



National Comprehensive
Cancer Network®

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®)

Bladder Cancer

Version 3.2021 — April 22, 2021

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regarding the BCG shortage
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BCG Shortage Notice](#).



National
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NCCN Guidelines Version 3.2021

Bladder Cancer

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Clinical Trials: NCCN believes that the best management for any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

To find clinical trials online at NCCN Member Institutions, [click here: nccn.org/clinical_trials/member_institutions.aspx](#).

NCCN Categories of Evidence and Consensus: All recommendations are category 2A unless otherwise indicated.

See [NCCN Categories of Evidence and Consensus](#).

NCCN Categories of Preference: All recommendations are considered appropriate. See [NCCN Categories of Preference](#).

Upper Genitourinary (GU) Tract Tumors

- [Renal Pelvis \(UTT-1\)](#)
- [Urothelial Carcinoma of the Ureter \(UTT-2\)](#)
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Updates in Version 3.2021 of the NCCN Guidelines for Bladder Cancer from Version 2.2021 include:

[BL-G \(4 of 7\)](#)

- Subsequent-line systemic therapy for locally advanced or metastatic disease (Stage IV)
 - Other recommended regimens, sacituzumab govitecan-hziy was added as a category 2A recommendation.

Updates in Version 2.2021 of the NCCN Guidelines for Bladder Cancer from Version 1.2021 include:

[BL-G \(3 of 7\)](#)

- Second-line systemic therapy for locally advanced or metastatic disease (Stage IV) (post-platinum)
 - Alternative preferred regimens, atezolizumab was removed as an option based on the voluntary withdrawal of the FDA indication.

Updates in Version 1.2021 of the NCCN Guidelines for Bladder Cancer from Version 6.2020 include:
[Bladder Cancer](#)

[BL-1](#)

- Initial Evaluation
 - 2nd bullet was revised, "Office cystoscopy, *enhanced if available*."
- Primary Evaluation/Surgical Treatment
 - Bullet removed, "If sessile, suspicious for high grade or Tis: Consider selected mapping biopsies."
- Footnote d was revised by adding: "...for selected patients. Most efficacious in patients with low-grade, low-volume Ta urothelial cancer."

[BL-2](#) and [BL-3](#)

- The algorithms for non-muscle invasive bladder cancer were extensively revised to provide recommendations for management based on AUA risk stratification group.

[BL-4](#)

- The title of the page was clarified as "Management of Positive Urine Cytology."
- Evaluation
 - 1st bullet was added, "If initial positive cytology, consider repeating cytology test within 3 months."
 - 2nd bullet was added, "If repeated positive cytology," and the current recommendations were added as sub-bullets to this bullet.

[BL-5](#)

- Additional Workup
 - Last bullet was added: "Estimate GFR to assess eligibility for cisplatin" with footnote v: "For patients with borderline GFR consider timed urine collection, which may more accurately determine eligibility for cisplatin." Also for BL-7, BL-8, and BL-9.
- Primary Treatment
 - "Bladder preservation with" was added to "concurrent chemoradiotherapy

(category 1)." Also for BL-7.

- Reassessment bullet was revised: "Reassess tumor status 2-3 months after full treatment *completion*." (Also to BL-6, BL-7)
- Adjuvant Treatment of Cystectomy candidates was updated. Also for BL-7.
 - "Based on pathologic risk, consider
 - ◇ Adjuvant cisplatin-based chemotherapy if no neoadjuvant treatment, or
 - ◇ Adjuvant RT (pT3–4, or positive nodes/*margins* or ~~positive margins~~) (category 2B)
- Footnote z was revised: "Optimal candidates for bladder preservation with chemoradiotherapy include patients with tumors that present without *moderate/severe* hydronephrosis,..." Also for BL-7.
- Footnote was removed: There are data to support equivalent survival rates. Not all institutions have experience with these multidisciplinary treatment approaches, which require a dedicated team. Also for BL-7.

[BL-6](#)

- Adjuvant Treatment
 - Tumor pathway: "± intravesical therapy" was added to TURBT. Also for BL-7.

[BL-8](#)

- Footnote dd was revised: "...there is no evidence of distant disease on imaging reassessment, further cystoscopic assessment of tumor response in the bladder ~~is recommended~~ *may be considered*."

[BL-9](#)

- M1a Disease, Subsequent Treatment
 - CR option was revised from "Concurrent chemoradiotherapy or Cystectomy" to "Consider consolidative local therapy in selected cases."

[BL-10](#)

- After primary treatment, a link to "See Follow-up (BL-E)" was added.

[Continued](#)
UPDATES



Updates in Version 1.2021 of the NCCN Guidelines for Bladder Cancer from Version 6.2020 include:

Principles of Imaging for Bladder/Urothelial Cancer

[BL-A \(1 of 5\)](#)

- Abdominal and Pelvic Imaging, Staging, 2nd sub-bullet was revised: MR urography (MRU) may be appropriate *especially* in patients..."

[BL-A \(3 of 5\)](#)

- "Metastatic Disease - Patients Being Observed, See Follow-Up (BL-E 6 of 6)" was added.

[BL-A \(4 of 5\)](#)

- Urothelial Carcinoma of the Prostate/Primary Carcinoma of the Urethra, Staging, 1st bullet was revised: Staging: *Chest CT (preferred)* or PA and lateral chest x-ray ~~or chest CT~~.

Principles of Surgical Management

[BL-B \(1 of 4\)](#)

- TURBT/Maximal TURBT for Treatment, 1st bullet revised: ~~Bladder preservation with maximally complete and safe TURBT~~ *Maximally complete and safe TURBT is an essential part of bladder preservation. See Principles of Radiation Therapy (BL-H) and sentence, "Concurrent chemoradiotherapy is generally most suitable for patients with solitary tumors, negative nodes, no extensive or multifocal CIS, no moderate/severe tumor-related hydronephrosis, and good pre-treatment bladder function"* was moved and added as last bullet on BL-H.

[BL-B \(2 of 4\)](#)

- Partial Cystectomy, 1st bullet was revised: "May be used for cT2 muscle invasive disease with solitary lesion in location amenable to segmental resection with adequate margins, *particularly for purely non-urothelial histology.*"
- Radical Cystectomy/Cystoprostatectomy,
 - ▶ 1st bullet was revised: In non-muscle invasive disease, radical cystectomy is generally reserved for residual high-grade cT1, *variant histology, lymphovascular invasion, concomitant CIS, and Bacillus Calmette-Guérin (BCG)-unresponsive disease.*
 - ▶ Last bullet was added: In appropriately selected female patients, approaches that preserve the uterus, vagina, and/or ovaries should be employed when feasible.
- Radical Nephroureterectomy with Cuff of Bladder
 - ▶ 3rd bullet was revised: Neoadjuvant chemotherapy should

be considered in select patients with high-grade disease *or concerning radiographic findings.*

- ▶ Last bullet was added: Adjuvant chemotherapy may also be considered in patients who did not receive neoadjuvant chemotherapy (Birtle A, et al. Lancet 2020;395:1268-1277).

[BL-B \(3 of 4\)](#)

- Urethrectomy, 6th bullet, first sub-bullet was updated: "with T2 primary carcinoma of the urethra may be treated with urethrectomy and cystectomy *with organ-sparing approaches when feasible in appropriately selected cases.*"

[BL-B \(4 of 4\)](#)

- 4th bullet, sub-bullet was removed: Hereditary predisposition (eg, hereditary nonpolyposis colon cancer [HNPCC])

Principles of Pathology Management

[BL-C](#)

- Section removed: Melanocytic tumors - Malignant melanoma, Naevus, Melanosis and Malignant melanoma was added to Miscellaneous tumors.
- Mesenchymal Tumors section was revised:
 - ▶ *Malignant* inflammatory myofibroblastic tumor
 - ▶ *Malignant* perivascular epithelioid cell tumor ~~– Benign, Malignant~~
 - ▶ *Malignant* solitary fibrous tumour ~~– Leiomyoma, Haemangioma, Granular cell tumour, Neurofibroma~~

Non-Urothelial And Urothelial With Variant Histology

[BL-D \(1 of 2\)](#)

- Mixed histology, 1st bullet was revised: Urothelial carcinoma plus squamous *differentiation*, adenocarcinoma *differentiation*,...
- Any Small-Cell Component (or neuroendocrine features), 1st bullet: "(See systemic therapy in NCCN Guidelines for Small Cell Lung Cancer)" was added.

[Continued](#)

UPDATES



Updates in Version 1.2021 of the NCCN Guidelines for Bladder Cancer from Version 6.2020 include:

Follow-up

BL-E (6 of 6)

- Table 8 for Metastatic Disease that is being observed was added.

Principles of Intravesical Treatment

BL-F (1 of 3)

- Induction (Adjuvant) Intravesical Chemotherapy or BCG
 - 3rd bullet, 1st sub-bullet was revised: Other options include: *sequential gemcitabine/docetaxel*, epirubicin, valrubicin, docetaxel, or ~~sequential gemcitabine/docetaxel~~ or sequential gemcitabine/mitomycin.

BL-F (2 of 3)

- Intrapelvic and Intravesical Therapy for Upper Tract Tumors
 - Postsurgical, 2nd sub-bullet was revised: Perioperative intravesical chemotherapy with mitomycin or gemcitabine ~~may be given~~ *should be considered* following nephroureterectomy with cuff of bladder resection.

Principles of Systemic Therapy

BL-G (1 of 7)

- Table header was clarified: Perioperative chemotherapy (neoadjuvant [*preferred for bladder*] or adjuvant)
- 8th bullet, sub-bullet was added: Adjuvant therapy should be considered if neoadjuvant was not given for UTUC (Birtle A, et al. Lancet 2020;395:1268-1277).
- 9th bullet was revised: Carboplatin should not be substituted for cisplatin in the perioperative *bladder cancer* setting.

BL-G (2 of 7)

- First-line systemic therapy for locally advanced or metastatic disease (Stage IV)
 - Avelumab maintenance was clarified as a category 1 recommendation.

BL-G (3 of 7)

- Second-line systemic therapy for locally advanced or metastatic disease (Stage IV) (post-platinum)
 - Alternative preferred regimens, durvalumab was removed as an option based on the voluntary withdrawal of the FDA indication.
- Footnote e was added: Also for patients who received a therapy other than platinum or an immune checkpoint inhibitor in first-line.

BL-G (4 of 7)

- Subsequent-line systemic therapy for locally advanced or metastatic disease (Stage IV)
 - Preferred regimens, enfortumab vedotin was changed from a category 2A to a category 1 recommendation and corresponding reference was added: Powles T, Rosenberg JE, Sonpavde G, et al. Enfortumab vedotin in previously treated advanced urothelial carcinoma. N Engl J Med 2021. Online ahead of print.
- Footnote h was added: These therapies are appropriate for patients who received a first-line platinum-containing chemotherapy followed by avelumab maintenance therapy.

Principles of Radiation Management of Invasive Disease

BL-H

- 10th bullet was revised: Concurrent chemoradiotherapy (*preferred*) or RT alone should be considered as potentially curative therapy for medically inoperable patients. *Concurrent chemoradiotherapy or RT alone should be considered* for local palliation in patients with metastatic disease.
- 14th bullet was revised by removing the follow-up recommendations and directing to Table 7 on BL-E.

Upper GU Tract Tumors

UTT-1

- Workup: "or CT" was added to Chest x-ray. Also for UTT-2, UCP-1 and PCU-1.

UTT-3

- Adjuvant therapy for pT2, pT3, pT4, pN+
 - "± RT" was added to "Consider adjuvant chemotherapy."

Primary Carcinoma of the Urethra

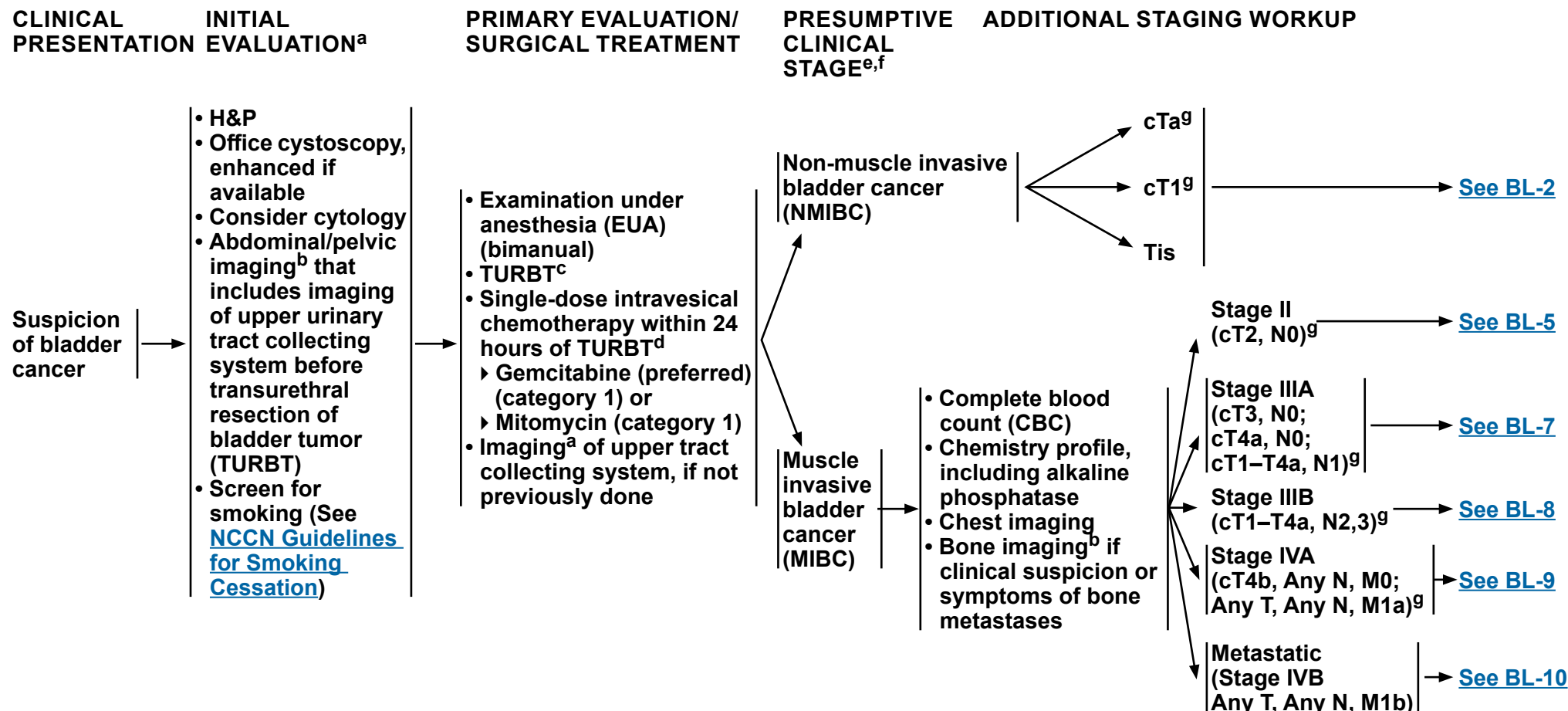
PCU-3

- cN0, Primary Treatment.
 - Last option was revised, "~~Consolidative~~ Surgery alone for non-urothelial histology."



INTRODUCTION

NCCN and the NCCN Bladder Cancer Panel believe that the best management for any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



^a For tools to aid optimal assessment and management of older adults with cancer, see [NCCN Guidelines for Older Adult Oncology](#).

^b See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

^c See [Principles of Surgical Management \(BL-B\)](#).

^d Immediate intravesical chemotherapy reduces the recurrence rate by 35% for selected patients. Most efficacious in patients with low-grade, low-volume Ta urothelial cancer. See [Principles of Intravesical Treatment \(BL-F\)](#).

^e See [Principles of Pathology Management \(BL-C\)](#).

^f See [Bladder Cancer: Non-Urothelial and Urothelial with Variant Histology \(BL-D\)](#).

^g The modifier “c” refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or transurethral resection), and imaging studies. The modifier “p” refers to pathologic staging based on cystectomy and lymph node dissection.

Note: All recommendations are category 2A unless otherwise indicated.

