

REVIEW

Kidney cancer in men's health: from sex disparity to sexual and endocrine survivorship

Marek Broul^{1,2,3,*}, Aneta Hujová³, Michal Vostrý³

¹Department of Sexology, Masaryk Hospital in Ústí nad Labem, Krajská zdravotní, a.s., 401 13 Ústí nad Labem, ULK, Czech Republic

²Department of Urology, Litoměřice Hospital, Krajská zdravotní, a.s., 412 01 Litoměřice, ULK, Czech Republic

³Faculty of Health Studies, Jan Evangelista Purkyně University in Ústí nad Labem, 400 11 Ústí nad Labem, ULK, Czech Republic

***Correspondence**

marek.broul@ujep.cz

(Marek Broul)

Abstract

Kidney cancer, particularly renal cell carcinoma (RCC), is a male-predominant malignancy whose clinical meaning extends beyond oncological control. Men carry a substantially higher global burden of kidney cancer than women, and this disparity probably reflects a combination of modifiable exposures, occupational risks, cardiometabolic vulnerability, health-seeking behavior, sex-hormone biology, immune regulation, and tumor microenvironmental differences. This narrative review and clinical perspective adds an operational men's health framework that separates RCC-specific evidence from broader survivorship extrapolation and links prevention, treatment choice, renal preservation, sexual and endocrine survivorship, fatigue, fertility, and psychosocial recovery. Population-wide screening of asymptomatic men is not evidence-based; prevention should instead emphasize smoking cessation, weight control, blood pressure management for renal and cardiovascular protection, physical activity, occupational risk reduction, and targeted evaluation of high-risk individuals. For localized RCC, nephron-sparing treatment can preserve renal function in appropriately selected patients, whereas systemic therapy for advanced disease requires proactive assessment of fatigue, endocrine immune-related adverse events and psychosexual morbidity. The review proposes a practical multidisciplinary pathway for integrating uro-oncology with andrology, sexual medicine, endocrinology, nephrology, cardiovascular prevention, rehabilitation, and psychosocial care.

Keywords

Kidney cancer; Renal cell carcinoma; Men's health; Sexual function; Hypogonadism; Survivorship; Nephrectomy; Androgen receptor; Quality of life; Prevention

1. Introduction

Kidney cancer is commonly managed as a uro-oncological disease, yet its epidemiology, risk-factor profile, and long-term sequelae place it firmly within the field of men's health. In 2022, global estimates recorded 434,840 new kidney cancer cases and 155,953 deaths, with men accounting for approximately 277,800 incident cases and 100,343 deaths [1, 2]. In the United States, registry data also show an approximately twofold male predominance in kidney and renal pelvis cancer incidence and mortality [3]. These figures are not only population statistics. They define a group of men whose cancer risk, treatment choices, and survivorship needs are inseparable from vascular, renal, endocrine, sexual, and psychosocial health.

Renal cell carcinoma (RCC) accounts for most adult kidney cancers. Clear-cell RCC is the predominant histological subtype and is characterized by inactivation of the von Hippel-Lindau pathway, hypoxia-inducible factor signaling, metabolic reprogramming, and recurrent alterations in chromatin-remodelling genes [4–7]. This molecular framework is not male-specific, but it provides the biological

context in which sex- and gender-related differences may act. Men are more frequently exposed to several established RCC risk factors, including cigarette smoking, excess adiposity, hypertension, and some occupational carcinogens, but exposure alone is unlikely to explain the full magnitude and consistency of the male excess [4, 8].

The terminology also requires precision. Population datasets often report kidney cancer, kidney and renal pelvis cancer, or renal tumors, whereas clinical and survivorship evidence usually concerns RCC, especially clear-cell RCC. Urothelial carcinoma of the renal pelvis and upper urinary tract is etiologically distinct from clear-cell RCC and has a stronger relationship with tobacco exposure and occupational or environmental urothelial carcinogens, including aromatic amines and aristolochic acid; it is therefore not the main focus of this review.

Throughout this review, the term “men” follows the terminology used in most epidemiological and clinical datasets, which generally classify participants by sex. However, the observed male burden of kidney cancer should be interpreted as the result of both biological sex-

related mechanisms and gender-related factors, including occupational exposures, smoking patterns, cardiometabolic risk, health-seeking behavior, and access to preventive care.

The men's health relevance of RCC is broader than incidence. Many men diagnosed with RCC are also living with hypertension, obesity, diabetes, chronic kidney disease, cardiovascular disease, erectile dysfunction, depressive symptoms or reduced physical reserve. Treatment may add new vulnerabilities through nephron loss, postoperative deconditioning, systemic therapy toxicity, immune-related endocrinopathy, fatigue, sexual dysfunction, and altered body image. A narrow view of men's health as prostate disease, testosterone deficiency or erectile dysfunction alone, therefore, misses an important cancer continuum in which prevention, function, intimacy, and survivorship are linked.

This narrative review synthesizes current evidence on kidney cancer as a men's health issue. We focus on epidemiology, sex disparity, modifiable risk factors, prevention, treatment-related consequences, sexual and endocrine survivorship, late recurrence, and practical care pathways for men living after, or with, RCC. The article was submitted under the formal Journal of Men's Health (JOMH) article category Review and is framed as a narrative review and clinical perspective rather than a systematic review.

Compared with existing sex/gender RCC reviews and generic cancer-survivorship guidance, this article adds a practical clinical bridge for men's health practice. It distinguishes three evidence layers: RCC-specific evidence, male-specific or sex-disparity evidence, and recommendations extrapolated from broader oncology, sexual medicine, endocrinology, and survivorship literature. The aim is not to create new screening recommendations, but to show how RCC prevention and survivorship can be integrated into men's health consultations without overstating the evidence base.

2. Methods: narrative evidence selection

This article was developed as a targeted narrative review and clinical perspective. The narrative format was chosen because the question is integrative rather than single-intervention: the review connects epidemiology, male-specific risk patterns, surgery, systemic therapy, sexual medicine, endocrinology, nephrology, rehabilitation, and survivorship care. A systematic review or meta-analysis would be poorly suited to this broad clinical aim because the relevant evidence includes guidelines, registry data, mechanistic studies, patient-reported outcomes, small RCC-specific sexual/endocrine studies, and extrapolated survivorship recommendations.

Evidence was identified through focused searches of PubMed and the Medical Literature Analysis and Retrieval System Online (MEDLINE), guideline repositories, and authoritative epidemiological or cancer-prevention sources, including the European Association of Urology (EAU), European Society for Medical Oncology (ESMO), American Society of Clinical Oncology (ASCO), Surveillance, Epidemiology, and End Results (SEER) Program, World Cancer Research Fund (WCRF)/American Institute for Cancer Research (AICR), and International Agency for

Research on Cancer (IARC) resources. Searches were first performed in May 2026, updated during revision in July 2026, and refreshed for the post-acceptance revision in August 2026. Search concepts included kidney cancer, renal cell carcinoma, men, male sex, sex differences, sex chromosomes, androgen receptor, occupational exposure, trichloroethylene, smoking, obesity, hypertension, physical activity, nephrectomy, partial nephrectomy, radical nephrectomy, robotic surgery, perioperative recovery, erectile dysfunction, orgasm, ejaculation, fertility, testosterone, hypogonadism, immune checkpoint inhibitor endocrinopathy, hypophysitis, fatigue, patient-reported outcomes, late recurrence, and survivorship.

