RCCC

Prognostic model	Subtype	Risk factors/prognostic factors
MSKCC [249]**	All	1. Karnofsky PS [250]* < 80% 2. Interval from diagnosis to systemic treatment < 1 year 3. Haemoglobin < lower limit of normal 4. Corrected calcium >10 mg/dL/> 2.5 mmol/L 5. LDH > 1.5x upper limit of normal 0 factors: favourable-risk disease 1–2 factors: intermediate-risk disease 3–5 factors: poor-risk disease
IMDC [251]***	All	1. Karnofsky PS [250]* < 80% 2. Interval from diagnosis to treatment < 1 year 3. Haemoglobin < lower limit of normal 4. Corrected calcium > upper limit of normal (i.e., > 10.2 mg/dL) 5. Neutrophil count > upper limit of normal (i.e., > 7.0×10^9/L) 6. Platelet count > upper limit of normal (i.e., > 400,000) 0 factors: favourable-risk disease 1–2 factors: intermediate-risk disease 3–6 factors: poor-risk disease

IMDC = International Metastatic Renal Cancer Database Consortium; LDH = lactate dehydrogenase; MSKCC = Memorial Sloan Kettering Cancer Center; PS = performance status.

* *Karnofsky performance status calculator: https://www.thecalculator.co/health/Karnofsky-Score-for-Performance-Status-Calculator-961.html.*

** *MSKCC: https://www.mdcalc.com/memorial-sloan-kettering-cancer-center-mskcc-motzer-score-etastaticrenal-cell-carcinoma-rcc.*

*** *IMDC: https://www.mdcalc.com/imdc-international-metastatic-rcc-database-consortium-risk-score-rcc.*

Table 5 : Proposed follow-up schedule following treatment for localized RCC, taking into account

Risk profile (*)	Oncological follow-up after date of surgery								
	3 mo	6 mo	12 mo	18 mo	24 mo	30 mo	36 mo	> 3 yr (**) (***)	> 5 yr (**) (***)
Low risk of recurrence For ccRCC: Leibovich Score 0-2 For non-ccRCC: pT1a-T1b pNx-0 M0 and histological grade 1 or 2.	-	CT	-	CT	-	CT	-	CT once every two yrs	-
Intermediate risk of recurrence For ccRCC: Leibovich Score 3-5 For non-ccRCC: pT1b pNx-0 and/or histological grade 3 or 4.	-	CT	CT	-	CT	-	CT	CT once yr	CT once every two yrs
High risk of recurrence For ccRCC: Leibovich Score ≥ 6 For non-ccRCC: pT2-pT4 with any histological grade or pT any, pN1 cM0 with any histological grade	CT	CT	CT	CT	CT	-	CT	CT once yr	CT once every two yrs

ccRCC = clear cell renal cell carcinoma; CT = computed tomography; mo = months; non-ccRCC = non clear cell renal cell carcinoma; yr = years.

The table above provides recommendations on follow-up strategies for low, intermediate and high risk of recurrence in patients curatively treated for localised RCC either with NSS or RN. Computed tomography in the table refers to imaging of both chest and abdomen. Alternatively, MRI of the abdomen can be performed instead of a CT-scan.

* *Risk of recurrence profiles should be based on validated prognostic models. The EAU RCC Guidelines Panel recommends the 2003 Leibovich model for ccRCC [238]. However, other validated models can be used by physicians based on their own national/regional recommendations. In a similar fashion, for curatively treated localised non-ccRCC, the Panel recommends the use of the University of California Los Angeles integrated staging system (UISS) to determine risk of recurrence [239].*

** *For all risk of recurrence profiles, functional follow-up, mainly monitoring renal and cardiovascular function, may continue according to specific clinical needs irrespective of the length of the oncological follow-up.*

*** *For low-risk profiles at > 3 years and intermediate-risk at > 5 years of follow-up respectively, consider counselling patients about terminating oncological follow-up imaging based on assessment of comorbidities, age, life expectancy and/or patient wishes.*