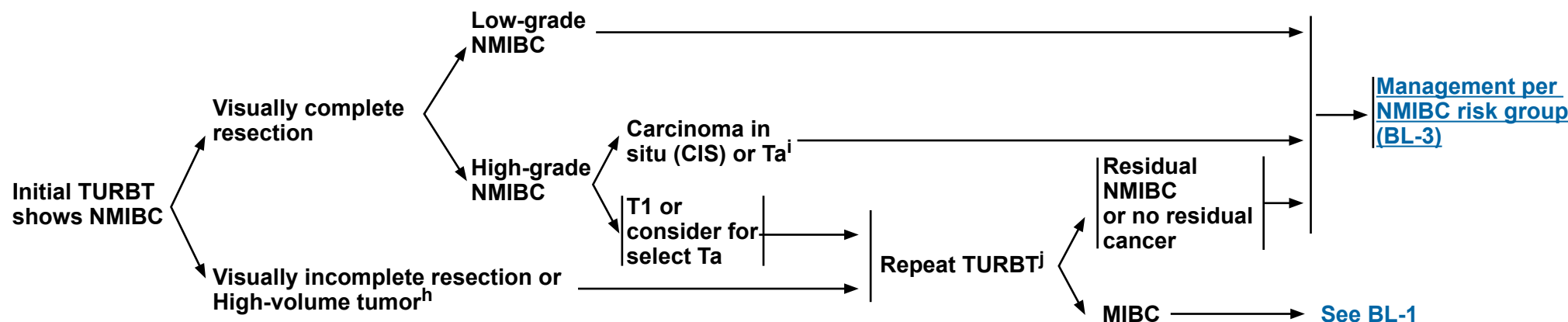
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Non-Muscle Invasive Bladder Cancer

RISK STRATIFICATION OF NMIBC



AUA Risk Stratification for Non-Muscle Invasive Bladder Cancer*

Low Risk	Intermediate Risk	High Risk
<ul style="list-style-type: none"> • Papillary urothelial neoplasm of low malignant potential • Low grade urothelial carcinoma <ul style="list-style-type: none"> ▶ Ta and ▶ ≤3 cm and ▶ Solitary 	<ul style="list-style-type: none"> • Low grade urothelial carcinoma <ul style="list-style-type: none"> ▶ T1 or ▶ >3 cm or ▶ Multifocal or ▶ Recurrence within 1 year • High grade urothelial carcinoma <ul style="list-style-type: none"> ▶ Ta and ▶ ≤3 cm and ▶ Solitary 	<ul style="list-style-type: none"> • High grade urothelial carcinoma <ul style="list-style-type: none"> ▶ CIS or ▶ T1 or ▶ >3 cm or ▶ Multifocal • Very high risk features (any): <ul style="list-style-type: none"> ▶ BCG unresponsive^k ▶ Variant histologies^l ▶ Lymphovascular invasion ▶ Prostatic urethral invasion

Reproduced with permission from Chang SS, Boorjian SA, Chou R, et al. Diagnosis and treatment of non-muscle invasive bladder cancer: AUA/SUO guideline. J Urol 2016;196:1021.

*Within each of these risk strata an individual patient may have more or less concerning features that can influence care.

^h High-volume tumors (large or highly multifocal) are at high risk of residual tumor.

ⁱ Consider repeat TURBT for high-grade Ta particularly if large, and/or no muscle in specimen.

^j Muscle should be present in repeat TURBT pathology specimen if possible.

^k Kamat AM, et al. J Clin Oncol 2016;34:1935-1944.

^l Montironi R, et al. Int J Surg Pathol 2005;13:143-153.

Note: All recommendations are category 2A unless otherwise indicated.

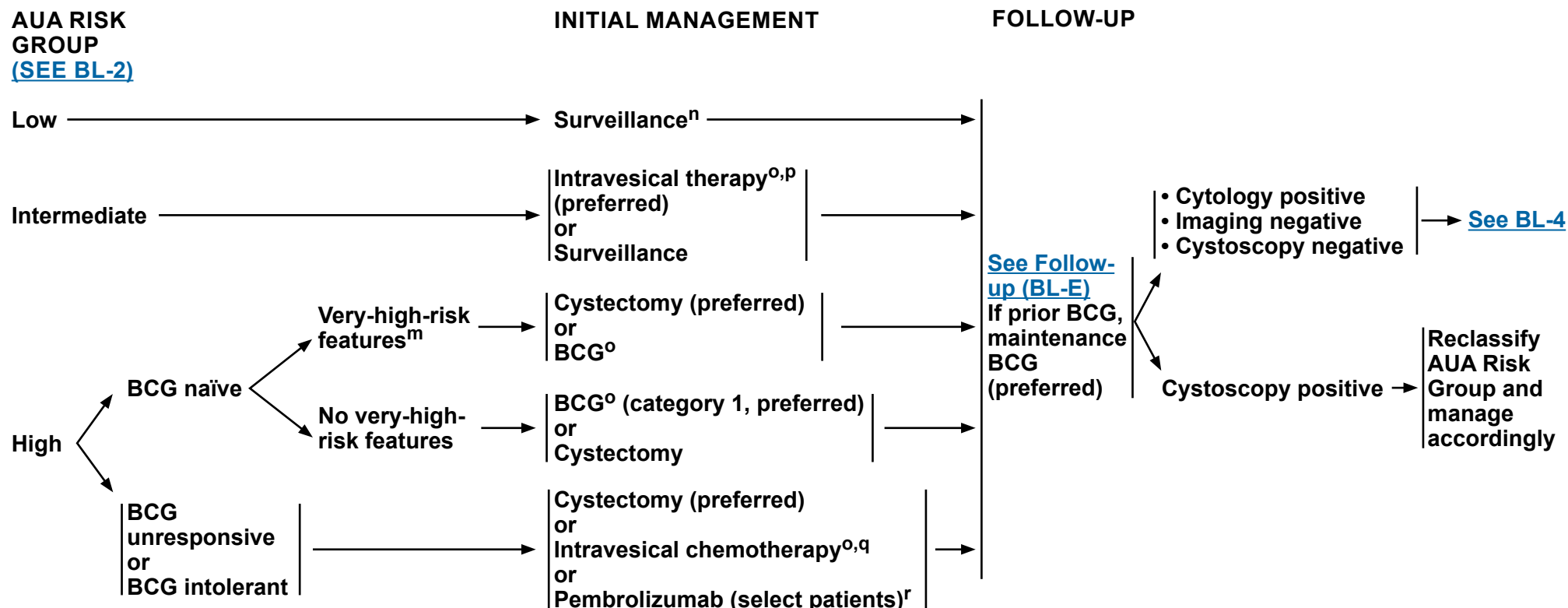
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Non-Muscle Invasive Bladder Cancer

MANAGEMENT PER NMIBC RISK GROUP


^m Lymphovascular invasion, prostatic urethral involvement of tumor, variant histology (eg, micropapillary, plasmacytoid, sarcomatoid), T1 with extensive CIS.

ⁿ Should consider single perioperative instillation of intravesical chemotherapy at time of TURBT.

^o See Principles of Intravesical Therapy (BL-F).

^p Options for intravesical therapy for intermediate-risk disease include BCG and chemotherapy; should consider BCG availability in decision-making.

^q Valrubicin is approved for BCG-refractory CIS.

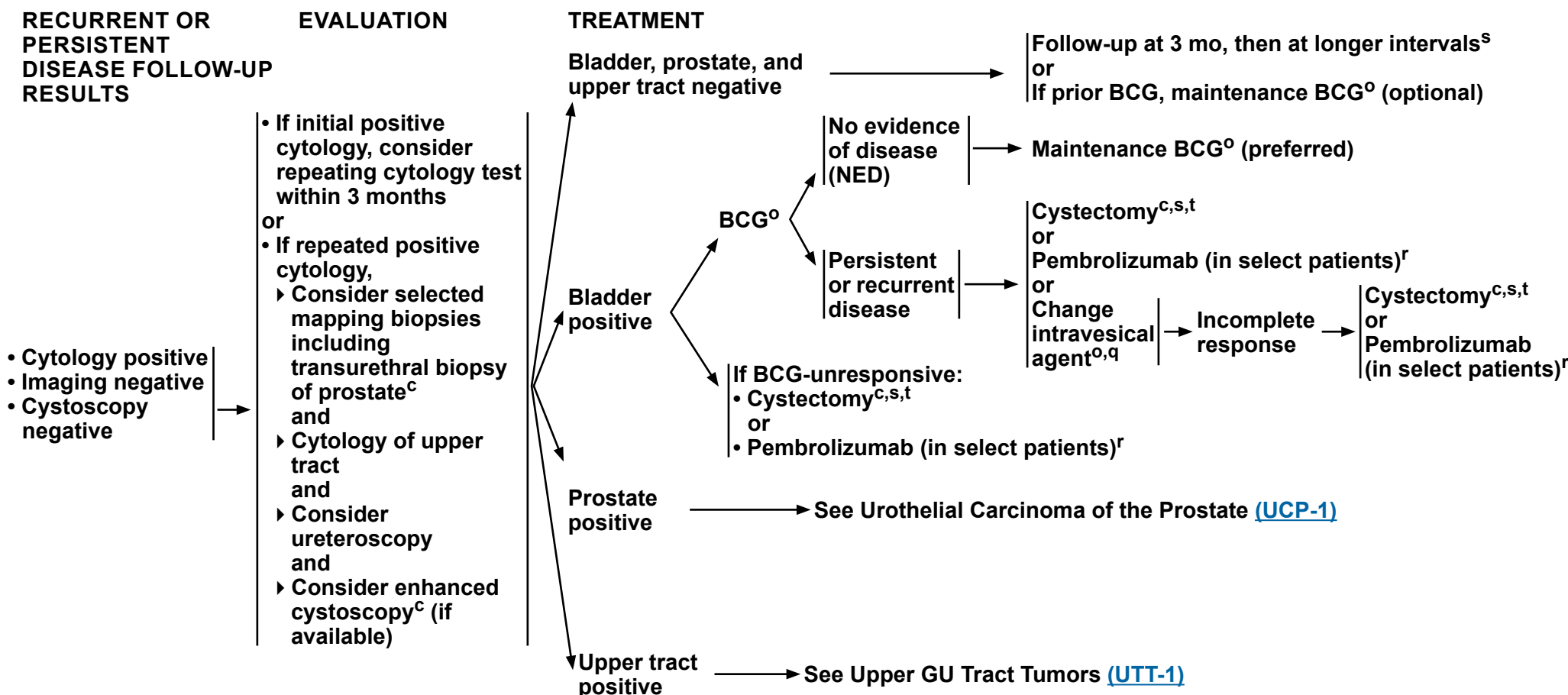
^r Pembrolizumab is indicated for the treatment of patients with BCG-unresponsive, high-risk NMIBC with Tis (with or without papillary) tumors who are ineligible for or have elected not to undergo cystectomy.

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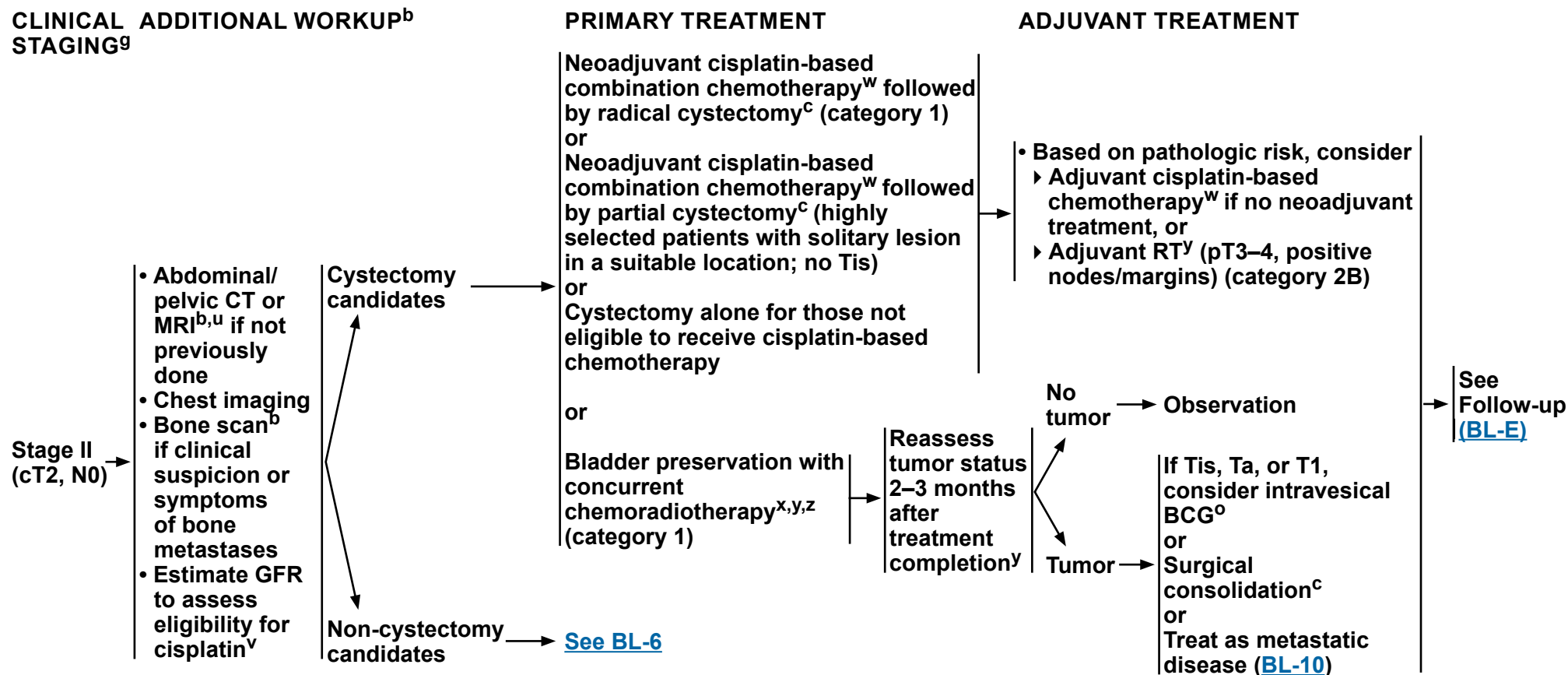
Management of Positive Urine Cytology

^c See Principles of Surgical Management ([BL-B](#)).^o See Principles of Intravesical Treatment ([BL-F](#)).^q Valrubicin is approved for BCG-refractory CIS.^r Pembrolizumab is indicated for the treatment of patients with BCG-unresponsive, high-risk, non-muscle invasive bladder cancer with Tis (with or without papillary) tumors who are ineligible for or have elected not to undergo cystectomy.^s See Follow-up ([BL-E](#)).^t If not a cystectomy candidate, and recurrence is cTa or cT1, consider concurrent chemoradiotherapy (category 2B for cTa, category 2A for cT1) or a clinical trial. See Principles of Systemic Therapy ([BL-G 5 of 7](#)).**Note:** All recommendations are category 2A unless otherwise indicated.**Clinical Trials:** NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



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Muscle Invasive Bladder Cancer

^b See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).^c See [Principles of Surgical Management \(BL-B\)](#).^g The modifier “c” refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or transurethral resection), and imaging studies. The modifier “p” refers to pathologic staging based on cystectomy and lymph node dissection.^o See [Principles of Intravesical Treatment \(BL-F\)](#).^u Consider FDG-PET/CT scan (skull base to mid-thigh) (category 2B).^v For patients with borderline glomerular filtration rate (GFR) consider timed urine collection, which may more accurately determine eligibility for cisplatin.^w See [Principles of Systemic Therapy \(BL-G 1 of 7\)](#).^x See [Principles of Systemic Therapy \(BL-G 5 of 7\)](#).^y See [Principles of Radiation Management of Invasive Disease \(BL-H\)](#).^z Optimal candidates for bladder preservation with chemoradiotherapy include patients with tumors that present without moderate/severe hydronephrosis, are without concurrent extensive or multifocal Tis, and are <6 cm. Ideally, tumors should allow a visually complete or maximally debulking TURBT. See [Principles of Radiation Management of Invasive Disease \(BL-H\)](#).**Note:** All recommendations are category 2A unless otherwise indicated.**Clinical Trials:** NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.[See Recurrent or Persistent Disease \(BL-11\)](#)**BL-5**

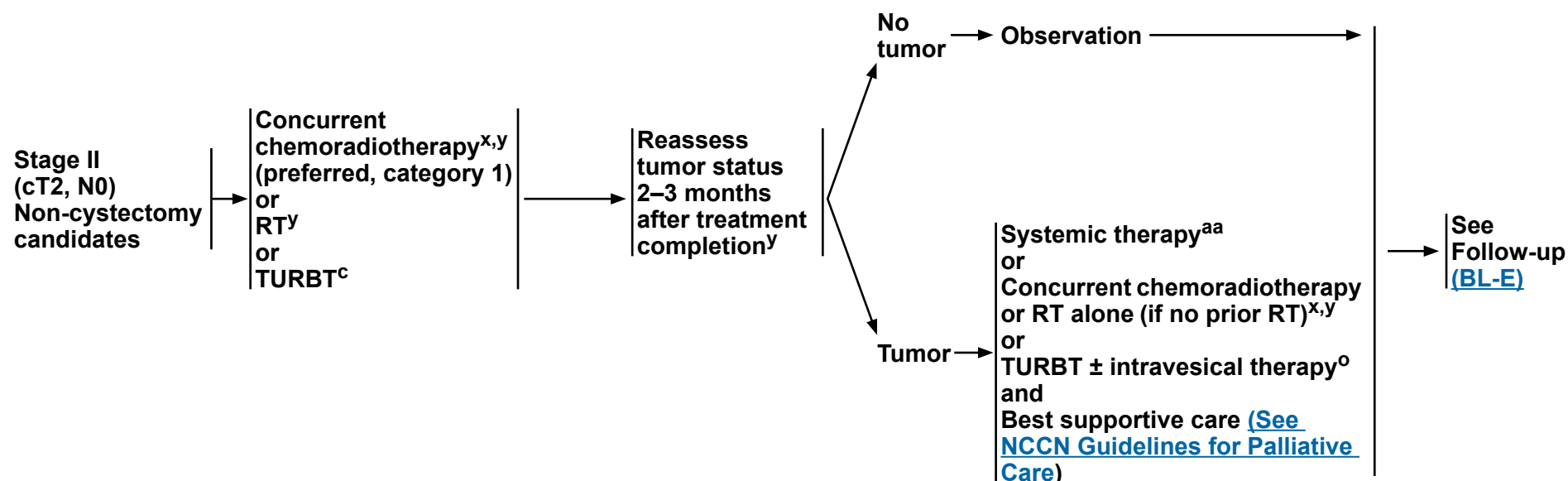


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Muscle Invasive Bladder Cancer

PRIMARY TREATMENT

ADJUVANT TREATMENT



^c See Principles of Surgical Management (BL-B).