Eligible sources were English-language human studies, international guidelines, systematic reviews, landmark trials, high-quality narrative reviews, epidemiological datasets, and selected mechanistic studies relevant to adult RCC or kidney cancer in men. Older studies were retained when they were landmark etiological or surgical papers not fully replaced by newer data. We excluded animal-only studies, pediatric-only reports unless relevant to hereditary RCC, non-RCC upper-tract urothelial carcinoma except for brief etiological clarification, and studies without relevance to men's health practice. Because this is a narrative review, no Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, formal risk-of-bias assessment or pooled estimate was produced. Conclusions should, therefore, be interpreted as a clinically oriented synthesis rather than systematic evidence quantification.

3. Epidemiology and the male burden of kidney cancer

Kidney cancer is a substantial public health problem and is consistently more common in men. WCRF data based on Global Cancer Observatory (GLOBOCAN) 2022 rank kidney cancer as the 14th most common cancer worldwide, the 10th most common cancer in men, and the 13th most common cancer in women [1]. The global age-standardized incidence rate was 5.9 per 100,000 in men and 3.0 per 100,000 in women, giving men almost twice the age-standardized incidence observed in women [1]. SEER data similarly show higher male incidence and mortality for kidney and renal pelvis cancer in the United States [3].

The burden is especially relevant in Europe, including Central Europe. The EAU guideline notes marked geographical variation and high European incidence and mortality [4]. Czechia is repeatedly identified among countries with high kidney cancer incidence, and WCRF lists a male age-standardized kidney cancer incidence of 19.0 per 100,000 in 2022 using the world standard population [1]. This Central-European emphasis is not intended to narrow a globally framed review; it identifies a high-burden setting in which prevention and survivorship pathways may be particularly valuable. EAU materials use European standardization and may, therefore, give different numerical rates. These standards should not be mixed in reporting or clinical communication, but the direction is consistent: Czech and Central European men represent a high-burden population.

Increasing incidental detection also matters for men's health

practice. Cross-sectional imaging performed for abdominal symptoms, trauma, cardiovascular evaluation or unrelated follow-up may identify small renal masses before classic symptoms occur. Incidental detection can improve stage distribution, but it also creates anxiety, risk of overtreatment, and complex decisions about active surveillance, ablation, partial nephrectomy or radical nephrectomy in older men with competing cardiovascular and renal risks [4, 5]. A men's health approach should, therefore, combine cancer awareness with comorbidity-aware decision-making.

Age further shapes interpretation. RCC incidence rises with age, and older men often have competing risks that may exceed the risk posed by a small indolent renal mass. Conversely, early-onset RCC, bilateral or multifocal tumors, strong family history, unusual histology or syndromic features should trigger consideration of hereditary risk. Clinically important hereditary contexts include von Hippel-Lindau disease, Birt-Hogg-Dube syndrome, hereditary leiomyomatosis and RCC, hereditary papillary RCC and succinate-dehydrogenase-deficient RCC; their relevance is greatest in younger men, men with bilateral/multifocal disease and men for whom fertility planning and long-term renal preservation are central [4, 9].

4. Why are men at higher risk? Exposures, occupation, and biology

The male predominance in RCC is best understood as multifactorial. Established modifiable risk factors include smoking, excess body fatness, and hypertension [4, 8, 10]. Cigarette smoking shows a dose-related association with RCC and remains a central target for prevention [8]. Obesity, hypertension, and metabolic dysfunction are also common in male sexual-medicine and cardiometabolic clinics, which makes RCC prevention part of a broader vascular and renal prevention agenda rather than an isolated cancer message.

Higher leisure-time physical activity was associated with a lower incidence of kidney cancer in a pooled analysis of prospective cohorts [11]. However, observational associations do not establish causality, and evidence on physical activity and RCC risk remains inconsistent [8, 10]. Alcohol has been associated with lower RCC risk in some observational syntheses, but this finding should not be translated into a men's health recommendation to drink alcohol, because alcohol increases the risk for several other cancers and contributes to trauma, liver disease, hypertension, and psychosocial harms [10].

Occupational exposure is relevant because many high-exposure occupations have historically been male-dominated. Trichloroethylene is classified by IARC as carcinogenic to humans, with sufficient evidence for kidney cancer [12]. The clinical message is targeted rather than alarmist: men with industrial solvent exposure, metal degreasing work or other relevant occupational histories should be asked about exposure and guided toward occupational health review where appropriate.

Biological mechanisms are also under active investigation. Contemporary reviews describe possible roles for androgen receptor signaling, estrogen and progesterone receptor pathways, sex chromosomes, immune regulation, and tumor microenvironment differences [13, 14]. A single-cell analysis reported

sex differences in the RCC immune microenvironment and suggested that androgen-androgen receptor signaling may contribute to exhausted cluster of differentiation 8 (CD8)-positive T-cell infiltration in male RCC [15]. Sex-chromosome biology provides another plausible layer: sex-linked gene expression, escape from X-chromosome inactivation, and Y-chromosome loss may contribute to sex-specific RCC biology [14]. Sex differences in xenobiotic metabolism and occupational exposure patterns may further interact with smoking and solvent exposure. These mechanisms remain hypothesis-generating in RCC practice; they support biologically informed research, not sex-specific treatment selection outside evidence-based indications.

The sex-disparity question is, therefore, not reducible to either hormones or behavior. Male-predominant smoking, solvent exposure, and hypertension interact with biological susceptibility, immune contexture, and tumor genomics. This interaction is especially relevant for prevention: exposure reduction can be recommended now, whereas sex-chromosome and hormone-pathway mechanisms should be treated as research priorities until validated predictive or therapeutic implications are available.

5. Prevention and risk-aware detection in men's health practice

Population-wide screening for RCC in asymptomatic average-risk men is not evidence-based. The EAU guideline states that there is no evidence to support primary screening for RCC and highlights unresolved concerns about cost-effectiveness, overdiagnosis, false positives, radiation exposure, and the lack of validated urinary or serum biomarkers [4]. This is a crucial point for men's health clinics: routine renal imaging should not be marketed as a generic male cancer screening test.

Prevention is different from screening. A prevention-first approach is strongly justified. Men should receive clear counseling on smoking cessation, weight reduction where obesity is present, physical activity, kidney protection, avoidance of unnecessary nephrotoxins, and relevant occupational risk mitigation [4, 8, 10, 12]. Blood pressure control should be presented primarily as cardiometabolic and renal protection in men at RCC risk or after RCC treatment, rather than as a proven stand-alone intervention that lowers RCC incidence. These interventions also reduce cardiovascular disease, chronic kidney disease progression, and erectile dysfunction risk. That overlap makes kidney cancer prevention a natural part of integrated male vascular, renal, and sexual health counseling.

Risk-aware detection remains appropriate in selected contexts. Men with hereditary RCC syndromes, strong family history, end-stage renal disease, acquired cystic kidney disease, unexplained hematuria, persistent flank symptoms, constitutional symptoms or suspicious imaging findings need individualized evaluation [4, 5]. The distinction is simple but important: targeted assessment of high-risk or symptomatic men is appropriate, whereas indiscriminate screening of asymptomatic average-risk men is not.