^o See Principles of Intravesical Treatment (BL-F).

^x See Principles of Systemic Therapy (BL-G 5 of 7).

^y See Principles of Radiation Management of Invasive Disease (BL-H).

^{aa} See Principles of Systemic Therapy (BL-G 2 of 7).

Note: All recommendations are category 2A unless otherwise indicated.

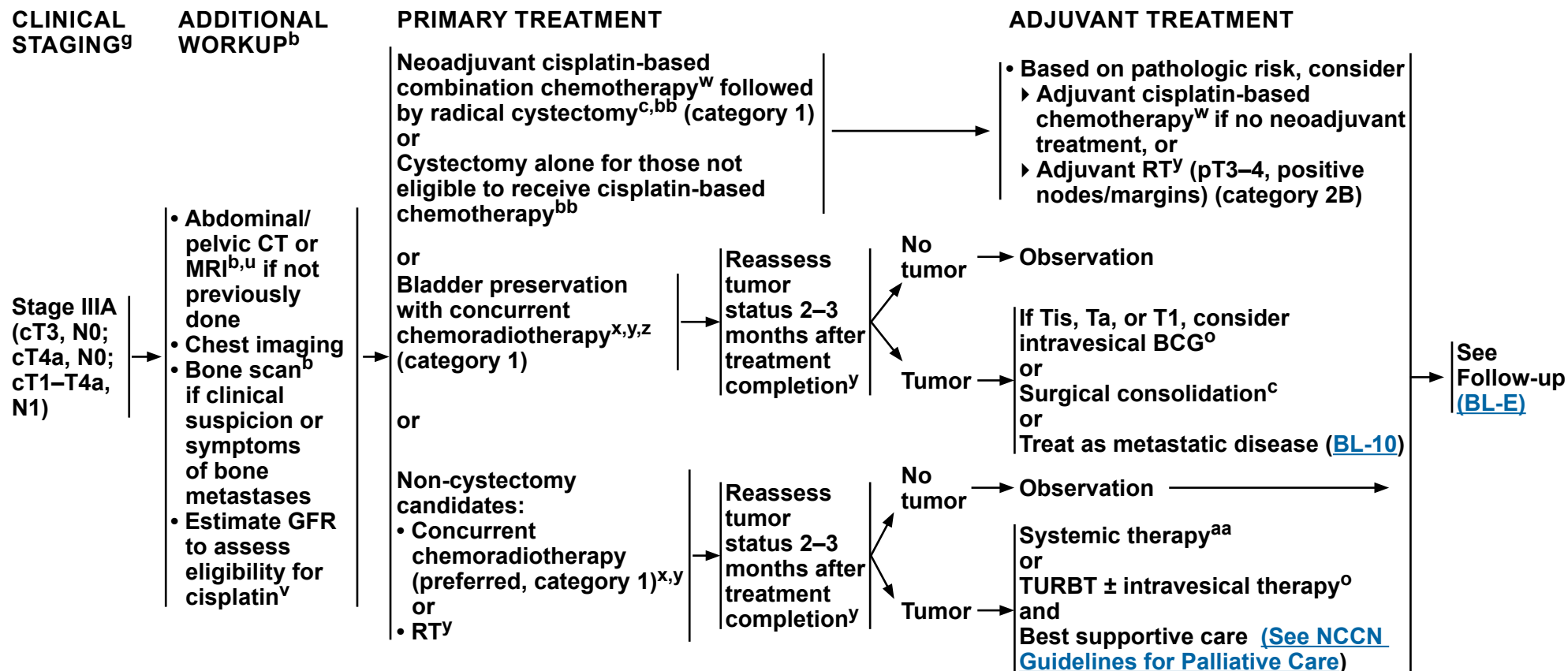
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[See Recurrent
or Persistent
Disease \(BL-11\)](#)



NCCN Guidelines Version 3.2021

Muscle Invasive Bladder Cancer



^b See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

^c See [Principles of Surgical Management \(BL-B\)](#).

^g The modifier “c” refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or transurethral resection), and imaging studies. The modifier “p” refers to pathologic staging based on cystectomy and lymph node dissection.

^o See [Principles of Intravesical Treatment \(BL-F\)](#).

^u Consider FDG-PET/CT scan (skull base to mid-thigh) (category 2B).

^v For patients with borderline GFR consider timed urine collection, which may more accurately determine eligibility for cisplatin.

^w See [Principles of Systemic Therapy \(BL-G 1 of 7\)](#).

^x See [Principles of Systemic Therapy \(BL-G 5 of 7\)](#).

^y See [Principles of Radiation Management of Invasive Disease \(BL-H\)](#).

^z Optimal candidates for bladder preservation with chemoradiotherapy include patients with tumors that present without moderate/severe hydronephrosis, are without concurrent extensive or multifocal Tis, and are <6 cm. Ideally, tumors should allow a visually complete or maximally debulking TURBT. See [Principles of Radiation Management of Invasive Disease \(BL-H\)](#).

^{aa} See [Principles of Systemic Therapy \(BL-G 2 of 7\)](#).

^{bb} Patients with cN1 disease have better outcomes if they are given neoadjuvant chemotherapy and have a response.

Note: All recommendations are category 2A unless otherwise indicated.

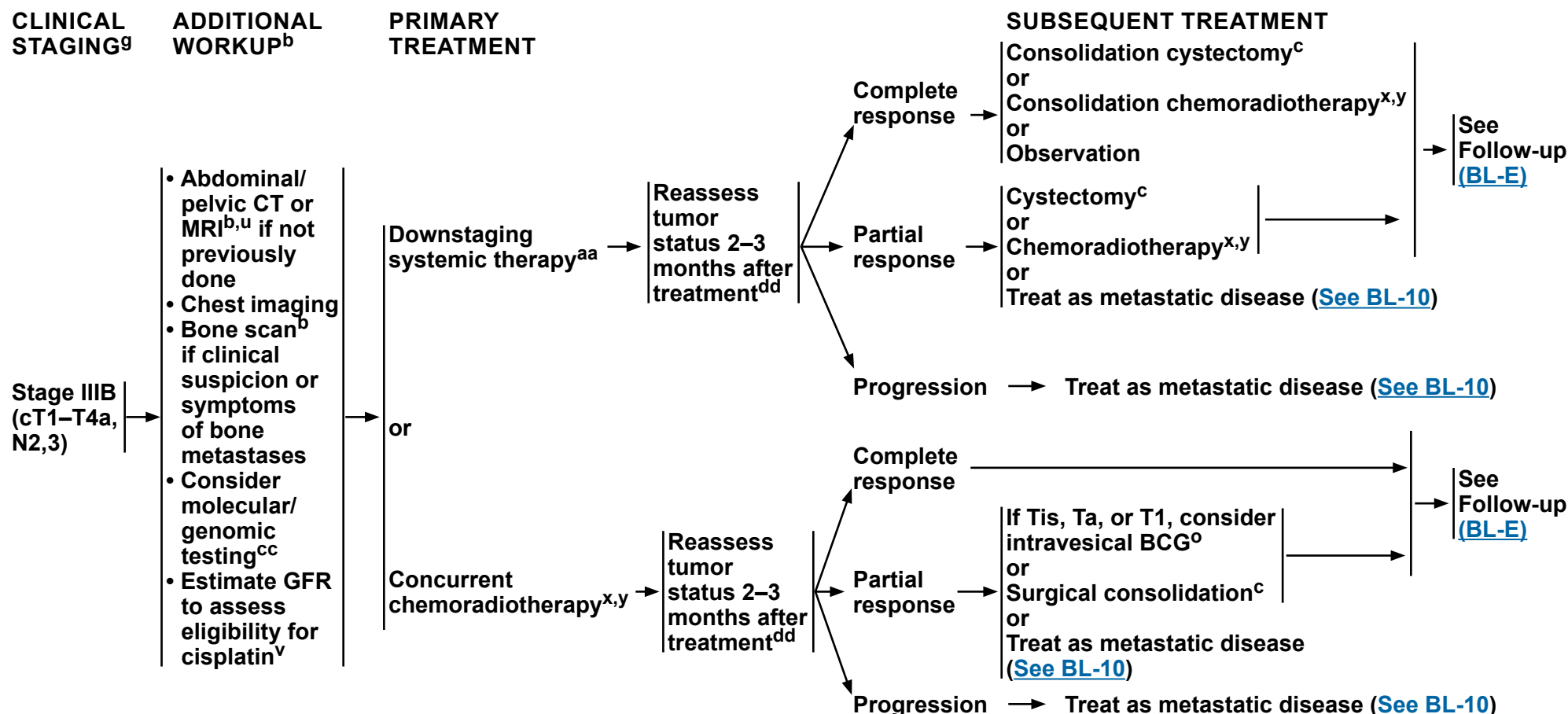
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[See Recurrent or Persistent Disease \(BL-11\)](#)



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Muscle Invasive Bladder Cancer


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^v For patients with borderline GFR consider timed urine collection, which may more accurately determine eligibility for cisplatin.

^x See Principles of Systemic Therapy (BL-G 5 of 7).

^y See Principles of Radiation Management of Invasive Disease (BL-H).

^{aa} See Principles of Systemic Therapy (BL-G 2 of 7).

^{cc} Molecular/genomic testing in a CLIA-approved laboratory, including FGFR RQ RT-PCR for *FGFR3* or *FGFR2* genetic alterations. See Discussion.

^{dd} Imaging with CT of chest/abdomen/pelvis with contrast. If there is no evidence of distant disease on imaging reassessment, further cystoscopic assessment of tumor response in the bladder may be considered.

Note: All recommendations are category 2A unless otherwise indicated.

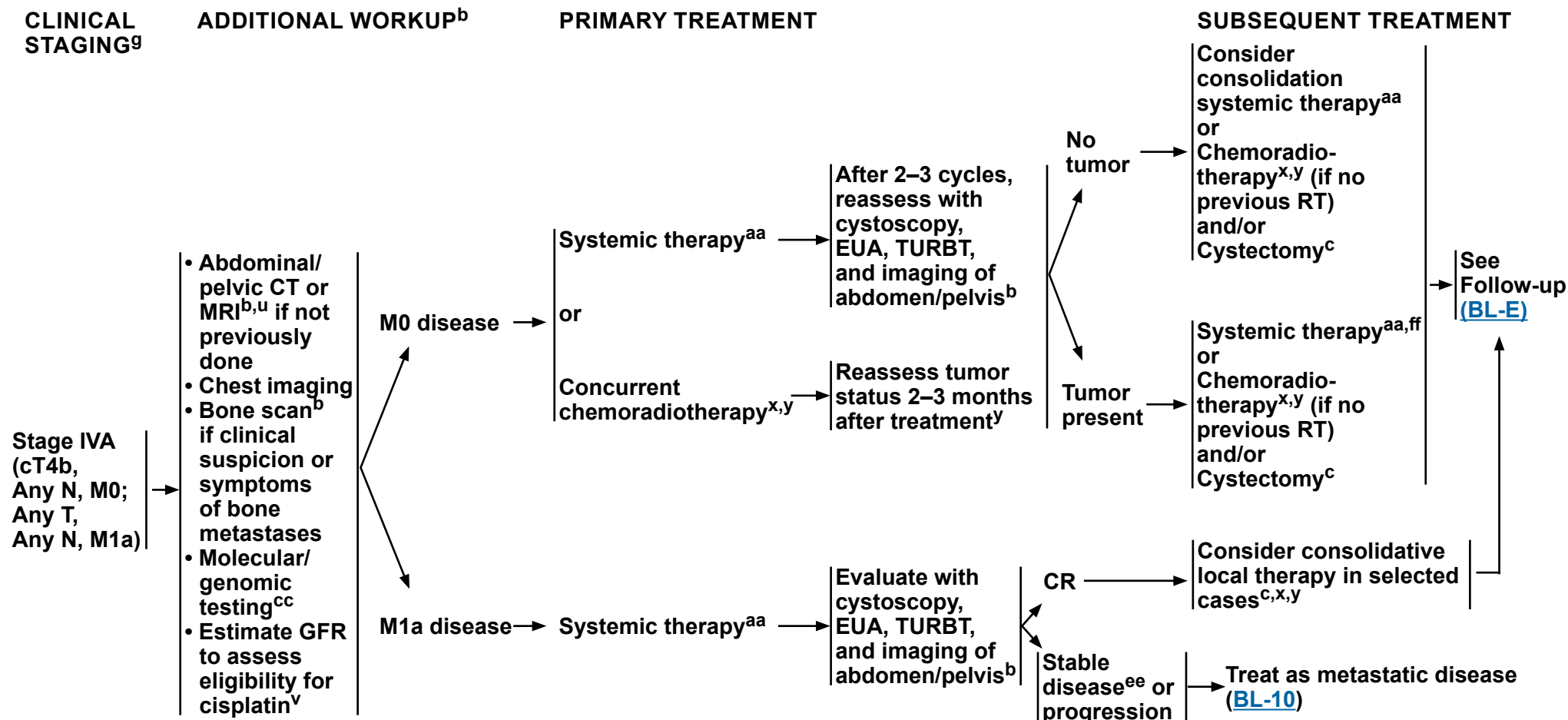
Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

[See Recurrent or Persistent Disease \(BL-11\)](#)



NCCN Guidelines Version 3.2021

Muscle Invasive Bladder Cancer



^b See Principles of Imaging for Bladder/Urothelial Cancer (BL-A).

^c See Principles of Surgical Management (BL-B).

^g The modifier “c” refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or transurethral resection), and imaging studies. The modifier “p” refers to pathologic staging based on cystectomy and lymph node dissection.

^u Consider FDG-PET/CT scan (skull base to mid-thigh) (category 2B).

^v For patients with borderline GFR consider timed urine collection, which may more accurately determine eligibility for cisplatin.

^x See Principles of Systemic Therapy (BL-G 5 of 7).

^y See Principles of Radiation Management of Invasive Disease (BL-H).

^{aa} See Principles of Systemic Therapy (BL-G 2 of 7).

^{cc} Molecular/genomic testing in a CLIA-approved laboratory, including FGFR RGQ RT-PCR for *FGFR3* or *FGFR2* genetic alterations. See Discussion.

^{ee} Non-bulky disease and no significant clinical progression.

^{ff} See Principles of Systemic Therapy (BL-G 3 of 7 and 4 of 7).

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[See Recurrent or Persistent Disease \(BL-11\)](#)



NCCN Guidelines Version 3.2021

Muscle Invasive Bladder Cancer

CLINICAL STAGING^g

ADDITIONAL WORKUP^b

PRIMARY TREATMENT

Metastatic^{cc}
(Stage IVB
Any T, Any
N, M1b)



- Bone scan^b if clinical suspicion or symptoms of bone metastases
- Chest CT
- Consider CNS imaging^b
- Estimate GFR to assess eligibility for cisplatin^v
- Consider biopsy if technically feasible
- Molecular/genomic testing^{cc}



Systemic therapy^{aa,ff}
and/or
Palliative RT^y



See
Follow-up
([BL-E](#))

^b See Principles of Imaging for Bladder/Urothelial Cancer ([BL-A](#)).

^g The modifier “c” refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or transurethral resection), and imaging studies. The modifier “p” refers to pathologic staging based on cystectomy and lymph node dissection.

^v For patients with borderline GFR consider timed urine collection, which may more accurately determine eligibility for cisplatin.

^y See Principles of Radiation Management of Invasive Disease ([BL-H](#)).

^{aa} See Principles of Systemic Therapy ([BL-G 2 of 7](#)).

^{cc} Molecular/genomic testing in a CLIA-approved laboratory, including FGFR RGQ RT-PCR for *FGFR3* or *FGFR2* genetic alterations. [See Discussion](#).

^{ff} See Principles of Systemic Therapy ([BL-G 3 of 7](#) and [4 of 7](#)).

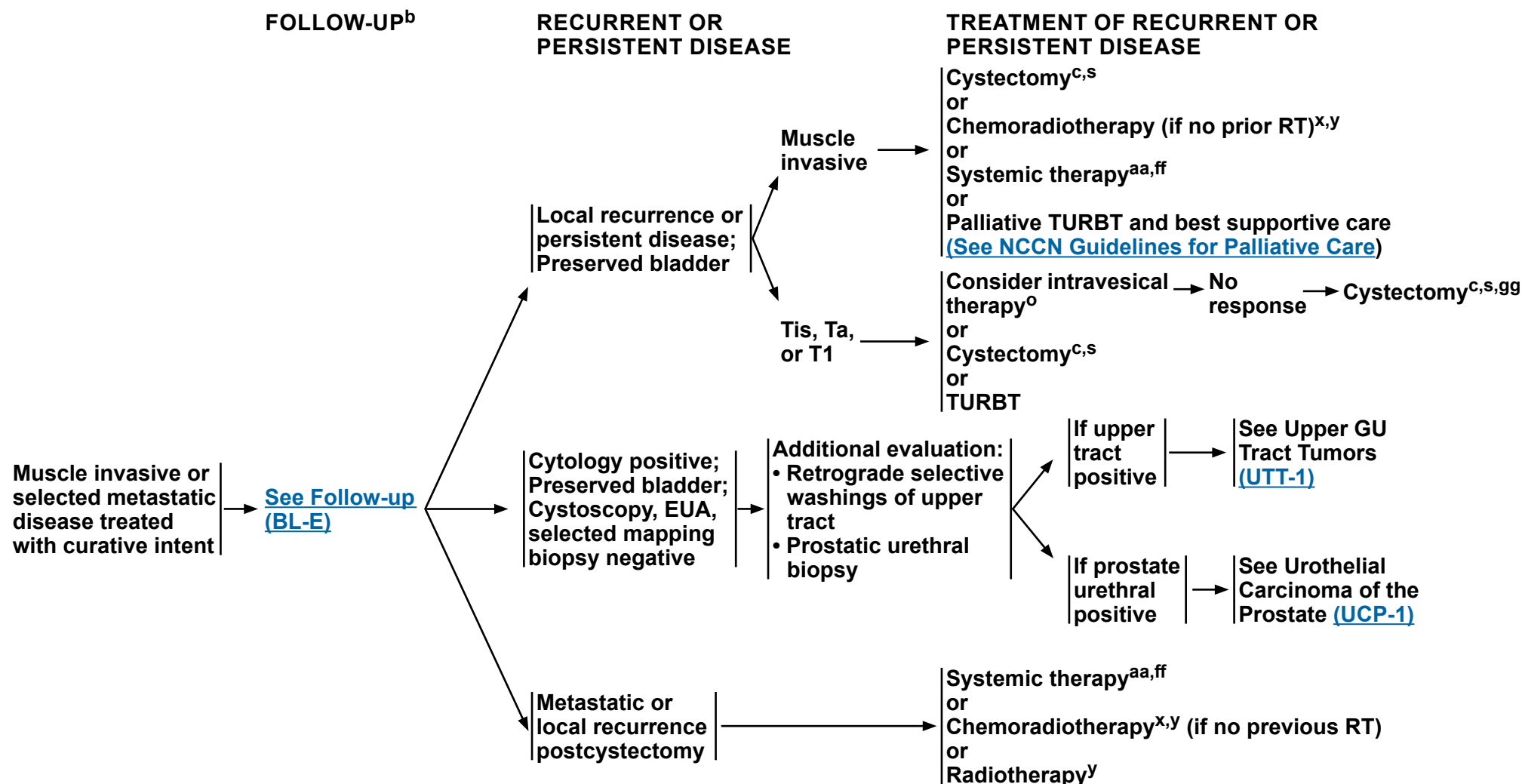
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NCCN Guidelines Version 3.2021

Muscle Invasive Bladder Cancer


^b [See Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\).](#)
^c [See Principles of Surgical Management \(BL-B\).](#)
^o [See Principles of Intravesical Treatment \(BL-F\).](#)
^s [See Follow-Up \(BL-E\).](#)
^x [See Principles of Systemic Therapy \(BL-G 5 of 7\).](#)
^y [See Principles of Radiation Management of Invasive Disease \(BL-H\).](#)
^{aa} [See Principles of Systemic Therapy \(BL-G 2 of 7\).](#)
^{ff} [See Principles of Systemic Therapy \(BL-G 3 of 7 and 4 of 7\).](#)
^{gg} If not a cystectomy candidate, consider concurrent chemoradiotherapy ([See BL-G 5 of 7](#)) (if no prior RT), change in intravesical agent, or a clinical trial.

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PRINCIPLES OF IMAGING FOR BLADDER/UROTHELIAL CANCER

No single follow-up plan is appropriate for all patients. Follow-up frequency and duration should be individualized based on patient requirements, and may be extended beyond 5 years after shared decision-making between the patient and physician.

Non-Muscle Invasive Bladder Cancer (NMIBC)

Chest Imaging

- Staging:
 - Chest imaging may not be necessary in initial staging of noninvasive disease.
- Follow-up of NMIBC:
 - Routine chest imaging is not recommended.¹

Abdominal and Pelvic Imaging

- Staging:
 - CT urography (CTU) (CT of the abdomen and pelvis without and with IV contrast with excretory imaging).
 - MR urography (MRU) may be appropriate, especially in patients with poor renal function or iodinated contrast allergy but with GFR >30 and no acute renal failure. May be performed without gadolinium-based contrast utilizing T2 imaging and native image contrast to evaluate upper tracts. Will have decreased sensitivity to plaque-like or non-obstructive lesions and metastasis.
 - Renal ultrasound (US) or CT without contrast may be utilized in conjunction with retrograde ureteropyelography in patients who cannot receive either iodinated or gadolinium-based contrast material.
 - Consider: In sessile or high-grade tumors, MRI of the pelvis without and with IV contrast for local staging.
 - ◊ May be performed in addition to CTU.
 - ◊ Can be performed without contrast if renal function does not allow for contrast administration, as early data suggest T2 and diffusion-weighted images may help with local staging.^{2,3}
- Follow-up of NMIBC: [\(See BL-E\)](#)
 - Upper tract (CTU, MRU, or retrograde ureteropyelography with CT or US) and abdominal/pelvic imaging at baseline. For high-risk patients, upper tract imaging also should be performed at 12 months and every 1–2 years thereafter up to 10 years.

Evaluation for Suspected Bone Metastasis

- Bone imaging not generally recommended as bone metastasis is unlikely.

Neurologic/Brain Imaging^{4,5}

- Staging
 - Brain MRI not generally recommended.

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[Continued](#)
[References](#)

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PRINCIPLES OF IMAGING FOR BLADDER/UROTHELIAL CANCER

No single follow-up plan is appropriate for all patients. Follow-up frequency and duration should be individualized based on patient requirements, and may be extended beyond 5 years after shared decision-making between the patient and physician.

Muscle Invasive Bladder Cancer (MIBC)

Chest Imaging

- Staging:⁴
 - ▶ CT of the chest with or without contrast (preferred)⁶
 - ▶ PA and lateral chest x-ray
 - ▶ FDG-PET/CT (category 2B) may be beneficial in selected patients with T2 (muscle invasive disease) and in patients with \geq T3 disease. This will also include abdomen and pelvis if performed.⁷⁻¹⁰ FDG-PET/CT should not be used to delineate the anatomy of the upper urinary tract.
- Follow-up with or without cystectomy: [\(See BL-E\)](#)
 - ▶ Chest CT with or without IV contrast (preferred)
 - ◊ May be performed without contrast if IV contrast cannot be given.
 - ◊ Consider performing with the abdomen and pelvis for a single exam in patients who also need imaging of the abdomen and pelvis.
 - ▶ PA and lateral chest x-ray
 - ▶ FDG-PET/CT (category 2B) may be performed if not previously done or if metastasis is suspected in selected patients. This examination will also include abdomen and pelvis. FDG-PET/CT should not be used to delineate the anatomy of the upper urinary tract.
- Follow-up of cT4b [\(See BL-E\)](#) and metastatic disease:
 - ▶ Chest CT with or without IV contrast (preferred)
 - ◊ May be performed without contrast if IV contrast cannot be given.
 - ◊ Consider performing with the abdomen and pelvis for a single exam in patients who also need imaging of the abdomen and pelvis.
 - ▶ PA and lateral chest x-ray
 - ▶ FDG-PET/CT (category 2B) may be performed if not previously done or in high-risk patients in whom metastatic disease is suspected. This could also be used to guide biopsy in certain patients. FDG-PET/CT should not be used to delineate the anatomy of the upper urinary tract.

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[Continued](#)
[References](#)

BL-A
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PRINCIPLES OF IMAGING FOR BLADDER/UROTHELIAL CANCER

Muscle Invasive Bladder Cancer (continued)

Abdominal and Pelvic Imaging

- **Staging:**
 - ▶ CTU (CT of the abdomen and pelvis without and with IV contrast with excretory imaging).¹¹
 - ▶ MRU may be appropriate in patients with poor renal function or iodinated contrast allergy but with GFR >30 and no acute renal failure.
 - ▶ Renal US and CT without contrast (particularly when FDG-PET/CT is not utilized) may be utilized in conjunction with retrograde evaluation in patients who cannot receive either iodinated or gadolinium-based contrast material.
 - ▶ Ureteroscopy if suspected upper tract lesions.
 - ▶ FDG-PET/CT (category 2B) may be useful in selected patients with \geq cT2 disease and may change management in patients with \geq cT3 disease.¹ FDG-PET/CT should not be used to delineate the anatomy of the upper urinary tract.
 - ▶ CT or MRI of the abdomen and pelvis with IV contrast if not performed with initial evaluation.
 - ▶ MRI of the pelvis without and with IV contrast for local staging.
 - ◊ May be performed in addition to CTU.
 - ◊ May also be performed without contrast if there is a contraindication to contrast.¹
- **Follow-up (See BL-E):**
 - ▶ Upper tract and abdominal/pelvic imaging as defined previously at 3- to 6-month intervals for 2 years, then abdominal/pelvic imaging annually for up to 5 years and as indicated thereafter.
 - ▶ FDG-PET/CT (category 2B) may be performed if not previously done or in high-risk patients in whom metastatic disease is suspected. This could also be used to guide biopsy in certain patients. FDG-PET/CT should not be used to delineate the anatomy of the upper urinary tract.

Evaluation for Suspected Bone Metastasis

- Symptomatic, or high-risk patients, or those with laboratory indicators of bone metastasis may be imaged with MRI, FDG-PET/CT (category 2B), or bone scan. FDG-PET/CT (category 2B) may also be considered in cases when additional sites of extrasosseous metastatic disease are suspected or previously documented.

Metastatic Disease - Patients Being Observed

- See Follow-Up ([BL-E 6 of 6](#))

Neurologic/Brain Imaging^{4,5}

- **Staging**
 - ▶ Brain MRI without and with IV contrast is recommended only in symptomatic or selected “high-risk” (eg, small cell histology) patients.
 - ▶ CT with IV contrast is considered only when symptomatic patients cannot undergo MRI (ie, non-MRI-compatible cardiac pacer, implant or foreign body, end-stage renal disease).

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[Continued](#)
[References](#)

BL-A
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PRINCIPLES OF IMAGING FOR BLADDER/UROTHELIAL CANCER

Upper Tract (renal pelvis and urothelial carcinoma of the ureter)¹²

- Staging and follow-up of $\leq T1$ disease (see recommendations for NMIBC bladder cancer).
- Staging and follow-up of $\geq T2$ disease (see recommendations for MIBC bladder cancer).

Urothelial Carcinoma of the Prostate/Primary Carcinoma of the Urethra

- Staging:
 - ▶ Chest CT (preferred) or PA and lateral chest x-ray.
 - ▶ Consider abdominal CT or MRI in high-risk T1 disease or patients with $\geq T2$ disease.¹³
 - ▶ MRI of the pelvis without and with IV contrast for local staging.
- Additional staging if urothelial carcinoma of prostate:
 - ▶ Imaging of upper tracts and collecting system.
 - ▶ CTU (CT of the abdomen and pelvis without and with IV contrast with excretory imaging).
 - ▶ MRU may be appropriate in patients with poor renal function or iodinated contrast allergy but with GFR >30 and no acute renal failure.
 - ▶ Ureteroscopy
 - ▶ Renal US or CT without contrast may be utilized in conjunction with retrograde evaluation in patients who cannot receive either iodinated or gadolinium-based contrast material.
- Additional staging if primary carcinoma of non-prostatic male urethra or female urethra:
 - ▶ In the setting of palpable inguinal lymph nodes:
 - ◊ Biopsy of palpable nodes.
 - ◊ CT of the chest, abdomen, and pelvis for additional staging, if not yet performed.
- Follow-up:
 - ▶ Low-risk T1 or $<T1$ disease:
 - ◊ MRI or CT of pelvis with and without IV contrast.
 - ▶ High-risk T1 or $\geq T2$:
 - ◊ May consider more extensive follow-up based on risk factors; 3–6 months for 2 years and then yearly.
 - Chest imaging with x-ray and/or CT as previously discussed.
 - Imaging of abdomen and pelvis with MRI or CT with and without contrast.

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[References](#)



PRINCIPLES OF IMAGING FOR BLADDER/UROTHELIAL CANCER

REFERENCES

- ¹ Leyendecker JR, Clingan MJ, Eberhardt SC, et al; Expert Panel on Urologic Imaging. ACR Appropriateness Criteria® post-treatment surveillance of bladder cancer [online publication]. Reston, VA: American College of Radiology (ACR); 2014.
- ² Tekes A, Kamel I, Imam K, et al. Dynamic MRI of bladder cancer: evaluation of staging accuracy. *AJR Am J Roentgenol* 2005;184:121-127.
- ³ Wu LM, Chen XX, Xu JR, et al. Clinical value of T2-weighted imaging combined with diffusion-weighted imaging in preoperative T staging of urinary bladder cancer: a large-scale, multiobserver prospective study on 3.0-T MRI. *Acad Radiol* 2013;20:939-946.
- ⁴ Shinagare AB, Ramaiya RH, Jagannathan JP, et al. Metastatic pattern of bladder cancer: correlation with the characteristics of the primary tumor. *AJR Am J Roentgenol* 2011;196:117-122.
- ⁵ Anderson TS, Regine WF, Kryscio R, et al. Neurologic complications of bladder carcinoma: A review of 359 cases. *Cancer* 2003;97:2267-2272.
- ⁶ Witjes JA, Compérat E, Cowan NC, et al. EAU guidelines on muscle-invasive and metastatic bladder cancer: summary of the 2013 guidelines. *Eur Urol* 2014;65:778-792.
- ⁷ Kollberg P, Almquist H, Bläckberg M, et al. [18F]Fluorodeoxyglucose – positron emission tomography/computed tomography improves staging in patients with high-risk muscle-invasive bladder cancer scheduled for radical cystectomy. *Scand J Urol* 2015;49:1-6.
- ⁸ Goodfellow H, Viney Z, Hughes P, et al. Role of fluorodeoxyglucose positron emission tomography (FDG PET)-computed tomography (CT) in the staging of bladder cancer. *BJU Int* 2014;114:389-395.
- ⁹ Lu YY, Chen JH, Liang JA, et al. Clinical value of FDG PET or PET/CT in urinary bladder cancer: A systematic review and meta-analysis. *Eur J of Radiol* 2012;81:2411–2416.
- ¹⁰ Kibel AS, Dehdashti F, Katz MD, et al. Prospective study of [18F]fluorodeoxyglucose positron emission tomography/computed tomography for staging of muscle-invasive bladder carcinoma. *J Clin Oncol* 2009;27:4314-4320.
- ¹¹ Zhang J, Gerst S, Lefkowitz RA, et al. Imaging of bladder cancer. *Radiol Clin North Am* 2007;45:183-205.
- ¹² Rouprêt M, Babjuk M, Compérat E, et al. European guidelines on upper tract urothelial carcinomas: 2013 update. *Eur Urol* 2013;63:1059-1071.
- ¹³ Gakis G, Witjes JA, Compérat E, et al. EAU guidelines on primary urethral carcinoma. *Eur Urol* 2013;64:823-830.