The clinic visit is the opportunity. Men attending for erectile dysfunction, low libido, infertility, lower urinary tract symptoms, hypertension or obesity may not need renal imaging, but

often need smoking cessation support, blood pressure treatment, metabolic risk reduction, and kidney function monitoring. Linking these actions to sexual function, cardiovascular prevention, and cancer risk can make the preventive message more concrete than a generic lifestyle recommendation.

Clinically, the men's health framing of RCC should not be interpreted as a call for indiscriminate screening of asymptomatic men. Rather, it supports a structured approach in which RCC prevention and survivorship are integrated into routine assessment of smoking, obesity, hypertension, renal function, cardiovascular risk, fatigue, sexual function, endocrine symptoms, and psychosocial recovery. This approach may be particularly valuable in men who already present to urology, andrology, primary care or sexual medicine services with cardiometabolic or sexual health concerns. Key risk and prevention messages are summarized in Table 1 (Ref. [4, 8, 10–12, 16, 17]).

6. Localized RCC: treatment choice and male functional outcomes

For localized RCC, treatment choice should balance oncological control with long-term renal, cardiovascular, and functional outcomes. EAU guidance recommends shared decision-making and supports partial nephrectomy for T1 tumors when technically feasible, because nephron-sparing surgery better preserves kidney function after surgery [4, 18, 19]. The survival and cardiovascular implications of partial nephrectomy require balanced interpretation: observational syntheses generally favor nephron-sparing surgery for early chronic kidney

disease and some cardiovascular outcomes, whereas randomized European Organisation for Research and Treatment of Cancer (EORTC) analyses did not establish a clear overall-survival advantage; heterogeneity and selection bias remain important limitations [19, 20]. Radical nephrectomy remains necessary for many larger or complex tumors, but its downstream consequences should be discussed explicitly: reduced renal reserve, higher chronic kidney disease risk in some patients, possible blood pressure worsening, medication limitations, and increased vulnerability to contrast exposure or nephrotoxic drugs.

These outcomes are men's health outcomes. Men often value return to work, physical performance, sexual confidence, independence, and avoidance of long-term medication burden. Treatment discussions should, therefore, include baseline estimated glomerular filtration rate (eGFR), hypertension, diabetes, albuminuria where relevant, cardiovascular risk, smoking status, body mass index, occupational demands, and patient preference. The renal-sexual pathway should be made explicit: nephron loss can accelerate chronic kidney disease; reduced eGFR and uremia can worsen endothelial dysfunction, atherosclerosis, autonomic neuropathy, anemia, inflammation, and hormonal disturbance; and each of these mechanisms can contribute to erectile dysfunction and reduced sexual confidence. In this sense, renal preservation is not only a nephrological goal, but also a concrete component of male functional survivorship. Active surveillance may be considered for selected patients with cT1a renal masses when immediate treatment is not indicated. Tumour ablation may be considered for selected patients with cT1 lesions who require

TABLE 1. Male-relevant kidney cancer risk factors and prevention messages.

Risk domain	Evidence-informed message	Men's health action
Smoking	Established RCC risk factor with dose-related association; supported by a recent prevention review [8].	Ask every man with RCC risk or survivorship needs about smoking and offer cessation support.
Excess adiposity	Body fatness is classified by WCRF/AICR as a convincing cause of kidney cancer [10].	Measure BMI/waist where appropriate; frame weight management as renal, vascular, sexual and cancer prevention.
Hypertension	Consistently associated with higher RCC risk and common in male RCC patients [4, 8].	Measure and treat blood pressure; monitor eGFR/creatinine and potassium when ACE inhibitors/ARBs are used in men with solitary kidney or reduced renal reserve.
Physical inactivity	Higher leisure-time physical activity is associated with lower kidney cancer incidence in prospective cohorts; causality has not been established [11].	Recommend tailored aerobic and resistance activity when clinically safe.
Occupational exposure	Trichloroethylene is an IARC Group 1 carcinogen with sufficient evidence for kidney cancer [12].	Ask about solvent/degreasing exposure and involve occupational health when relevant.
Screening	Routine population screening for asymptomatic average-risk men is not supported; targeted evaluation of high-risk or symptomatic men remains appropriate [4, 8, 16, 17].	Avoid indiscriminate renal imaging; evaluate high-risk or symptomatic men individually.

BMI, body mass index; IARC, International Agency for Research on Cancer; RCC, renal cell carcinoma; WCRF/AICR, World Cancer Research Fund/American Institute for Cancer Research; eGFR, estimated glomerular filtration rate; ACE, angiotensin-converting enzyme; ARBs, angiotensin II receptor blockers.

treatment but are unfit for surgery [4].

Partial nephrectomy may be performed using an open, laparoscopic or robot-assisted approach, according to tumour characteristics and the surgeon's expertise. A minimally invasive approach should not compromise oncological, functional or perioperative outcomes [4]. Minimally invasive and robotic partial nephrectomy can facilitate early recovery in selected patients, yet complex hilar, central, multifocal or locally advanced tumors may still require open surgery or radical nephrectomy. Perioperative counseling should include bleeding, urine leak, ischemia-related renal functional loss, conversion risk, venous thromboembolism, cardiopulmonary risk, postoperative fatigue, and expected return-to-work trajectory. Trials and observational series often focus on recurrence-free survival, margins, and renal function, but men experience surgery through pain, fatigue, body image, sexual function, anxiety, and recovery of daily roles.

Postoperative recovery trajectories should also be discussed explicitly. Younger working men may prioritize speed of functional recovery and return to employment, while older men may prioritize independence and avoidance of hospitalization or renal decline. For both groups, the relevant endpoint is not only complication-free surgery, but recovery of physical activity, sleep, appetite, sexual confidence, and daily roles.

Nephrology involvement should be considered before renal function is irreversibly lost, not only after chronic kidney disease is established. Men with solitary kidney, pre-existing chronic kidney disease, diabetes, hypertension, albuminuria, bilateral tumors or expected radical nephrectomy need a renal-protection plan. This includes blood pressure control, medication review, avoidance of nephrotoxins where possible, contrast-risk planning, and long-term eGFR follow-up. When renin-angiotensin-system blockers, such as angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs), are started for hypertension, albuminuria or cardiovascular risk, creatinine/eGFR, and potassium should be monitored dynamically, particularly in men with a solitary kidney or reduced renal reserve. Preserving kidney function may also preserve physical capacity, medication options, sexual health, and eligibility for future systemic treatment.

7. Advanced RCC: systemic therapy, fatigue, and treatment toxicity

Systemic treatment for advanced RCC has changed substantially. Contemporary ESMO and EAU guidance supports immune checkpoint inhibitor-based combinations for advanced clear-cell RCC, including dual immune checkpoint inhibitor (ICI/ICI) and immune checkpoint inhibitor/tyrosine kinase inhibitor (ICI/TKI) strategies selected according to risk group, comorbidity, disease tempo, toxicity profile, and patient preference [4, 21]. KEYNOTE-564 also established adjuvant pembrolizumab as a relevant option for selected high-risk clear-cell RCC after surgery, with an overall survival benefit reported in the updated analysis [22, 23].