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PRINCIPLES OF SURGICAL MANAGEMENT

Transurethral Resection of the Bladder Tumor (TURBT) for Staging

- Adequate resection with muscle in specimen
 - ▶ Muscle may be omitted in cases of documented low-grade Ta disease
 - ▶ In cases of suspected or known CIS:
 - ◊ Biopsy adjacent to papillary tumor
 - ◊ Consider prostate urethral biopsy
 - ▶ Papillary appearing tumor (likely non-muscle invasive)
 - ◊ Early repeat TURBT (within 6 weeks) if:
 - Incomplete initial resection
 - No muscle in original specimen for high-grade disease
 - Large (≥3 cm) or multifocal lesions
 - Any T1 lesion
 - ▶ Transurethral resection (TUR) for sessile or invasive appearing tumor (likely muscle invasive)
 - ◊ Repeat TURBT if:
 - Prior resection did not include muscle in the setting of high-grade disease
 - Any T1 lesion
 - First resection does not allow adequate staging/attribution of risk for treatment selection
 - Incomplete resection and considering tri-modality bladder preservation therapy
- Enhanced (blue light and narrow-band imaging) cystoscopy may be helpful in identifying lesions not visible using white light cystoscopy.
- Immediate postoperative intravesical chemotherapy within 24 hours is recommended if NMIBC and if no concern for bladder perforation and visibly complete resection.
 - ▶ Gemcitabine (preferred) (category 1) and mitomycin (category 1) are the most commonly used options for intravesical chemotherapy.

TURBT/Maximal TURBT for Treatment

- Maximally complete and safe TURBT is an essential part of bladder preservation. [See Principles of Radiation Therapy \(BL-H\).](#)
- TURBT alone can be considered for non-cystectomy candidates.
- A visually complete TURBT is associated with improved patient outcomes in non-metastatic settings.

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[Continued](#)



PRINCIPLES OF SURGICAL MANAGEMENT

Transurethral Resection of the Prostate (TURP)

- Primary treatment option for urothelial carcinoma of the prostate with ductal/acini or prostatic urethral pathology.
- Postsurgical intravesical BCG is recommended [[see Principles of Intravesical Treatment \(BL-F\)](#)].

Transurethral Resection (TUR) of the Urethral Tumor

- Primary treatment of Tis, Ta, T1 primary carcinoma of the urethra.
- Patients with a prior radical cystectomy and a cutaneous diversion should consider a total urethrectomy.
- Consider postsurgical intraurethral therapy [[see Principles of Intravesical Treatment \(BL-F\)](#)].

Partial Cystectomy

- May be used for cT2 muscle invasive disease with solitary lesion in location amenable to segmental resection with adequate margins, particularly for purely non-urothelial histology. May also be appropriate in other select situations including cancer in a bladder diverticulum.
- No CIS as determined by random biopsies.
- Should be given with neoadjuvant cisplatin-based combination chemotherapy.
- Bilateral pelvic lymphadenectomy should be performed and include common, internal iliac, external iliac, and obturator nodes.

Radical Cystectomy/Cystoprostatectomy

- In non-muscle invasive disease, radical cystectomy is generally reserved for residual high-grade cT1, variant histology, lymphovascular invasion, concomitant CIS, and Bacillus Calmette-Guérin (BCG)-unresponsive disease.
- Cystectomy should be done within 3 months of diagnosis if no therapy is given.
- Primary treatment option for cT2, cT3, and cT4a disease. Highly select patients with cT4b disease that responds to primary treatment may be eligible for cystectomy.
- Should be given with neoadjuvant cisplatin-based combination chemotherapy for patients with cT2–cT4a disease. For patients who cannot receive neoadjuvant chemotherapy, radical cystectomy alone is an option.
- Bilateral pelvic lymphadenectomy should be performed and include common, internal iliac, external iliac, and obturator nodes.
- In appropriately selected female patients, approaches that preserve the uterus, vagina, and/or ovaries should be employed when feasible.

Radical Nephroureterectomy with Cuff of Bladder

- Primary treatment option for non-metastatic high-grade upper GU tract tumors.
- For upper GU tract urothelial carcinoma, strongly consider single-dose immediate postoperative intravesical chemotherapy, as randomized trials have shown a decrease in intravesical recurrence. The most commonly used option for intravesical chemotherapy is mitomycin; gemcitabine is being utilized in select patients.
- Neoadjuvant chemotherapy should be considered in select patients with high-grade disease or concerning radiographic findings.
- Adjuvant chemotherapy may also be considered in patients who did not receive neoadjuvant chemotherapy (Birtle A, et al. Lancet 2020;395:1268-1277).

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[Continued](#)



PRINCIPLES OF SURGICAL MANAGEMENT

Regional Lymphadenectomy

- Recommended for patients with high-grade upper GU tract tumors.
- Left-sided renal pelvic, upper ureteral, and midureteral tumors:
 - Regional lymphadenectomy should include the paraaortic lymph nodes from the renal hilum to the aortic bifurcation.
 - Most midureteral tumors will also include the common iliac, external iliac, obturator, and hypogastric lymph nodes.
- Right-sided renal pelvic, upper ureteral, and midureteral tumors:
 - Regional lymphadenectomy should include the paracaval lymph nodes from the renal hilum to the inferior vena cava (IVC) bifurcation.
 - Most midureteral tumors will also include the common iliac, external iliac, obturator, and hypogastric lymph nodes.
- Distal ureteral tumors:
 - Regional lymphadenectomy should be performed and include the common iliac, external iliac, obturator, and hypogastric lymph nodes.

Urethrectomy

- Neoadjuvant chemotherapy (category 2B) or chemoradiation should be considered.
- Distal urethrectomy may include inguinal lymph node dissection in selected cases.
- Total urethrectomy may include inguinal lymphadenectomy in selected cases.
- Male patients with T2 primary carcinoma of the urethra in the bulbar urethra may be treated with a urethrectomy with or without a cystoprostatectomy.
- Male patients
 - with T2 primary carcinoma of the urethra in the pendulous urethra may receive a distal urethrectomy. Alternatively, a partial penectomy can be considered. A total penectomy may be necessary in cases of recurrence.
- Female patients
 - with T2 primary carcinoma of the urethra may be treated with urethrectomy and cystectomy with organ-sparing approaches when feasible in appropriately selected cases.

Pelvic Exenteration (category 2B)

- Therapy for recurrence in female patients with \geq T2 primary carcinoma of the urethra.
- Ilioinguinal lymphadenectomy and/or chemoradiotherapy can be considered in patients with \geq T3 disease.

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[Continued](#)



PRINCIPLES OF SURGICAL MANAGEMENT

Endoscopic Management of Upper Tract Urothelial Cancer (UTUC)

- **Favorable clinical and pathologic criteria for nephron preservation:**
 - Low-grade tumor based on cytology and biopsy
 - Papillary architecture
 - Tumor size <1.5 cm
 - Unifocal tumor
 - Cross-sectional imaging showing no concern for invasive disease
- **For favorable tumors - ureteroscopic and percutaneous management provide similar survival outcomes compared to nephroureterectomy**
- **Less favorable clinical and pathologic criteria for nephron preservation:**
 - Multifocal tumors
 - Flat or sessile tumor architecture
 - Tumor size >1.5 cm
 - High-grade tumors
 - cT2–T4 tumors
 - Mid and proximal ureteral tumor due to technical challenges
 - Tumor crossing in fundibulum or ureteropelvic junction
- **Imperative indications for conservative therapy of UTUC**
 - Bilateral renal pelvis and/or urothelial carcinoma of the ureter
 - Solitary or solitary functioning kidney
 - Chronic kidney disease/renal insufficiency
- **Percutaneous or ureteroscopic surgical procedures**
 - Tumor fulguration/cautery
 - Tumor resection incorporating electrical energy, baskets, or cold cup devices with fulguration of the tumor bed
 - Laser therapies (Nd:YAG – penetration 4–6 mm; Ho:YAG – shallow penetration <0.5 mm)
- **Extirpative surgical procedures**
 - Segmental ureterectomy ± ureteral reimplantation for distal ureteral tumors
 - Complete ureterectomy with ileal ureter replacement (proximal/mid ureteral tumors)
- **Topical immunotherapy and chemotherapy management**
 - BCG, mitomycin
 - Route of administration might include percutaneous antegrade (preferred) or retrograde ureteral catheters
 - Induction and maintenance therapy regimens, similar to intravesical therapy, can be used
- **Patients with renal pelvis and urothelial carcinoma of the ureter managed with nephron-preserving procedures and adjunctive therapies require long-term surveillance, including cross-sectional urography or endoscopic visualization. Treatment can be associated with patient anxiety, tumor seeding, and the need for multiple procedures and ultimate nephroureterectomy with bladder cuff. Clinical/pathologic understaging is problematic. Recurrence or tumor persistence might be life-threatening due to disease progression.**

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PRINCIPLES OF PATHOLOGY MANAGEMENT

2016 WHO Classification of Tumors of the Urothelial Tract^{1,2}

Urothelial Tumors

- Infiltrating urothelial carcinoma
 - Infiltrating urothelial carcinoma
 - Infiltrating urothelial carcinoma with divergent differentiation
 - ◊ Squamous differentiation
 - ◊ Glandular differentiation
 - ◊ Trophoblastic differentiation
 - ◊ Müllerian differentiation
 - Infiltrating urothelial carcinoma, variants:
 - ◊ Nested, including large nested
 - ◊ Microcystic
 - ◊ Micropapillary
 - ◊ Lymphoepithelioma-like
 - ◊ Plasmacytoid/ signet ring cell/diffuse
 - ◊ Sarcomatoid
 - ◊ Giant cell
 - ◊ Poorly differentiated
 - ◊ Lipid-rich
 - ◊ Clear cell
- Noninvasive urothelial neoplasms
 - Urothelial CIS
 - Noninvasive papillary urothelial carcinoma, low grade
 - Noninvasive papillary urothelial carcinoma, high-grade
 - Papillary urothelial neoplasm of low malignant potential
 - Urothelial papilloma
 - Inverted urothelial papilloma
 - Urothelial proliferation of uncertain malignant potential
 - Urothelial dysplasia^a

Squamous Cell Neoplasms

- Pure squamous cell carcinoma
- Verrucous carcinoma
- Squamous cell papilloma

Glandular Neoplasms

- Adenocarcinoma, NOS
 - Enteric
 - Mucinous
 - Mixed
- Villous adenoma

Urachal Carcinoma

Tumors of Müllerian Type

- Clear cell carcinoma
- Endometrioid carcinoma

Neuroendocrine Tumors

- Small cell neuroendocrine carcinoma
- Large cell neuroendocrine carcinoma
- Well-differentiated neuroendocrine tumor
- Paraganglioma

Mesenchymal Tumors

- Rhabdomyosarcoma
- Leiomyosarcoma
- Angiosarcoma
- Malignant inflammatory myofibroblastic tumor
- Malignant perivascular epithelioid cell tumor
- Malignant solitary fibrous tumor

Urothelial Tract Hematopoietic and Lymphoid Tumors

Miscellaneous Tumors

- Epithelial tumors of the upper urinary tract
- Tumors arising in a bladder diverticulum
- Urothelial tumors of the urethra
- Malignant melanoma
- Carcinoma of Skene, Cowper, and Littre glands
- Metastatic tumors and tumors extending from other organs

References

- ¹Moch H, Cubilla AL, Humphrey PA, et al. The 2016 WHO Classification of Tumours of the Urinary System and Male Genital Organs-Part A: Renal, Penile, and Testicular Tumours. Eur Urol 2016;70:93-105.
- ²Humphrey PA, Moch H, Cubilla AL, et al. The 2016 WHO Classification of Tumours of the Urinary System and Male Genital Organs-Part B: Prostate and Bladder Tumours. Eur Urol 2016;70:106-119.

^aThe term “urothelial dysplasia” is very rarely used. Its morphologic features are poorly defined and interobserver reproducibility of this diagnosis is very low.

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[Continued](#)



PRINCIPLES OF PATHOLOGY MANAGEMENT

- The pathology report on biopsy/TURBT specimens should specify:
 - ▶ If muscularis propria (detrusor muscle) is present and if present whether it is invaded by tumor
 - ▶ Presence or absence of lamina propria invasion
 - ▶ Presence or absence of lymphovascular space invasion
 - ▶ Presence or absence of adjacent urothelial carcinoma in situ
- Urothelial tumors with an inverted growth pattern should be graded similar to the system for papillary tumors as described above

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

**BLADDER CANCER: NON-UROTHELIAL AND UROTHELIAL WITH VARIANT HISTOLOGY****Mixed Histology:**

- Urothelial carcinoma plus squamous differentiation, adenocarcinoma differentiation, micropapillary, nested, plasmacytoid, and sarcomatoid should be identified because of the potential to have a more aggressive natural history.
- These are usually treated in a similar manner to pure urothelial carcinoma of the bladder.
- Micropapillary,^{1,2} plasmacytoid,³ and sarcomatoid histologies are generally at higher risk for progression to muscle invasive disease and a more aggressive approach should be considered.

Pure Squamous:

- No proven role for neoadjuvant/adjuvant chemotherapy for pure squamous cell carcinoma of the bladder.
- Local control with surgery or RT and best supportive care ([See NCCN Guidelines for Palliative Care](#)) recommended.
- For advanced disease, clinical trial preferred. For selected patients, combination chemotherapy with paclitaxel, ifosfamide, and cisplatin may be considered.⁴
- Consider postoperative RT in selected cases (positive margins).⁵

Pure Adenocarcinoma Including Urachal Carcinoma:

- No proven role for neoadjuvant/adjuvant chemotherapy for pure adenocarcinomas of the bladder including urachal carcinoma.
- Local control with surgery or RT and best supportive care ([See NCCN Guidelines for Palliative Care](#)) recommended.
- For urachal carcinoma with localized disease, a partial or complete cystectomy with en bloc resection of the urachal ligament with umbilicus and lymph node dissection is recommended.
- For node-positive disease, consider chemotherapy with colorectal regimen (FOLFOX [oxaliplatin, leucovorin, and 5-FU] or GemFLP [5-FU, leucovorin, gemcitabine, and cisplatin]). Consider post-chemotherapy surgical consolidation in responding disease.
- For advanced disease, clinical trial preferred. For selected patients, combination chemotherapy with a 5-FU–based regimen (FOLFOX or GemFLP) or ITP (paclitaxel, ifosfamide, and cisplatin). Alternatively, combination paclitaxel and platinum may be considered.^{4,6}
- For non-urachal pure adenocarcinoma, consider additional metastatic workup. [See NCCN Guidelines for Occult Primary.](#)

Any Small Cell Component (or neuroendocrine features):

- Concurrent chemoradiotherapy or neoadjuvant chemotherapy followed by local treatment (cystectomy or radiotherapy) is recommended for any patient with small cell component histology with localized disease regardless of stage. ([See Principles of Systemic Therapy in NCCN Guidelines for Small Cell Lung Cancer](#))
- Neoadjuvant chemotherapy
 - ▶ Standard cisplatin eligible
 - ◇ Etoposide + cisplatin⁷
 - ◇ Alternating ifosfamide + doxorubicin with etoposide + cisplatin⁸⁻¹⁰
 - ▶ Standard cisplatin ineligible
 - ◇ Etoposide + carboplatin¹¹
- Metastatic chemotherapy
 - ▶ Standard cisplatin eligible
 - ◇ Etoposide + cisplatin⁷
 - ▶ Standard cisplatin ineligible
 - ◇ Etoposide + carboplatin¹¹
 - ▶ Alternate regimen for select patients
 - ◇ Alternating ifosfamide + doxorubicin with etoposide + cisplatin⁸⁻¹⁰

Primary Bladder Sarcoma:

- Treatment as per [NCCN Guidelines for Soft Tissue Sarcoma](#).

Note: All recommendations are category 2A unless otherwise indicated.

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[References](#)



BLADDER CANCER: NON-UROTHELIAL AND UROTHELIAL WITH VARIANT HISTOLOGY

REFERENCES

- ¹ Meeks JJ, et al. Pathological response to neoadjuvant chemotherapy for muscle-invasive micropapillary bladder cancer. *BJU Int* 2013;111:E325-30.
- ² Siefker-Radtke AO, Dinney CP, Shen Y, et al. A phase 2 clinical trial of sequential neoadjuvant chemotherapy with ifosfamide, doxorubicin, and gemcitabine followed by cisplatin, gemcitabine, and ifosfamide in locally advanced urothelial cancer: Final results. *Cancer* 2013;119:540-547.
- ³ Dayyani F, Czerniak BA, Sircar K, et al. Plasmacytoid urothelial carcinoma, a chemosensitive cancer with poor prognosis, and peritoneal carcinomatosis. *J Urol* 2013;189:1656-1661.
- ⁴ Galsky M, Iasonos A, Mironov S, et al. Prospective trial of ifosfamide, paclitaxel, and cisplatin in patients with advanced non-transitional cell carcinoma of the urothelial tract. *Urology* 2007;69:255-259.
- ⁵ Zaghloul MS, Awwad HK, Akoush HH, et al. Postoperative radiotherapy of carcinoma in bilharzial bladder: improved disease free survival through improving local control. *Int J Radiat Oncol Biol Phys* 1992;23:511-517.
- ⁶ Siefker-Radtke A, Gee J, Shen Y, et al. Multimodality management of urachal carcinoma: The M. D. Anderson Cancer Center experience. *J Urol* 2003;169:1295-1298.
- ⁷ Roth BJ, Johnson DH, Einhorn LH, et al. Randomized study of cyclophosphamide, doxorubicin, and vincristine versus etoposide and cisplatin versus alternation of these two regimens in extensive small-cell lung cancer: a phase III trial of the Southeastern Cancer Study Group. *J Clin Oncol* 1992;10:282-291.
- ⁸ Siefker-Radtke AO, Kamat AM, Grossman HB, et al. Phase II clinical trial of neoadjuvant alternating doublet chemotherapy with ifosfamide/doxorubicin and etoposide/cisplatin in small-cell urothelial cancer. *J Clin Oncol* 2009; 27:2592-2597.
- ⁹ Lynch SP, Shen Y, Kamat A, et al. Neoadjuvant chemotherapy in small cell urothelial cancer improves pathologic downstaging and long-term outcomes: Results from a retrospective study at the MD Anderson Cancer Center. *Eur Urol* 2013;64:307-313.
- ¹⁰ Siefker-Radtke AO, Dinney CP, Abrahams NA, et al. Evidence supporting preoperative chemotherapy for small cell carcinoma of the bladder: A retrospective review of the M. D. Anderson cancer experience. *J Urol* 2004;172:481-484.
- ¹¹ Okamoto H, Watanabe K, Nishiwaki Y, et al. Phase II study of area under the plasma-concentration-versus-time curve-based carboplatin plus standard-dose intravenous etoposide in elderly patients with small-cell lung cancer. *J Clin Oncol* 1999;17:3540-3545.

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FOLLOW-UP

No single follow-up plan is appropriate for all patients. The follow-up tables are to provide guidance, and should be modified for the individual patient based on sites of disease, biology of disease, and length of time on treatment. Reassessment of disease activity should be performed in patients with new or worsening signs or symptoms of disease, regardless of the time interval from previous studies. Further study is required to define optimal follow-up duration.

Table 1: AUA Risk Stratification for Non-Muscle Invasive Bladder Cancer*

Low Risk	Intermediate Risk	High Risk
<ul style="list-style-type: none"> • Papillary urothelial neoplasm of low malignant potential • Low grade urothelial carcinoma <ul style="list-style-type: none"> ▸ Ta and ▸ ≤3 cm and ▸ Solitary 	<ul style="list-style-type: none"> • Low grade urothelial carcinoma <ul style="list-style-type: none"> ▸ T1 or ▸ >3 cm or ▸ Multifocal or ▸ Recurrence within 1 year • High grade urothelial carcinoma <ul style="list-style-type: none"> ▸ Ta and ▸ ≤3 cm and ▸ Solitary 	<ul style="list-style-type: none"> • High grade urothelial carcinoma <ul style="list-style-type: none"> ▸ CIS or ▸ T1 or ▸ >3 cm or ▸ Multifocal • Very high risk features (any): <ul style="list-style-type: none"> ▸ BCG unresponsive ▸ Variant histologies ▸ Lymphovascular invasion ▸ Prostatic urethral invasion

Reproduced with permission from Chang SS, Boorjian SA, Chou R, et al. Diagnosis and treatment of non-muscle invasive bladder cancer: AUA/SUO guideline. J Urol 2016;196:1021.

*Within each of these risk strata an individual patient may have more or less concerning features that can influence care.

Table 2: Low-Risk,¹ Non-Muscle Invasive Bladder Cancer

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	3, 12	Annually				As clinically indicated	
Upper tract ² and abdominal/ pelvic ³ imaging ⁴	Baseline imaging	As clinically indicated					
Blood tests	N/A						
Urine tests	N/A						

[Intermediate Risk, Non-Muscle Invasive \(BL-E 2 of 6\)](#)

[High-Risk, Non-Muscle Invasive \(BL-E 2 of 6\)](#)

[Post-Cystectomy Non-Muscle Invasive Bladder Cancer \(BL-E 3 of 6\)](#)

[Post-Cystectomy Muscle Invasive Bladder Cancer \(BL-E 4 of 6\)](#)

[Post-Bladder Sparing \(BL-E 5 of 6\)](#)

[Metastatic Disease: Observation \(BL-E 6 of 6\)](#)

[See Recurrent or Persistent Disease \(BL-11\)](#)

¹ See AUA Risk Stratification for Non-Muscle Invasive Bladder Cancer definitions on [BL-2](#).

² Upper tract imaging includes CTU, MRU, intravenous pyelogram (IVP), retrograde pyelography, or ureteroscopy.

³ Abdominal/pelvic imaging includes CT or MRI.

⁴ [See Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

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[See NCCN Guidelines for Survivorship](#)



FOLLOW-UP

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Table 3: Intermediate Risk,¹ Non-Muscle Invasive Bladder Cancer

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	3, 6, 12	Every 6 mo	Annually			As clinically indicated	
Upper tract ² and abdominal/ pelvic ³ imaging ⁴	Baseline imaging	As clinically indicated					
Blood tests	N/A						
Urine tests	Urine cytology ⁵ 3, 6, 12	Urine cytology every 6 mo	Annually			As clinically indicated	

Table 4: High-Risk,¹ Non-Muscle Invasive Bladder Cancer

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	Every 3 mo		Every 6 mo			Annually	As clinically indicated
Upper tract ² imaging ⁴	Baseline imaging, and at 12 mo	Every 1–2 y					As clinically indicated
Abdominal/pelvic ³ imaging ⁴	Baseline imaging	As clinically indicated					
Blood tests	N/A						
Urine tests	• Urine cytology ⁵ every 3 mo • Consider urinary urothelial tumor markers (category 2B)		Urine cytology every 6 mo			Annually	As clinically indicated

¹ See AUA Risk Stratification for Non-Muscle Invasive Bladder Cancer definitions on [BL-2](#).

² Upper tract imaging includes CTU, MRU, IVP, retrograde pyelography, or ureteroscopy.

³ Abdominal/pelvic imaging includes CT, MRI, or FDG PET/CT (category 2B) (PET/CT not recommended for NMIBC).

⁴ [See Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

⁵ Urine cytology should be done at time of cystoscopy if bladder in situ.

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Table 5: Post-Cystectomy Non-Muscle Invasive Bladder Cancer

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	N/A						
Imaging ⁴	• CTU or MRU (image upper tracts + axial imaging of abdomen/pelvis) at 3 and 12 mo	CTU or MRU (image upper tracts + axial imaging of abdomen/pelvis) annually				Renal US annually ⁶	As clinically indicated
Blood tests	• Renal function testing (electrolytes and creatinine) every 3–6 mo • LFT ⁷ every 3–6 mo • CBC, CMP every 3–6 mo if received chemotherapy	• Renal function testing (electrolytes and creatinine) annually • LFT ⁷ annually • B ₁₂ annually				B ₁₂ annually	
Urine tests	• Urine cytology ⁵ every 6–12 mo • Consider urethral wash cytology every 6–12 mo ⁸	Urine cytology as clinically indicated Urethral wash cytology as clinically indicated					

[Post-Cystectomy MIBC \(BL-E 4 of 6\)](#)

[Post-Bladder Sparing \(BL-E 5 of 6\)](#)

[See Recurrent or Persistent Disease \(BL-11\)](#)

⁴ See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

⁵ Urine cytology should be done at time of cystoscopy if bladder in situ.

⁶ Renal US to look for hydronephrosis.

⁷ Liver function testing includes AST, ALT, bilirubin, and alkaline phosphatase.

⁸ Urethral wash cytology is reserved for patients with high-risk disease. High-risk disease includes: positive urethral margin, multifocal CIS, and prostatic urethral invasion.

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FOLLOW-UP

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Table 6: Post-Cystectomy Muscle Invasive Bladder Cancer

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	N/A						
Imaging ⁴	<ul style="list-style-type: none">• CTU or MRU (image upper tracts + axial imaging of abdomen/pelvis) every 3–6 mo• Chest x-ray or CT chest every 3–6 mo or• FDG PET/CT (category 2B) only if metastatic disease suspected		<ul style="list-style-type: none">• Abdominal/pelvic CT or MRI annually• Chest x-ray or CT chest annually or• FDG PET/CT (category 2B) only if metastatic disease suspected			Renal US annually ⁶	As clinically indicated
Blood tests	<ul style="list-style-type: none">• Renal function testing (electrolytes and creatinine) every 3–6 mo• LFT⁷ every 3–6 mo• CBC, CMP every 3–6 mo if received chemotherapy	<ul style="list-style-type: none">• Renal function testing (electrolytes and creatinine) annually<ul style="list-style-type: none">• LFT⁷ annually• B₁₂ annually				B ₁₂ annually	
Urine tests	<ul style="list-style-type: none">• Urine cytology⁵ every 6–12 mo• Consider urethral wash cytology every 6–12 mo⁸		Urine cytology as clinically indicated Urethral wash cytology as clinically indicated				

[Post-Bladder Sparing \(BL-E 5 of 6\)](#)

[See Recurrent or Persistent Disease \(BL-11\)](#)

⁴ See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

⁵ Urine cytology should be done at time of cystoscopy if bladder in situ.

⁶ Renal US to look for hydronephrosis.

⁷ Liver function testing includes AST, ALT, bilirubin, and alkaline phosphatase.

⁸ Urethral wash cytology is reserved for patients with high-risk disease. High-risk disease includes: positive urethral margin, multifocal CIS, and prostatic urethral invasion.

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FOLLOW-UP

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Table 7: Post-Bladder Sparing (ie, Partial Cystectomy or Chemoradiation)

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	Every 3 mo		Every 6 mo		Annually		As clinically indicated
Imaging ⁴	<ul style="list-style-type: none">• CTU or MRU (image upper tracts + axial imaging of abdomen/pelvis) every 3–6 mo for MIBC• Chest x-ray or CT chest every 3–6 mo for MIBC or• FDG PET/CT (category 2B) only if metastatic disease suspected		<ul style="list-style-type: none">• Abdominal/pelvic CT or MRI annually• Chest x-ray or CT chest annually or• FDG PET/CT (category 2B) only if metastatic disease suspected⁹			As clinically indicated	
Blood tests	<ul style="list-style-type: none">• Renal function testing (electrolytes and creatinine) every 3–6 mo• LFT⁷ every 3–6 mo• CBC, CMP every 3–6 mo if received chemotherapy	<ul style="list-style-type: none">• Renal function testing (electrolytes and creatinine) as clinically indicated• LFT⁷ as clinically indicated					
Urine tests	Urine cytology ⁵ every 6–12 mo		Urine cytology ⁵ as clinically indicated				

⁴ See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

⁵ Urine cytology should be done at time of cystoscopy if bladder in situ.

⁷ Liver function testing includes AST, ALT, bilirubin, and alkaline phosphatase.

⁹ PET/CT not recommended for NMIBC.

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Table 8: Metastatic Disease: Observation

Test	Year						
	1	2	3	4	5	5–10	>10
Cystoscopy	• Every 3–6 mo as clinically indicated						
Imaging⁴	• CTU or MRU (image upper tracts + axial imaging of abdomen/pelvis) every 3–6 mo if clinically indicated and with any clinical change or new symptoms • CT chest/abdomen/pelvic every 3–6 mo and with any clinical change or new symptoms or • FDG PET/CT (category 2B)						
Blood tests	• CBC, CMP every 1–3 mo • B12 annually for patients who had undergone a cystectomy						
Urine tests	• Urine cytology ⁵ as clinically indicated						

⁴ See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

⁵ Urine cytology should be done at time of cystoscopy if bladder in situ.

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PRINCIPLES OF INTRAVESICAL TREATMENT

Indications: Based on probability of recurrence and progression to muscle invasive disease, such as size, number, and grade.

Intravesical Therapy for Bladder Cancer

Immediate Postoperative Intravesical Chemotherapy

• [See Clinical Presentation and Initial Evaluation \(BL-1\)](#)

- A single instillation of chemotherapy is administered within 24 hours of surgery (ideally within 6 hours).
- Gemcitabine (preferred) (category 1)¹ and mitomycin (category 1)² are the most commonly used agents in the United States for intravesical chemotherapy. Thiotepea does not appear to be effective.³
- Immediate postoperative intravesical chemotherapy reduces the 5-year recurrence rate by approximately 35% and has a number needed to treat to prevent a recurrence of 7. However, it does not reduce the risk of progression or the risk of cancer mortality.³
- It is not effective in patients with an elevated EORTC recurrence risk score (≥5). This includes patients with ≥8 tumors and those with ≥1 recurrence per year.
- Contraindications include: bladder perforation, known drug allergy

Induction (Adjuvant) Intravesical Chemotherapy or BCG

- Treatment option for NMIBC.
- The most commonly used agents are BCG, mitomycin, and gemcitabine.
- In the event of a BCG shortage, BCG should be prioritized for induction of high-risk patients (eg, high-grade T1 and CIS). Preferable alternatives to BCG include mitomycin or gemcitabine.
 - ▶ Other options include: sequential gemcitabine/docetaxel, epirubicin, valrubicin, docetaxel, or sequential gemcitabine/mitomycin.
 - ▶ If feasible, the dose of BCG may be split (1/3 or 1/2 dose) so that multiple patients may be treated with a single vial in the event of a shortage.
- Initiated 3–4 weeks after TURBT with or without maintenance.
- Weekly instillations during induction are given for approximately 6 weeks.
- Maximum of 2 consecutive cycle inductions without complete response.
- Withhold if traumatic catheterization, bacteriuria, persistent gross hematuria, persistent severe local symptoms, or systemic symptoms.

Maintenance Intravesical BCG

- Although there is no standard regimen for maintenance BCG, many NCCN Member Institutions follow the SWOG regimen consisting of a 6-week induction course of BCG followed by maintenance with 3 weekly instillations at months 3, 6, 12, 18, 24, 30, and 36.⁴
- In the event of a BCG shortage, BCG should be prioritized for high-risk patients (eg, high-grade T1 and CIS), especially in the early maintenance period (ie, 3 and 6 months post-induction).
 - ▶ If feasible, the dose of BCG may be split (1/3 or 1/2 dose) so that multiple patients may be treated with a single vial in the event of a shortage.
- Ideally maintenance should be given for 1 year for intermediate-risk and 3 years for high-risk NMIBC.
- BCG would be withheld if traumatic catheterization, bacteriuria, persistent gross hematuria, persistent severe local symptoms, or systemic symptoms.
- Dose reduction is encouraged if there are substantial local symptoms during maintenance therapy.
- Data suggest the benefit of maintenance BCG therapy through a decreased rate of recurrence for NMIBC.⁴

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[Continued](#)
[References](#)

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PRINCIPLES OF INTRAVESICAL TREATMENT

Indications: Based on probability of recurrence and progression to muscle invasive disease, such as size, number, and grade.

Topical or Percutaneous Administration of Chemotherapy or BCG

- Although the target site differs, the principles of this treatment are similar to intravesical therapy. Topical chemotherapeutic agents are delivered by instillation. Administration can be percutaneous or through a retrograde approach using a catheter. There is no standard regimen and patients should be referred to an institution with experience in this treatment or a clinical trial.

Postsurgical Intraprostatic BCG for Urothelial Carcinoma of the Prostate

- Treatment for patients with ductal + acini, or prostatic urethra involvement. [See Urothelial Carcinoma of the Prostate \(UCP-1\)](#)
- Induction (adjuvant) therapy should be initiated 3–4 weeks after TURP
- Induction BCG should be followed with maintenance BCG
- Data indicate a reduction in recurrence in the prostate in patients with superficial disease⁵⁻¹¹

Postsurgical Intraurethral Therapy for Primary Carcinoma of the Urethra

- Consider as primary treatment for select patients with Tis, Ta, or T1 disease. [See Primary Carcinoma of the Urethra \(PCU-2\)](#)
- Induction (adjuvant) therapy should be initiated 3–4 weeks after TUR.
- The most commonly used agents are BCG, mitomycin, and gemcitabine.
- Role of maintenance in this context is uncertain.
- Efficacy of this treatment in primary carcinoma of the urethra has not been established.