Pivotal metastatic RCC regimens have improved outcomes, including nivolumab plus ipilimumab, pembrolizumab plus axitinib, nivolumab plus cabozantinib, and pembrolizumab plus lenvatinib [24–27]. Their men's health implications differ

from those of surgery. Men with advanced RCC may live for long periods with fatigue, diarrhea, hypertension, hand-foot syndrome, hypothyroidism, adrenal or pituitary dysfunction, pain, sleep disruption, mood symptoms, muscle loss, appetite change, and fear of progression. These symptoms often converge on libido, erectile function, intimacy, and perceived masculinity, even when no direct genital injury has occurred.

Patient-reported outcome data should be integrated into counseling. In CheckMate 214, nivolumab plus ipilimumab showed favorable patient-reported outcomes compared with sunitinib in intermediate- and poor-risk advanced RCC [28]. In the adjuvant setting, patient-reported outcomes from KEYNOTE-564 are important because treatment is offered after nephrectomy to patients who may be asymptomatic from cancer [29]. For men considering adjuvant or metastatic therapy, survival and recurrence data must be discussed together with the practical burden of chronic toxicity, monitoring, sexual symptoms, fatigue, and work capacity.

Toxicity review should be specific. Asking only whether treatment is tolerated may miss clinically actionable symptoms. Men should be asked about home blood pressure, diarrhea, skin and foot symptoms, appetite, weight, sleep, muscle strength, sexual interest, erectile function, mood, headache, dizziness, cold intolerance, palpitations, and orthostatic symptoms. These questions are not peripheral to cancer treatment; they identify modifiable causes of treatment interruption, relationship strain, and loss of function.

8. Sexual health after kidney cancer

RCC-specific evidence on male sexual function is limited but clinically important. Christiansen *et al.* [30] studied patients treated surgically for kidney cancer and reported that sexual relationship problems were more common after surgery, that only a small minority had been informed preoperatively about possible sexual effects, and that many would have preferred more information. This is one of the few RCC-specific datasets in this area; therefore, recommendations in the following paragraphs are explicitly a combination of RCC-specific observations, general oncology survivorship guidance, and sexual-medicine principles rather than RCC-only evidence.

Mechanisms of sexual morbidity after RCC are usually indirect and multifactorial. Vascular disease, smoking, obesity, diabetes, hypertension, chronic kidney disease, and medication effects may predate cancer. Diagnosis adds fear, altered self-image, and uncertainty. Surgery adds pain, fatigue, and deconditioning. Systemic therapy can add hypothyroidism, diarrhea, weight change, mucosal symptoms, hypertension, hand-foot syndrome, mood changes, and immune-related endocrine toxicity. A sexual history limited to erections will miss libido, orgasm, ejaculation, penile pain, body image, partner communication, and intimacy.

General cancer survivorship guidance supports clinician-initiated discussion of sexual problems, identification of treatable contributing factors, written information, counseling, and specialist referral when needed [31–33]. Evidence on sexual well-being interventions in men with genitourinary cancers is dominated by prostate cancer, which reinforces the need to identify this recommendation as an extrapolation rather

than RCC-specific evidence [33]. In male RCC survivors, the approach remains clinically relevant because vascular, renal, endocrine, and psychological comorbidities directly affect sexual function. A practical approach is to ask directly and routinely: Has your cancer or treatment affected sexual interest, erections, orgasm, ejaculation, body confidence or your relationship? Short tools, such as the Sexual Health Inventory for Men (SHIM) or the five-item International Index of Erectile Function (IIEF-5), can quantify erectile dysfunction and monitor response when appropriate.

Sexual counseling should be normalized before the patient has to ask. A short preoperative or pretreatment statement is often enough: kidney cancer and its treatment can affect energy, body confidence, libido, erections, orgasm, and ejaculation; if this happens, it is medically relevant and treatable. Most sexual morbidity after nephrectomy is indirect, but urological anatomy should still be considered. Retrograde ejaculation or anejaculation is classically associated with retroperitoneal lymph-node dissection for testicular cancer; however, injury to the lumbar sympathetic chain or hypogastric plexus may also be possible during extended para-aortic or retroperitoneal dissection for large or locally advanced renal masses, nodal surgery or adrenalectomy. This mechanism is uncommon, but relevant when counseling younger men or men undergoing extensive retroperitoneal surgery. Partner-inclusive counseling may be useful when the patient wants it, particularly when fatigue, fear of recurrence or altered body image changes intimacy more than erection rigidity itself.

9. Fertility and endocrine survivorship

Fertility receives little attention in RCC because the median age at diagnosis is higher than for testicular cancer. That does not make fertility irrelevant. Younger men with hereditary syndromes, bilateral disease, early-onset RCC or metastatic disease may still wish to father children. Hereditary RCC syndromes may require repeated renal interventions across decades, making nephron preservation and family planning especially important. Current ASCO guidance recommends discussing reproductive risk before cancer-directed therapy and offering sperm cryopreservation to males when treatment may threaten fertility [34]. Evidence specific to fertility after RCC treatment remains sparse, so this recommendation is extrapolated from general oncology and male fertility practice rather than RCC-specific trials.

Testosterone and fatigue require the same caution. Men with RCC commonly have comorbidities associated with functional hypogonadism, including obesity, diabetes, chronic kidney disease, systemic inflammation, and advanced cancer. Targeted therapy and immune checkpoint inhibitors may further complicate the endocrine picture. Prospective RCC data have described hypogonadism during targeted therapy, and a small RCC-specific trial explored testosterone for treatment-related fatigue [35–37]. A recent systematic review across advanced cancers confirms that treatment-related hypogonadism remains incompletely characterized and heterogeneous [38]. These data are clinically relevant, but do not justify testosterone as a general RCC fatigue treatment.

A defensible approach is symptom-driven endocrine assess-

ment. Low libido, persistent fatigue, erectile dysfunction, depressed mood, anemia, loss of muscle mass, hot-flush-like symptoms or suspected pituitary disease may justify morning total testosterone testing, repeat confirmation, and assessment of luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin, thyroid function, and adrenal status when clinically indicated. Current EAU guidance defines male hypogonadism as a clinical and biochemical diagnosis, not as a single laboratory value [39]. During immune checkpoint inhibitor therapy, the gonadal axis should be interpreted in a central-versus-primary framework: hypophysitis, particularly with anti-cytotoxic T-lymphocyte-associated protein 4 (anti-CTLA-4) exposure, such as ipilimumab-containing regimens, can produce secondary hypogonadism with low testosterone and inappropriately low or normal LH/FSH, often alongside adrenocorticotrophic hormone (ACTH) or thyroid-stimulating hormone (TSH)-axis abnormalities [38, 40–43].

Testosterone therapy, when considered, should be individualized. This should not be interpreted to imply that testosterone is a general treatment for fatigue in RCC. It may be appropriate only when persistent symptoms, repeated biochemical evidence and a careful safety review align. Fertility wishes, hematocrit, sleep apnea, cardiovascular status, prostate and breast cancer history, thrombosis risk, and the current oncological situation should be reviewed before treatment. In advanced RCC, the decision also requires coordination with oncology because fatigue may reflect progression or systemic therapy toxicity rather than androgen deficiency.