Intrapelvic and Intravesical Therapy for Upper Tract Tumors

- Primary Therapy
 - Complete or near complete endoscopic resection or ablation is recommended prior to mitomycin ureteral gel application, which is most suitably indicated for a residual, low-grade, low-volume (5–15 mm), solitary tumor in the upper urinary tract for a patient not a candidate for or not seeking nephroureterectomy as a definitive treatment. Mitomycin for pyelocaliceal application may be administered via ureteral catheter or a nephrostomy tube.
- Postsurgical Therapy
 - Consider intrapelvic therapy for patients with non-metastatic, low-grade tumors of the renal pelvis. [See Upper GU Tract Tumors: Renal Pelvis \(UTT-1\)](#)
 - ◊ Intrapelvic induction (adjuvant) therapy should be initiated 3–4 weeks after endoscopic resection.
 - ◊ The most commonly used agents for intrapelvic therapy are BCG, mitomycin C, and gemcitabine.
 - ◊ Role of maintenance following intrapelvic therapy in this context is uncertain.
 - ◊ Efficacy of intrapelvic therapy in upper urinary tract cancer has not been established.¹²⁻¹⁴
 - Perioperative intravesical chemotherapy with mitomycin or gemcitabine should be considered following nephroureterectomy with cuff of bladder resection.

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[References](#)



PRINCIPLES OF INTRAVESICAL TREATMENT REFERENCES

- ¹ Messing E, Tangen C, Lerner S, et al. Effect of intravesical instillation of gemcitabine vs saline immediately following resection of suspected low-grade non-muscle-invasive bladder cancer on tumor recurrence. *JAMA* 2018;319:1880-1888.
- ² Bosschiet J, Nieuwenhuijzen JA, van Ginkel T, et al. Value of an immediate intravesical instillation of mitomycin C in patients with non-muscle-invasive bladder cancer: A prospective multicentre randomised study in 2243 patients. *Eur Urol* 2018;73:226-232.
- ³ Sylvester RJ, Oosterlinck W, Holmang S, et al. Systematic review and individual patient data meta-analysis of randomized trials comparing a single immediate instillation of chemotherapy after transurethral resection with transurethral resection alone in patients with stage pTa-pT1 urothelial carcinoma of the bladder: Which patients benefit from the instillation? *Eur Urol* 2016;69:231-244.
- ⁴ Lamm DL, Blumenstein BA, Crissman JD, et al. Maintenance bacillus Calmette-Guerin immunotherapy for recurrent TA, T1 and carcinoma in situ transitional cell carcinoma of the bladder: a randomized Southwest Oncology Group Study. *J Urol* 2000;163:1124-1129.
- ⁵ Hillyard RW, Jr., Ladaga L, Schellhammer PF. Superficial transitional cell carcinoma of the bladder associated with mucosal involvement of the prostatic urethra: results of treatment with intravesical bacillus Calmette-Guerin. *J Urol* 1988;139:290-293.
- ⁶ Canda AE, Tuzel E, Mungan MU, et al. Conservative management of mucosal prostatic urethral involvement in patients with superficial transitional cell carcinoma of the bladder. *Eur Urol* 2004;45:465-469; discussion 469-470.
- ⁷ Palou J, Xavier B, Laguna P, et al. In situ transitional cell carcinoma involvement of prostatic urethra: bacillus Calmette-Guerin therapy without previous transurethral resection of the prostate. *Urology* 1996;47:482-484.
- ⁸ Schellhammer PF, Ladaga LE, Moriarty RP. Intravesical bacillus Calmette-Guerin for the treatment of superficial transitional cell carcinoma of the prostatic urethra in association with carcinoma of the bladder. *J Urol* 1995;153:53-56.
- ⁹ Bretton PR, Herr HW, Whitmore WF, Jr., et al. Intravesical bacillus Calmette-Guerin therapy for in situ transitional cell carcinoma involving the prostatic urethra. *J Urol* 1989;141:853-856.
- ¹⁰ Orihuela E, Herr HW, Whitmore WF, Jr. Conservative treatment of superficial transitional cell carcinoma of prostatic urethra with intravesical BCG. *Urology* 1989;34:231-237.
- ¹¹ Solsona E, Iborra I, Ricos JV, et al. Recurrence of superficial bladder tumors in prostatic urethra. *Eur Urol* 1991;19:89-92.
- ¹² Cutress ML, Stewart GD, Zakikhani P, et al. Ureteroscopic and percutaneous management of upper tract urothelial carcinoma (UTUC): systematic review. *BJU Int* 2012;110:614-628.
- ¹³ Hayashida Y, Nomata K, Noguchi M, et al. Long-term effects of bacille Calmette-Guerin perfusion therapy for treatment of transitional cell carcinoma in situ of upper urinary tract. *Urology* 2004;63:1084-1088.
- ¹⁴ Audenet F, Traxer O, Bensalah K, Roupret M. Upper urinary tract instillations in the treatment of urothelial carcinomas: a review of technical constraints and outcomes. *World J Urol* 2013;31:45-52.

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PRINCIPLES OF SYSTEMIC THERAPY

Perioperative chemotherapy (neoadjuvant [preferred for bladder] or adjuvant)
Preferred regimens <ul style="list-style-type: none"> • DDMVAC (dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin) with growth factor support for 3 or 4 cycles^{1,2} • Gemcitabine and cisplatin for 4 cycles^{3,4}
Other recommended regimens <ul style="list-style-type: none"> • CMV (cisplatin, methotrexate, and vinblastine) for 3 cycles⁵

- For patients who are not candidates for cisplatin, there are no data to support a recommendation for perioperative chemotherapy.
- Randomized trials and meta-analyses show a survival benefit for cisplatin-based neoadjuvant chemotherapy (3 or 4 cycles) in patients with MIBC.^{1,6,7}
- Meta-analysis suggests overall survival benefit with adjuvant cisplatin-based chemotherapy for pathologic T3, T4 or N+ disease at cystectomy, if it was not given as neoadjuvant.⁷
- Neoadjuvant chemotherapy is preferred over adjuvant-based chemotherapy on a higher level of evidence data.
- DDMVAC is preferred over standard MVAC based on category 1 evidence for metastatic disease showing DDMVAC to be better tolerated and more effective than conventional MVAC in advanced disease.^{2,8} Based on these data, the traditional dose and schedule for MVAC is no longer recommended.
- Perioperative gemcitabine and cisplatin is a reasonable alternative to DDMVAC based on category 1 evidence for metastatic disease showing equivalence to conventional MVAC in the setting of advanced disease.^{4,9}
- For gemcitabine/cisplatin, a 21-day cycle is preferred. Better dose compliance may be achieved with fewer delays in dosing using the 21-day schedule.¹⁰
- Neoadjuvant chemotherapy may be considered for select patients with UTUC, particularly for higher stage and/or grade tumors, as renal function will decline after nephroureterectomy and may preclude adjuvant therapy.
 - ▶ Adjuvant therapy should be considered if neoadjuvant therapy was not given for UTUC (Birtle A, et al. Lancet 2020;395:1268-1277).
- Carboplatin should not be substituted for cisplatin in the perioperative bladder cancer setting.
 - ▶ For patients with borderline renal function or minimal dysfunction, a split-dose administration of cisplatin may be considered (such as 35 mg/m² on days 1 and 2 or days 1 and 8) (category 2B). While safer, the relative efficacy of the cisplatin-containing combination administered with such modifications remains undefined.
- For patients with borderline renal function, estimate GFR to assess eligibility for cisplatin. Consider timed urine collection, which may more accurately determine eligibility for cisplatin.

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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PRINCIPLES OF SYSTEMIC THERAPY

First-line systemic therapy for locally advanced or metastatic disease (Stage IV)	
Cisplatin eligible	Preferred regimens <ul style="list-style-type: none"> Gemcitabine and cisplatin⁴ (category 1) followed by avelumab maintenance therapy (category 1)^{a,11} DDMVAC with growth factor support (category 1)^{2,8} followed by avelumab maintenance therapy (category 1)^{a,11}
Cisplatin ineligible	Preferred regimens <ul style="list-style-type: none"> Gemcitabine and carboplatin¹² followed by avelumab maintenance therapy (category 1)^{a,11} Atezolizumab¹³ (only for patients whose tumors express PD-L1^b or who are not eligible for any platinum-containing chemotherapy regardless of PD-L1 expression) Pembrolizumab¹⁴ (only for patients whose tumors express PD-L1^c or who are not eligible for any platinum-containing chemotherapy regardless of PD-L1 expression) Other recommended regimens <ul style="list-style-type: none"> Gemcitabine¹⁵ Gemcitabine and paclitaxel¹⁶ Useful under certain circumstances <ul style="list-style-type: none"> Ifosfamide, doxorubicin, and gemcitabine¹⁷ (for patients with good kidney function and good PS)

- The presence of both non-nodal metastases and ECOG performance score ≥ 2 strongly predict poor outcome with chemotherapy. Patients without these adverse prognostic factors have the greatest benefit from chemotherapy. The impact of these factors in relation to immune checkpoint inhibition is not fully defined, but they remain poor prognostic indicators in general.
- For most patients, the risks of adding paclitaxel to gemcitabine and cisplatin outweigh the limited benefit seen in the randomized trial.¹⁸
- A substantial proportion of patients cannot receive cisplatin-based chemotherapy due to renal impairment or other comorbidities.
 - Participation in clinical trials of new or more tolerable therapy is recommended.

^a Maintenance therapy with avelumab only if there is no progression on first-line platinum-containing chemotherapy.

^b Atezolizumab: SP142 assay, PD-L1–stained tumor-infiltrating immune cells covering $\geq 5\%$ of the tumor area.

^c Pembrolizumab: 22C3 antibody assay, Combined Positive Score (CPS) ≥ 10 .

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NCCN Guidelines Version 3.2021

Bladder Cancer

PRINCIPLES OF SYSTEMIC THERAPY

Second-line systemic therapy for locally advanced or metastatic disease (Stage IV) (post-platinum)^{d,e} Participation in clinical trials of new agents is recommended.	
Preferred regimen • Pembrolizumab (category 1) ¹⁹	Other recommended regimens • Paclitaxel ²⁴ or docetaxel ²⁵ • Gemcitabine ¹⁵
Alternative preferred regimens • Immune checkpoint inhibitor ▶ Nivolumab ²⁰ ▶ Avelumab ^{21,22} • Erdafitinib ^{f,23}	Useful in certain circumstances based on prior medical therapy • Ifosfamide, doxorubicin, and gemcitabine ¹⁷ • Gemcitabine and paclitaxel ¹⁶ • Gemcitabine and cisplatin ⁴ • DDMVAC with growth factor support ²

Second-line systemic therapy for locally advanced or metastatic disease (Stage IV) (post-checkpoint inhibitor) Participation in clinical trials of new agents is recommended.	
Preferred regimen for cisplatin ineligible, chemotherapy naïve • Gemcitabine/carboplatin	Other recommended regimens • Erdafitinib ^{f,23} • Paclitaxel or docetaxel ²⁵ • Gemcitabine ¹⁵
Preferred regimens for cisplatin eligible, chemotherapy naïve • Gemcitabine and cisplatin ⁴ • DDMVAC with growth factor support ²	Useful in certain circumstances based on prior medical therapy • Ifosfamide, doxorubicin, and gemcitabine ¹⁷ • Gemcitabine and paclitaxel ¹⁶

^d If PFS >12 months after platinum (eg, cisplatin or carboplatin), consider re-treatment with platinum if the patient is still platinum eligible.^e Also for patients who received a therapy other than platinum or an immune checkpoint inhibitor in first-line.^f Only for patients with susceptible *FGFR3* or *FGFR2* genetic alterations.**Note:** All recommendations are category 2A unless otherwise indicated.**Clinical Trials:** NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.[Continued](#)
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**PRINCIPLES OF SYSTEMIC THERAPY**

<u>Subsequent-line systemic therapy for locally advanced or metastatic disease (Stage IV)^{g,h}</u> Participation in clinical trials of new agents is recommended.	
<u>Preferred regimens</u> <ul style="list-style-type: none"> • Enfortumab vedotin-ejfv (category 1)^{26,27} • Erdafitinib^f 	<u>Other recommended regimens</u> <ul style="list-style-type: none"> • Gemcitabine¹⁵ • Paclitaxel²⁴ or docetaxel²⁵ • Ifosfamide, doxorubicin, and gemcitabine¹⁷ • Gemcitabine and paclitaxel¹⁶ • Gemcitabine and cisplatin⁴ • DDMVAC with growth factor support² • Sacituzumab govitecan-hziy²⁸

^f Only for patients with susceptible *FGFR3* or *FGFR2* genetic alterations.^g Patient should have already received platinum and a checkpoint inhibitor, if eligible.^h These therapies are appropriate for patients who received a first-line platinum-containing chemotherapy followed by avelumab maintenance therapy.**Note: All recommendations are category 2A unless otherwise indicated.****Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.**[Continued](#)
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Bladder Cancer

PRINCIPLES OF SYSTEMIC THERAPY

<u>Radiosensitizing chemotherapy regimens for organ-preserving chemoradiation</u>
<u>Preferred regimens</u> (doublet chemotherapy is preferred when feasible) <ul style="list-style-type: none"> • Cisplatinⁱ and 5-FU^{29,30} • Cisplatinⁱ and paclitaxel^{29,31} • 5-FU and mitomycin³² • Cisplatinⁱ alone³³
<u>Other recommended regimen</u> <ul style="list-style-type: none"> • Low-dose gemcitabine^{30,34,35} (category 2B)

<u>Radiosensitizing chemotherapy given concurrently with conventionally fractionated radiation with palliative intent for regional disease</u>
<u>Preferred regimen</u> <ul style="list-style-type: none"> • Cisplatinⁱ
<u>Other recommended regimens</u> <ul style="list-style-type: none"> • Taxane (docetaxel or paclitaxel) (category 2B) • 5-FU (category 2B) • 5-FU and mitomycin (category 2B) • Low-dose gemcitabine³⁰ (category 2B) • Capecitabine (category 3)

ⁱ Carboplatin is not an effective radiation sensitizer and should not be substituted for cisplatin with radiation. (Rödel C, Grabenbauer GG, Kühn R, et al. Combined-modality treatment and selective organ preservation in invasive bladder cancer: long-term results. J Clin Oncol 2002; 20:3061.)