10. Fatigue, psychological distress, and body image

Fatigue is one of the most important survivorship symptoms in RCC, especially in advanced disease and during systemic therapy. It is rarely explained by one mechanism. Anemia, chronic kidney disease, hypothyroidism, adrenal insufficiency, hypogonadism, sleep disturbance, pain, depression, anxiety, deconditioning, medication toxicity, and disease progression can all contribute. RCC-specific fatigue data are limited; therefore, practical management relies on combining RCC treatment-toxicity assessment with broader cancer-fatigue guidance. The updated ASCO-Society for Integrative Oncology guideline supports screening and emphasizes exercise, cognitive behavioral therapy, mindfulness-based approaches, and selected psychosocial interventions [44].

Psychological distress is also central. The EAU RCC guideline recommends psychological evaluation for patients diagnosed with RCC, reflecting the clinical reality that diagnosis, surveillance imaging, fear of recurrence, and treatment toxicity can produce anxiety and depression [4]. Men may be less likely to volunteer emotional, sexual or body-image concerns unless asked directly. In practice, a brief normalized question often works better than waiting for spontaneous disclosure: many men notice changes in energy, mood, body confidence or intimacy after kidney cancer treatment; has this happened to you?

Body image after RCC is less studied than after prostate, bladder or testicular cancer treatment, but it should not be ignored. Surgical scars, weight change, muscle loss, edema,

skin toxicity, hand-foot syndrome, reduced physical performance, and loss of work role can affect masculine identity and relationship confidence. Current evidence should not be overstated; body image should instead be identified as an under-researched domain that belongs in survivorship assessment. This is an extrapolated survivorship recommendation rather than an RCC-specific evidence-based intervention.

The same applies to work and role recovery. For many men, the practical question after treatment is not only whether imaging is clear, but whether they can return to employment, physical activity, family responsibilities, and intimate partnership. These outcomes are rarely captured in routine oncology notes, yet they shape the patient's interpretation of recovery. A brief functional assessment can identify men who need rehabilitation, psychological support, sexual medicine or social work input.

11. Late recurrence, atypical metastasis, and patient education

RCC can recur late and at unusual sites. Risk-adapted surveillance is necessary, and intensive imaging is not appropriate for all patients, but follow-up should include patient education about symptoms that deserve attention. EAU follow-up guidance emphasizes recurrence detection, renal function, contralateral kidney recurrence, distant metastasis, cardiovascular events, and long-term sequelae [4]. For men, this should be translated into practical language: report new unexplained bone pain, hemoptysis, neurological symptoms, persistent weight loss, new skin nodules, eyelid lesions or unexplained fatigue.

Atypical recurrence is rare but clinically instructive. Periocular cutaneous metastasis and very late soft-tissue metastasis have been reported after radical nephrectomy [45–47]. These case reports, including one report from the authors' centre, are not used as epidemiological evidence and do not define surveillance schedules; they are retained only to illustrate why patient education about unusual late symptoms can matter. For urologists, oncologists, dermatologists, ophthalmologists, and primary care physicians, the practical lesson is diagnostic awareness rather than intensified routine imaging.

12. An integrated male RCC survivorship pathway

RCC survivorship should not be reduced to imaging. A male RCC survivorship pathway should connect oncological surveillance with renal protection, cardiovascular prevention, sexual medicine, endocrine assessment, fatigue management, psychological support, rehabilitation, and patient education. The intensity of oncological imaging should remain risk-adapted, but functional follow-up should be routine because renal impairment, cardiovascular events, fatigue, and sexual symptoms directly affect quality of life [4].

A practical pathway begins before treatment. Baseline assessment should include renal function, blood pressure, smoking status, body mass index or waist circumference, diabetes status, cardiovascular history, medications, sexual function, fertility wishes in younger men, fatigue, and distress. After

surgery, men should receive renal and cardiovascular follow-up, recurrence surveillance, sexual health review, and lifestyle support. During systemic therapy, symptom review should explicitly include fatigue, libido, erections, mood, thyroid symptoms, adrenal symptoms, diarrhea, hypertension, hand-foot symptoms and sleep. Long-term survivorship should include return-to-work issues, relationship quality, physical activity, fear of recurrence, and awareness of atypical late recurrence.

This model is multidisciplinary, but not necessarily complex. The core intervention is reliable questioning and appropriate referral. Uro-oncology manages cancer control; nephrology supports men with reduced renal reserve or chronic kidney disease; primary care and cardiology address vascular prevention; endocrinology and andrology evaluate confirmed endocrine and sexual disorders; psycho-oncology and sexual counseling support distress, body image and intimacy; rehabilitation helps fatigue and physical performance. The pathway should be adapted to local resources, but the domains should not disappear.

The pathway can be implemented as a short checklist rather than a separate clinic. At each major transition (diagnosis, postoperative review, start of systemic therapy, response assessment, end of treatment, and long-term follow-up), the clinician can document renal function, blood pressure, cardiovascular risk, sexual function, fertility concerns when relevant, endocrine symptoms, fatigue, mood, body image, and work recovery. This is also where evidence level should be made visible to patients: renal surveillance and oncological follow-up are RCC guideline-based, whereas many sexual, psychosocial, and rehabilitation actions are extrapolated from broader oncology survivorship and male sexual-medicine evidence. The resulting assessment and referral framework is summarized in Table 2 (Ref. [4, 9, 18–20, 22–29, 35–38, 40–48]).

Practical sexual and endocrine survivorship questions for male RCC patients are listed in Table 3 (Ref. [9, 30–44]).

13. Research gaps and future directions

Several gaps limit current care. First, sex-specific RCC biology needs prospective translational validation. Single-cell, hormone-pathway, and sex-chromosome studies are promising, but they do not yet define clinical treatment selection [13–15, 49]. Second, sexual function, libido, orgasmic and ejaculatory function, body image, relationship quality, and fertility should be included more consistently as patient-reported outcomes in RCC surgical cohorts, adjuvant studies, and metastatic treatment trials. Third, endocrine outcomes in male RCC survivors need prospective study, especially during ICI/TKI therapy and after ICI-related hypophysitis or thyroid/adrenal dysfunction.

Fourth, high-incidence regions, including Central Europe, are important settings for prevention research and survivorship pathway testing, but the framing should remain globally applicable. Finally, men's health services should be evaluated as entry points for risk-factor modification. Men presenting with erectile dysfunction, low libido, infertility, hypogonadal symptoms or cardiometabolic risk may also need smoking

TABLE 2. Men's health assessment across the RCC care continuum.

Phase	Key assessment	Referral or intervention
Before treatment	Renal function, blood pressure, smoking, BMI/waist, diabetes, cardiovascular history, sexual function, fertility wishes, distress; ask about early-onset, bilateral/multifocal or syndromic features [4, 9].	Shared decision-making; smoking cessation; cardiometabolic optimization; genetic counseling when hereditary RCC is suspected; sperm preservation discussion in younger men.
Localized surgery	Partial versus radical nephrectomy implications, surgical approach, perioperative complications, baseline eGFR, occupational demands, recovery expectations, sexual concerns [4, 18–20].	Nephron-sparing where appropriate; renal/cardiovascular follow-up; recovery planning; normalize sexual-health discussion.
Adjuvant therapy	Fatigue, thyroid symptoms, adrenal/pituitary symptoms, mood, work capacity, patient-reported outcomes [22, 23, 29, 40, 41, 43, 44].	Oncology toxicity monitoring; endocrine testing when symptomatic; rehabilitation and psychosocial support.
Metastatic therapy	Fatigue, hypertension, diarrhea, hand-foot syndrome, libido, erectile function, orgasm/ejaculation, pain, sleep, mood, endocrine symptoms [24–28, 35–38, 40–44].	Symptom-directed toxicity management; sexual medicine, endocrinology, psycho-oncology, palliative/supportive care.
Long-term survivorship	Recurrence surveillance, eGFR, blood pressure, cardiovascular risk, sexual function, body image, fear of recurrence, return to work [4, 18, 44–48].	Risk-adapted imaging; nephrology/cardiology/primary care; rehabilitation; patient education about atypical recurrence.

BMI, body mass index; eGFR, estimated glomerular filtration rate; RCC, renal cell carcinoma.

TABLE 3. Sexual and endocrine survivorship questions for male RCC patients.

Domain	Ask or assess	Escalate when
Sexual function	Libido, erections, orgasm, ejaculation, pain, intimacy and relationship distress; consider SHIM/IIEF-5 for erectile function [30–33].	Persistent ED, SHIM/IIEF-5 in the ED range or clinically important decline, low libido, partner distress, treatment failure, complex comorbidity or medication contraindications.
Fertility	Future fatherhood wishes, prior fertility, planned systemic therapy, hereditary/bilateral disease and cumulative renal interventions [9, 34].	Younger patient, hereditary/bilateral disease, metastatic treatment before family completion, or uncertainty about sperm cryopreservation.
Testosterone	Symptoms plus morning total testosterone; repeat if low; consider LH/FSH, prolactin and SHBG/free testosterone by context [35–39].	Repeatedly low testosterone with symptoms, fertility wishes, pituitary features, or discordant LH/FSH pattern suggesting primary versus central hypogonadism.
ICI endocrine toxicity	TSH/free T4 during ICI; evaluate cortisol/ACTH and pituitary axes when fatigue, hypotension, headache, hyponatremia or libido loss suggests endocrine toxicity [40–43].	Suspected adrenal insufficiency, hypophysitis, severe hypothyroidism, unexplained severe fatigue, or low testosterone with inappropriately low/normal LH/FSH during ICI therapy.
Fatigue	Anemia, renal function, thyroid/adrenal status, sleep, pain, depression, medication toxicity and deconditioning; consider graded severity and functional impact [44].	Severe, persistent or progressive fatigue, functional impairment, or red flags for recurrence, endocrine crisis or treatment-limiting toxicity.

ACTH, adrenocorticotropic hormone; ED, erectile dysfunction; FSH, follicle-stimulating hormone; ICI, immune checkpoint inhibitor; LH, luteinizing hormone; RCC, renal cell carcinoma; SHBG, sex hormone-binding globulin; TSH, thyroid-stimulating hormone; SHIM, Sexual Health Inventory for Men; IIEF, International Index of Erectile Function; T4, thyroxine.

cessation, blood pressure control, obesity management, and kidney health assessment. Kidney cancer prevention should not be overpromised in these encounters, but it can be part of the same vascular, renal, and sexual-health conversation.

Screening research is moving, but the message should be precise. Systematic reviews and the Yorkshire Kidney Screening Trial suggest that risk-stratified kidney cancer detection within lung-cancer computed tomography (CT) screening pathways may be feasible in selected high-risk groups, particularly smokers [8, 16, 17]. These data are important, but they do not justify population-wide renal imaging for average-risk men. Future research should define which men benefit, which imaging protocols minimize harm, and whether earlier detection improves survival, renal outcomes, and patient-reported outcomes.

The strongest future studies would combine oncological outcomes with patient-reported and biological endpoints. Surgical cohorts should build on multispecialty localized kidney cancer models, randomized evidence, and contemporary renal/cardiovascular outcome syntheses by collecting baseline and follow-up sexual function, fatigue, renal function, cardiovascular risk, and cardiometabolic data [18–20, 50]. Trials of systemic therapy should include male sexual function, libido, endocrine symptoms, and fertility-relevant outcomes where appropriate. Psychological distress in RCC also deserves stronger study and structured intervention testing, because recurrence fear and functional loss may persist even when imaging is stable [48]. Translational studies should report sex-stratified immune and hormone-pathway findings without assuming that molecular differences automatically justify different clinical treatment.

14. Study limitations

This review has several limitations. First, because it is a narrative review, the search strategy was transparent, but not designed to identify all available studies, and no formal meta-analysis or risk-of-bias assessment was undertaken. Second, RCC-specific evidence on sexual function, fertility, body image, and endocrine outcomes remains limited, and several recommendations are, therefore, explicitly extrapolated from broader oncology, sexual medicine, and survivorship literature. Third, many available datasets do not clearly separate biological sex from gender-related exposures and health-system factors. Fourth, the discussion of Central Europe reflects a high-incidence setting and should not be read as limiting the review's global relevance.

15. Conclusions

Kidney cancer should be recognized as a clinically relevant men's health condition. Men carry a higher burden of disease, and many established RCC risk factors overlap with male cardiometabolic, renal, and sexual health. Prevention should emphasize smoking cessation, healthy weight, blood pressure control, physical activity, and occupational risk awareness rather than population-wide screening. Treatment planning should incorporate renal preservation, surgical approach, post-operative recovery, cardiovascular risk, and long-term func-

tion. Survivorship should include sexual health, orgasmic and ejaculatory function when relevant, fertility in younger or hereditary-risk men, fatigue, endocrine symptoms, psychological distress, body image, renal function, cardiovascular prevention, and patient education about late recurrence. A men's health framework does not replace RCC guidelines; it strengthens them by placing oncological control within the broader recovery of men living after, or with, kidney cancer.

ABBREVIATIONS

ACE, angiotensin-converting enzyme; ACTH, adrenocorticotrophic hormone; AICR, American Institute for Cancer Research; anti-CTLA-4, anti-cytotoxic T-lymphocyte-associated protein 4; ARBs, angiotensin II receptor blockers; ASCO, American Society of Clinical Oncology; BMI, body mass index; CD8, cluster of differentiation 8; CT, computed tomography; EAU, European Association of Urology; ED, erectile dysfunction; eGFR, estimated glomerular filtration rate; EORTC, European Organisation for Research and Treatment of Cancer; ESMO, European Society for Medical Oncology; FSH, follicle-stimulating hormone; GLOBOCAN, Global Cancer Observatory; IARC, International Agency for Research on Cancer; ICI, immune checkpoint inhibitor; IIEF, International Index of Erectile Function; JOMH, Journal of Men's Health; LH, luteinizing hormone; MEDLINE, Medical Literature Analysis and Retrieval System Online; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RCC, renal cell carcinoma; SEER, Surveillance, Epidemiology, and End Results; SHBG, sex hormone-binding globulin; SHIM, Sexual Health Inventory for Men; T4, thyroxine; TKI, tyrosine kinase inhibitor; TSH, thyroid-stimulating hormone; WCRF, World Cancer Research Fund.

AVAILABILITY OF DATA AND MATERIALS

Data sharing is not applicable because this narrative review did not generate or analyze new datasets.

AUTHOR CONTRIBUTIONS

MB—conceptualized the manuscript, led the literature review, drafted the manuscript and prepared the initial tables. AH—contributed to literature interpretation and critical revision of the manuscript. MV—contributed to critical revision, added substantive content on interpretation, limitations and clinical framing, and reviewed the manuscript for intellectual content. All authors contributed to editorial changes, read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable. This article is a narrative review and does not report new human participant data, human tissue research or animal research.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI) USE

Artificial intelligence tools were used during manuscript preparation to assist with language editing, readability, and general editorial support. All scientific content, interpretation of the literature, clinical conclusions, and final wording were critically reviewed and approved by all authors. The authors take full responsibility for the accuracy, integrity, and originality of the manuscript.

REFERENCES

- [1] World Cancer Research Fund International. Kidney cancer statistics. 2024. Available at: <https://www.wcrf.org/preventing-cancer/cancer-statistics/kidney-cancer-statistics/> (Accessed: 16 May 2026).
- [2] Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, *et al.* Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal for Clinicians*. 2024; 74: 229–263.
- [3] National Cancer Institute. SEER cancer stat facts: kidney and renal pelvis cancer. 2026. Available at: <https://seer.cancer.gov/statfacts/html/kidrp.html> (Accessed: 16 May 2026).
- [4] European Association of Urology. EAU guidelines on renal cell carcinoma. 2026. Available at: <https://uroweb.org/guidelines/renal-cell-carcinoma> (Accessed: 16 May 2026).
- [5] Rose TL, Kim WY. Renal cell carcinoma: a review. *JAMA*. 2024; 332: 1001–1010.
- [6] World Health Organization Classification of Tumours Editorial Board. Urinary and male genital tumours. 5th edn. IARC: Lyon. 2022.
- [7] Cancer Genome Atlas Research Network. Comprehensive molecular characterization of clear cell renal cell carcinoma. *Nature*. 2013; 499: 43–49.
- [8] Campi R, Rebez G, Klatte T, Roussel E, Ouizad I, Ingels A, *et al.* Effect of smoking, hypertension and lifestyle factors on kidney cancer—perspectives for prevention and screening programmes. *Nature Reviews Urology*. 2023; 20: 669–681.
- [9] Re C, Pecoraro A, Stewart GD, Calìo A, Erdem S, Kalayci T, *et al.*; European Association of Urology Young Academic Urologists Renal Cancer Working Group. Genetic testing and counselling for hereditary renal carcinoma: what do clinicians need to know? *European Urology Open Science*. 2025; 82: 131–141.
- [10] World Cancer Research Fund International; American Institute for Cancer Research. Diet, nutrition, physical activity and kidney cancer. 2018. Available at: <https://www.wcrf.org/wp-content/uploads/2024/10/kidney-cancer-report.pdf> (Accessed: 16 May 2026).
- [11] Moore SC, Lee IM, Weiderpass E, Campbell PT, Sampson JN, Kitahara CM, *et al.* Association of leisure-time physical activity with risk of 26 types of cancer in 1.44 million adults. *JAMA Internal Medicine*. 2016; 176: 816–825.
- [12] International Agency for Research on Cancer. Trichloroethylene, tetrachloroethylene, and some other chlorinated agents. IARC monographs on the evaluation of carcinogenic risks to humans, volume 106. IARC: Lyon. 2014.
- [13] Ladurner M, Lindner AK, Rehder P, Tulchiner G. The influence of sex hormones on renal cell carcinoma. *Therapeutic Advances in Medical Oncology*. 2024; 16: 17588359241269664.
- [14] Pallauf M, Ged Y, Singla N. Molecular differences in renal cell carcinoma between males and females. *World Journal of Urology*. 2023; 41: 1727–1739.
- [15] Ning K, Peng Y, Jiang Y, Li Z, Luo X, Lin L, *et al.* Sex differences in renal cell carcinoma: a single-cell analysis reveals exhausted CD8⁺ T-cells highly infiltrated in males. *Biology of Sex Differences*. 2023; 14: 58.
- [16] Diana P, Klatte T, Amparore D, Bertolo R, Carbonara U, Erdem S, *et al.*; European Association of Urology (EAU) Young Academic Urologists (YAU) Renal Cancer group. Screening programs for renal cell carcinoma: a systematic review by the EAU Young Academic Urologists Renal Cancer Working Group. *World Journal of Urology*. 2023; 41: 929–940.
- [17] Stewart GD, Godoy A, Farquhar F, Kitt J, Cartledge J, Kimuli M, *et al.* Abdominal noncontrast computed tomography scanning to screen for kidney cancer and other abdominal pathology within community-based computed tomography screening for lung cancer: results of the Yorkshire kidney screening trial. *European Urology*. 2025; 87: 561–570.
- [18] Stewart GD, Klatte T, Cosmai L, Bex A, Lamb BW, Moch H, *et al.* The multispecialty approach to the management of localised kidney cancer. *The Lancet*. 2022; 400: 523–534.
- [19] Ochoa-Arviso M, García-Campa M, Santos-Santillana KM, Klatte T, García-Chairez LR, González-Colmenero AD, *et al.* Renal functional and cardiovascular outcomes of partial nephrectomy versus radical nephrectomy for renal tumors: a systematic review and meta-analysis. *Urologic Oncology*. 2023; 41: 113–124.
- [20] Scosyrev E, Messing EM, Sylvester R, Van Poppel H. Exploratory subgroup analyses of renal function and overall survival in European Organization for Research and Treatment of Cancer randomized trial of nephron-sparing surgery versus radical nephrectomy. *European Urology Focus*. 2017; 3: 599–605.
- [21] Powles T, Albiges L, Bex A, Comperat E, Grünwald V, Kanesvaran R, *et al.*; ESMO Guidelines Committee. Renal cell carcinoma: ESMO clinical practice guideline for diagnosis, treatment and follow-up. *Annals of Oncology*. 2024; 35: 692–706.
- [22] Bedke J, Ghanem YA, Albiges L, Bonn S, Campi R, Capitanio U, *et al.* Updated European Association of Urology Guidelines on the use of adjuvant immune checkpoint inhibitors and subsequent therapy for renal cell carcinoma. *European Urology*. 2025; 87: 491–496.
- [23] Choueiri TK, Tomczak P, Park SH, Venugopal B, Ferguson T, Symeonides SN, *et al.* Overall survival with adjuvant pembrolizumab in renal-cell carcinoma. *The New England Journal of Medicine*. 2024; 390: 1359–1371.
- [24] Motzer RJ, Tannir NM, McDermott DF, Arén Frontera O, Melichar B, Choueiri TK, *et al.*; CheckMate 214 Investigators. Nivolumab plus ipilimumab versus sunitinib in advanced renal-cell carcinoma. *The New England Journal of Medicine*. 2018; 378: 1277–1290.
- [25] Rini BI, Plimack ER, Stus V, Gafanov R, Hawkins R, Nosov D, *et al.*; KEYNOTE-426 Investigators. Pembrolizumab plus axitinib versus sunitinib for advanced renal-cell carcinoma. *The New England Journal of Medicine*. 2019; 380: 1116–1127.
- [26] Choueiri TK, Powles T, Burotto M, Escudier B, Boursion MT, Zurawski B, *et al.*; CheckMate 9ER Investigators. Nivolumab plus cabozantinib versus sunitinib for advanced renal-cell carcinoma. *The New England Journal of Medicine*. 2021; 384: 829–841.
- [27] Motzer R, Alekseev B, Rha SY, Porta C, Eto M, Powles T, *et al.*; CLEAR Trial Investigators. Lenvatinib plus pembrolizumab or everolimus for advanced renal cell carcinoma. *The New England Journal of Medicine*. 2021; 384: 1289–1300.
- [28] Cella D, Grünwald V, Escudier B, Hammers HJ, George S, Nathan P, *et al.* Patient-reported outcomes of patients with advanced renal cell carcinoma treated with nivolumab plus ipilimumab versus sunitinib (CheckMate 214): a randomised, phase 3 trial. *The Lancet Oncology*. 2019; 20: 297–310.
- [29] Choueiri TK, Tomczak P, Park SH, Venugopal B, Symeonides S, Hajek J, *et al.* Patient-reported outcomes in KEYNOTE-564: adjuvant

- pembrolizumab versus placebo for renal cell carcinoma. *The Oncologist*. 2024; 29: 142–150.
- [30] Christiansen RS, Azawi N, Højgaard A, Lund L. Informing patients about the negative effect of nephrectomy on sexual function. *Turkish Journal of Urology*. 2020; 46: 18–25.
- [31] Carter J, Lacchetti C, Andersen BL, Barton DL, Bolte S, Damast S, *et al*. Interventions to address sexual problems in people with cancer: American Society of Clinical Oncology Clinical Practice Guideline adaptation of Cancer Care Ontario guideline. *Journal of Clinical Oncology*. 2018; 36: 492–511.
- [32] Barros R, Favorito LA, Nahar B, Almeida R Jr, Ramasamy R. Changes in male sexuality after urologic cancer: a narrative review. *International Brazilian Journal of Urology*. 2023; 49: 175–183.
- [33] Schubach K, Niyonsenga T, Turner M, Paterson C. Experiences of sexual well-being interventions in males affected by genitourinary cancers and their partners: an integrative systematic review. *Supportive Care in Cancer*. 2023; 31: 265.
- [34] Su HI, Lacchetti C, Letourneau J, Partridge AH, Qamar R, Quinn GP, *et al*. Fertility preservation in people with cancer: ASCO guideline update. *Journal of Clinical Oncology*. 2025; 43: 1488–1515.
- [35] Bastin J, Werbrouck E, Verbiest A, Punie K, Bechter O, Woei-A-Jin FJ, *et al*. Prospective evaluation of hypogonadism in male metastatic renal cell carcinoma patients treated with targeted therapies. *Acta Clinica Belgica*. 2019; 74: 169–179.
- [36] Tsimafeyeu I, Tishova Y, Zukov R, Borisov P, Bondarenko A, Zakurdaeva K. Testosterone for managing treatment-related fatigue in patients with metastatic renal cell carcinoma: a phase 2 randomized study FARETES. *American Journal of Clinical Oncology*. 2021; 44: 137–142.
- [37] Dalla Volta A, Delbarba A, Valcamonico F, Cappelli C, Caramella I, Bergamini M, *et al*. Gonadal function in male patients with metastatic renal cell cancer treated with sunitinib. *In Vivo*. 2023; 37: 410–416.
- [38] Massa G, Zambelli L, Zecca E, Shkodra M, Tinè G, Caraceni A. Anticancer drugs-related hypogonadism in male patients with advanced cancers on active treatment: a systematic review. *The Oncologist*. 2024; 29: e728–e740.
- [39] European Association of Urology. EAU guidelines on sexual and reproductive health: male hypogonadism. 2026. Available at: <https://uroweb.org/guidelines/sexual-and-reproductive-health/chapter/male-hypogonadism> (Accessed: 16 May 2026).
- [40] Husebye ES, Castinetti F, Criseno S, Curigliano G, Decallonne B, Fleseriu M, *et al*. Endocrine-related adverse conditions in patients receiving immune checkpoint inhibition: an ESE clinical practice guideline. *European Journal of Endocrinology*. 2022; 187: G1–G21.
- [41] Oppolzer IA, Riester J, Büttner R, Burger M, Schnabel MJ. Endocrine immune-related adverse events in patients with metastatic renal and urothelial cancer treated with immune checkpoint-inhibitors. *International Urology and Nephrology*. 2023; 55: 1943–1949.
- [42] Ntemou E, Delgouffe E, Goossens E. Immune checkpoint inhibitors and male fertility: should fertility preservation options be considered before treatment? *Cancers*. 2024; 16: 1176.
- [43] Kotwal A, Kennedy R, Kikani N, Thosani S, Goldner W, Shariff A. Endocrinopathies associated with immune checkpoint inhibitor use. *Endocrine Practice*. 2024; 30: 584–591.
- [44] Bower JE, Lacchetti C, Alici Y, Barton DL, Bruner D, Canin BE, *et al*. Management of fatigue in adult survivors of cancer: ASCO-Society for Integrative Oncology guideline update. *Journal of Clinical Oncology*. 2024; 42: 2456–2487.
- [45] Broul M, Milota J, Šurán M, Horák V, Hujová A, Liegertová M. Late cutaneous metastasis of clear-cell renal cell carcinoma to the lower eyelid five years after radical nephrectomy: a case report. *Urology Case Reports*. 2025; 63: 103225.
- [46] Yin H, Du Z, Zhang J, Ma Y, Zhao S, Yang T. Case report: isolated eyelid metastasis of clear cell renal cell carcinoma 5 years after receiving radical nephrectomy. *Frontiers in Oncology*. 2024; 14: 1321919.
- [47] Marra C, Losco L, Ceccaroni A, Pentangelo P, Troisi D, Alfano C. Metastatic renal cell carcinoma to the soft tissue 27 years after radical nephrectomy: a case report. *Medicina*. 2023; 59: 150.
- [48] Vartolomei L, Schmidinger M, Vartolomei MD, Shariat SF. Psychological distress in patients treated for renal cell carcinoma: a systematic literature review. *Journal of Clinical Medicine*. 2022; 11: 6383.
- [49] Incorvaia L, Monteiro FSM, Massari F, Park SH, Roviello G, Fiala O, *et al*. Sex and survival outcomes in patients with renal cell carcinoma receiving first-line immune-based combinations. *Cancer Immunology, Immunotherapy*. 2024; 73: 142.
- [50] Huang WC, Levey AS, Serio AM, Snyder M, Vickers AJ, Raj GV, *et al*. Chronic kidney disease after nephrectomy in patients with renal cortical tumours: a retrospective cohort study. *The Lancet Oncology*. 2006; 7: 735–740.

How to cite this article: Marek Broul, Aneta Hujová, Michal Vostrý. Kidney cancer in men's health: from sex disparity to sexual and endocrine survivorship. *Journal of Men's Health*. 2026; 22(10): 18–28. doi: 10.22514/jomh.2026.081.