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[References](#)

**PRINCIPLES OF SYSTEMIC THERAPY - REFERENCES**

- ¹ Grossman HB, Natale RB, Tangen CM, et al. Neoadjuvant chemotherapy plus cystectomy compared with cystectomy alone for locally advanced bladder cancer. *N Engl J Med* 2003;349:859-866.
- ² Sternberg CN, de Mulder PH, Schornagel JH, et al. Randomized phase III trial of high-dose-intensity methotrexate, vinblastine, doxorubicin, and cisplatin (MVAC) chemotherapy and recombinant human granulocyte colony-stimulating factor versus classic MVAC in advanced urothelial tract tumors: European Organization for Research and Treatment of Cancer Protocol no. 30924. *J Clin Oncol* 2001;19:2638-2646.
- ³ Dash A, Pettus JA, Herr HW, et al. A role for neoadjuvant gemcitabine plus cisplatin in muscle-invasive urothelial carcinoma of the bladder: a retrospective experience. *Cancer* 2008;113:2471-2477.
- ⁴ Von der Maase H, Hansen SW, Roberts JT, et al. Gemcitabine and cisplatin versus methotrexate, vinblastine, doxorubicin, and cisplatin in advanced or metastatic bladder cancer: results of a large, randomized, multinational, multicenter, phase III study. *J Clin Oncol* 2000;18:3068-3077.
- ⁵ Griffiths G, Hall R, Sylvester R, et al. International phase III trial assessing neoadjuvant cisplatin, methotrexate, and vinblastine chemotherapy for muscle-invasive bladder cancer: long-term results of the BA06 30894 trial. *J Clin Oncol* 2009;27:2171-2177.
- ⁶ Advanced Bladder Cancer Meta-analysis Collaboration. Neoadjuvant chemotherapy in invasive bladder cancer: update of a systematic review and meta-analysis of individual patient data advanced bladder cancer (ABC) meta-analysis collaboration. *Eur Urol* 2005;48:202-205; discussion 205-206.
- ⁷ Advanced Bladder Cancer Meta-analysis Collaboration. Adjuvant chemotherapy in invasive bladder cancer: a systematic review and meta-analysis of individual patient data Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. *Eur Urol* 2005;48:189-199; discussion 199-201.
- ⁸ Sternberg CN, de Mulder P, Schornagel JH, et al. Seven year update of an EORTC phase III trial of high-dose intensity M-VAC chemotherapy and G-CSF versus classic M-VAC in advanced urothelial tract tumours. *Eur J Cancer* 2006;42:50-54.
- ⁹ von der Maase H, Sengelov L, Roberts JT, et al. Long-term survival results of a randomized trial comparing gemcitabine plus cisplatin, with methotrexate, vinblastine, doxorubicin, plus cisplatin in patients with bladder cancer. *J Clin Oncol* 2005;23:4602-4608.
- ¹⁰ Soto Parra H, Cavina R, Latteri F, et al. Three-week versus four-week schedule of cisplatin and gemcitabine: results of a randomized phase II study. *Ann Oncol* 2002;13:1080-1086.
- ¹¹ Powles T, Park SH, Voog E, et al. Maintenance avelumab + best supportive care (BSC) versus BSC alone after platinum-based first-line (1L) chemotherapy in advanced urothelial carcinoma (UC): JAVELIN Bladder 100 phase III interim analysis. *J Clin Oncol* 38: 2020 (suppl; abstr LBA1).
- ¹² De Santis M, Bellmunt J, Mead G, et al: Randomized phase II/III trial assessing gemcitabine/carboplatin and methotrexate/carboplatin/vinblastine in patients with advanced urothelial cancer who are unfit for cisplatin-based chemotherapy: EORTC study 30986. *J Clin Oncol* 2012;30:191-199.
- ¹³ Balar AV, Galsky MD, Rosenberg JE, et al. Atezolizumab as first-line treatment in cisplatin-ineligible patients with locally advanced and metastatic urothelial carcinoma: a single-arm, multicentre, phase 2 trial. *Lancet* 2017;389:67-76.
- ¹⁴ Balar AV, Castellano DE, O'Donnell PH, et al. Pembrolizumab as first-line therapy in cisplatin-ineligible advanced urothelial cancer: Results from the total KEYNOTE-052 study population [abstract]. *J Clin Oncol* 2018;6S:Abstract 284.
- ¹⁵ Stadler WM, Kuzel T, Roth B, et al: Phase II study of single-agent gemcitabine in previously untreated patients with metastatic urothelial cancer. *J Clin Oncol* 1997;15:3394-3398.
- ¹⁶ Calabro F, Lorusso V, Rosati G, et al: Gemcitabine and paclitaxel every 2 weeks in patients with previously untreated urothelial carcinoma. *Cancer* 2009;115:2652-2659.
- ¹⁷ Siefker-Radtke AO, Dinney CP, Shen Y, et al: A phase 2 clinical trial of sequential neoadjuvant chemotherapy with ifosfamide, doxorubicin, and gemcitabine followed by cisplatin, gemcitabine, and ifosfamide in locally advanced urothelial cancer: final results. *Cancer* 2013;119:540-547.
- ¹⁸ Bellmunt J, von der Maase H, Mead GM, et al. Randomized phase III study comparing paclitaxel/cisplatin/gemcitabine and gemcitabine/cisplatin in patients with locally advanced or metastatic urothelial cancer without prior systemic therapy: EORTC Intergroup Study 30987. *J Clin Oncol* 2012;30:1107-1113.
- ¹⁹ Bellmunt, de Wit R, Vaughn D, et al. Pembrolizumab as second-line therapy for advanced urothelial carcinoma. *N Engl J Med* 2017;376:1015-1026.
- ²⁰ Sharma P, Retz M, Siefker-Radtke A, et al. Nivolumab in metastatic urothelial carcinoma after platinum therapy (CheckMate 275): A multicentre, single-arm, phase 2 trial. *Lancet Oncol* 2017;18:312-322.
- ²¹ Apolo AB, Infante JR, Patel MR, et al. Avelumab, an anti-programmed death-ligand 1 antibody, in patients with refractory metastatic urothelial carcinoma: Results from a multicenter, phase Ib study. *J Clin Oncol* 2017;35:2117-2124.
- ²² Patel M, Ellerton J, Infante J, et al. Avelumab in patients with metastatic urothelial carcinoma: Pooled results from two cohorts of the phase 1b JAVELIN Solid Tumor trial [abstract]. *J Clin Oncol* 2018;6S:Abstract 330.

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PRINCIPLES OF SYSTEMIC THERAPY - REFERENCES

- ²³ Loriot Y, Necchi A, Park SH, et al. Erdafitinib in locally advanced or metastatic urothelial carcinoma. *N Engl J Med* 2019;381:338-348.
- ²⁴ Sideris S, Auon F, Zanaty M, et al. Efficacy of weekly paclitaxel treatment as a single agent chemotherapy following first-line cisplatin treatment in urothelial bladder cancer. *Mol Clin Oncol* 2016;4:1063-1067.
- ²⁵ McCaffrey JA, Hilton S, Mazumdar M, et al. Phase II trial of docetaxel in patients with advanced or metastatic transitional-cell carcinoma. *J Clin Oncol* 1997;15:1853-1857.
- ²⁶ Rosenberg JE, O'Donnell PH, Balar AV, et al. Pivotal trial of enfortumab vedotin in urothelial carcinoma after platinum and anti-programmed death 1/programmed death ligand 1 therapy. *J Clin Oncol* 2019;37:2592-2600.
- ²⁷ Powles T, Rosenberg JE, Sonpavde G, et al. Enfortumab vedotin in previously treated advanced urothelial carcinoma. *N Engl J Med* 2021;384:1125-1135.
- ²⁸ Loriat Y, et al. TROPY-U-01 cohort 1 final results: A phase II study of sacituzumab govitecan (SG) in metastatic urothelial cancer (mUC) that has progressed after platinum (PLT) and checkpoint inhibitors (CPI) [abstract]. *Ann Oncol* 2020;31:Abstract LBA24.
- ²⁹ Mitin T, Hunt D, Shipley W, et al. Transurethral surgery and twice-daily radiation plus paclitaxel-cisplatin or fluorouracil-cisplatin with selective bladder preservation and adjuvant chemotherapy for patients with muscle invasive bladder cancer (RTOG 0233): a randomized multicentre phase 2 trial. *Lancet Oncol* 2013;14:863-872.
- ³⁰ Coen JJ, Zhang P, Saylor PJ, et al. Bladder preservation with twice-a-day radiation plus fluorouracil/cisplatin or once daily radiation plus gemcitabine for muscle-invasive bladder cancer: NRG/RTOG 0712-A randomized phase II trial. *J Clin Oncol* 2019;37:44-51.
- ³¹ Efsthathiou JA, Spiegel DY, Shipley WU, et al. Long-term outcomes of selective bladder preservation by combined-modality therapy for invasive bladder cancer: The MGH experience. *Eur Urol* 2012; 61:705-711.
- ³² James ND, Hussain SA, Hall E, et al; BC2001 Investigators. Radiotherapy with or without chemotherapy in muscle-invasive bladder cancer. *N Engl J Med* 2012;366:1477-1488.
- ³³ Tester W, Caplan R, Heaney J, et al. Neoadjuvant combined modality program with selective organ preservation for invasive bladder cancer: results of Radiation Therapy Oncology Group phase II trial 8802. *J Clin Oncol* 1996;14:119-126.
- ³⁴ Kent E et al. Combined-modality therapy with gemcitabine and radiotherapy as a bladder preservation strategy: results of a phase I trial. *J Clin Oncol* 2004;22:2540-2545.
- ³⁵ Choudhury A, Swindell R, Logue JP, et al. Phase II study of conformal hypofractionated radiotherapy with concurrent gemcitabine in muscle-invasive bladder cancer. *J Clin Oncol* 2011; 29:733-738.

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PRINCIPLES OF RADIATION MANAGEMENT OF INVASIVE DISEASE

Carcinoma of the Bladder: Unless otherwise stated, doses are 1.8–2.0 Gy daily fractionation.

- Precede radiation therapy (RT) alone or concurrent chemoradiotherapy by maximal TUR of the tumor when safely possible.
- Simulating and treating patients when they have an empty bladder is preferred for daily reproducibility (bladder full for tumor boosts is acceptable with image guidance).
- Use multiple fields from high-energy linear accelerator beams.
- For invasive tumors, consider low-dose preoperative RT prior to segmental cystectomy (category 2B).
- Concurrent chemoradiotherapy or RT alone is most successful for patients without hydronephrosis and without extensive CIS associated with their muscle-invading tumor.
- For patients with stage Ta, T1, or Tis, external beam RT (EBRT) alone is rarely appropriate. For patients with recurrent Ta–T1 disease usually following BCG therapy but without extensive Tis who are not candidates for cystectomy, concurrent chemoradiotherapy may be considered as a potentially curative alternative to radical cystectomy, which is the standard treatment by NCCN Guidelines.
- Treat the whole bladder with or without pelvic nodal radiotherapy 39.6–50.4 Gy using conventional or accelerated hyperfractionation. Elective treatment to the lymph nodes is optional and should take into account patient comorbidities and the risks of toxicity to adjacent critical structures. Then boost either the whole or partial bladder between 60–66 Gy. For node-positive disease, consider boosting grossly involved nodes to the highest achievable dose that does not violate dose-volume histogram (DVH) parameters based on the clinical scenario. Reasonable alternatives to conventional fractionation include taking the whole bladder to 55 Gy in 20 fractions, or using simultaneous integrated boosts to sites of gross disease.
- When irradiating the bladder only or bladder tumor boost, consider daily image guidance.
- Concurrent chemoradiotherapy is recommended for added tumor cytotoxicity, and can be given without significant increased toxicity over RT alone. Concurrent 5-FU and mitomycin C or low-dose gemcitabine can be used instead of cisplatin-containing regimens in patients with low or moderate renal function. Such therapy is optimally given by dedicated multidisciplinary teams.
- Concurrent chemoradiotherapy (preferred) or RT alone should be considered as potentially curative therapy for medically inoperable patients. Concurrent chemoradiotherapy or RT alone should be considered for local palliation in patients with metastatic disease.
- When giving palliative radiation for metastatic bladder cancer or for recurrent pelvic tumor, combining radiation with radiosensitizing chemotherapy should be considered. See [BL-G 5 of 7](#) for agents. Chemotherapy should not be used concurrently with high-dose (>3 Gy per fraction) palliative radiation.
- Treatment field should include whole bladder and all sites of gross disease plus or minus uninvolved regional lymph nodes. Regional lymph nodes include the hypogastric, obturator, internal and external iliac, perivesical, sacral, and presacral nodes. For involved nodal disease, the common iliac nodes are a site of secondary involvement.
- For patients with pT3/pT4 pN0–2 urothelial (pure urothelial or primary urothelial mixed with other subtypes) bladder cancer following radical cystectomy with ileal conduit, consider postoperative adjuvant pelvic RT (category 2B). Treatment field should encompass areas at risk for harboring residual microscopic disease based on pathologic findings at resection and may include cystectomy bed and pelvic lymph nodes with doses in the range of 45 to 50.4 Gy. Involved resection margins and areas of extranodal extension could be boosted to 54–60 Gy if feasible based on normal tissue constraints.
- Tumor status assessment after completion of full-dose primary chemoradiotherapy. See Table 7 on [BL-E 5 of 6](#).
- In highly selected T4b tumor cases, may consider intraoperative RT.
- Concurrent chemoradiotherapy is generally most suitable for patients with solitary tumors, negative nodes, no extensive or multifocal CIS, no moderate/severe tumor-related hydronephrosis, and good pre-treatment bladder function.

Note: All recommendations are category 2A unless otherwise indicated.

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[References](#)

BL-H
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PRINCIPLES OF RADIATION MANAGEMENT OF INVASIVE DISEASE

Carcinoma of the Urethra: Unless otherwise stated, doses are 1.8–2.0 Gy daily fractionation.

- Data support the use of RT for urothelial carcinoma and squamous cell carcinoma of the urethra (case series and experience treating these carcinomas arising from other disease sites); radiation can also be considered for adenocarcinomas of the urethra.
- Definitive Radiation Therapy (organ preservation)
 - ▶ cT2 cN0
 - ◊ 66–70 Gy EBRT delivered to gross disease with a margin to encompass areas of potential microscopic spread. Concurrent chemotherapy with regimens used for bladder cancer is encouraged for added tumor cytotoxicity.
 - ◊ Strongly consider prophylactic radiation treatment of regional-nodal basins (inguinal and low pelvic nodes for female and distal male tumors; pelvic lymph nodes for proximal male tumors).
 - ▶ cT3–T4, or lymph node positive
 - ◊ 45–50.4 Gy EBRT delivered to gross disease with a margin to encompass areas of microscopic spread and to regional-nodal basins (inguinal and low pelvic nodes for female and distal male tumors; pelvic lymph nodes for proximal male tumors). Boost gross primary disease to 66–70 Gy and gross nodal disease to 54–66 Gy, if feasible. Dose delivered to gross nodal disease may be limited secondary to normal tissue dose constraints. Concurrent chemotherapy should be administered for added tumor cytotoxicity.
 - ▶ Postoperative adjuvant radiation therapy
 - ◊ Treatment field should encompass areas at risk for harboring residual microscopic disease based on pathologic findings at resection and may include resection bed, inguinal lymph nodes, and pelvic lymph nodes. Areas at risk for harboring residual microscopic disease should receive 45–50.4 Gy EBRT. Involved resection margins and areas of extranodal extension should be boosted to 54–60 Gy if feasible based on normal tissue constraints. Areas of gross residual disease should be boosted to 66–70 Gy, if feasible based on normal tissue constraints. Concurrent chemotherapy with regimens used for bladder cancer should be considered for added tumor cytotoxicity.
 - ▶ Recurrent disease
 - ◊ Clinical target volume (CTV) should include gross disease in any suspected areas of spread at 66–74 Gy (higher dose up to 74 Gy for larger tumor and non-urothelial histology) and consideration can be given to elective regional-nodal basins (45–50.4 Gy) as discussed above, if feasible based on normal tissue constraints.

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[References](#)



PRINCIPLES OF RADIATION MANAGEMENT OF INVASIVE DISEASE REFERENCES

- Baumann BC, Bosch WR, Bahl A, et al. Development and validation of consensus contouring guidelines for adjuvant radiation therapy for bladder cancer after Radical cystectomy. *Int J Radiat Oncol Biol Phys* 2018;96:78-86.
- Baumann BC, He J, Hwang WT, et al. Validating a local failure risk stratification for use in prospective studies of adjuvant radiation therapy for bladder cancer. *Int J Radiat Oncol Biol Phys* 2018;95:703-706.
- Coen JJ, Zhang P, Saylor PJ, et al. Selective bladder preservation with twice-daily radiation plus 5-fluorouracil/cisplatin (FCT) or daily radiation plus gemcitabine (GD) for patients with muscle invasive bladder cancer: Primary results of NRG/RTOG 0712—A randomized phase 2 multicenter trial [Abstract]. *J Clin Oncol* 2018;36:6_suppl, 408.
- Efstathiou JA, Spiegel DY, Shipley WU, et al. Long-term outcomes of selective bladder preservation by combined-modality therapy for invasive bladder cancer: the MGH experience. *Eur Urol* 2012;61:705-711.
- Efstathiou JA, Zietman AL. Bladder Cancer. In Gunderson & Tepper, editors. *Clinical Radiation Oncology*. Churchill Livingstone Elsevier 2015.
- James ND, Hussain SA, Hall E, et al. Radiotherapy with or without chemotherapy in muscle-invasive bladder cancer. *N Engl J Med* 2012; 366:1477-1488.
- Kamat AM, Hahn NM, Efstathiou JA, et al. Bladder cancer. *Lancet* 2016;338:2796-2810.
- Mak RH, Hunt D, Shipley WU, et al. Long-term outcomes in patients with muscle-invasive bladder cancer after selective bladder-preserving combined-modality therapy: A pooled analysis of Radiation Therapy Oncology Group protocols 8802, 8903, 9506, 9706, 9906, and 0233. *J Clin Oncol* 2014;32:3801-3809.
- Mitin T, Hunt D, Shipley WU, et al. Transurethral surgery and twice-daily radiation plus paclitaxel-cisplatin or fluorouracil-cisplatin with selective bladder preservation and adjuvant chemotherapy for patients with muscle invasive bladder cancer (RTOG 0233): A randomised multicentre phase 2 trial. *Lancet Oncol* 2013;14:863-872.
- Ploussard G, Daneshmand S, Efstathiou JA, et al. Critical analysis of bladder sparing with trimodal therapy in muscle-invasive bladder cancer: a systematic review. *Eur Urol* 2014; 66:120-137.
- Rödel C, Grabenbauer GG, Kühn R, et al. Combined-modality treatment and selective organ preservation in invasive bladder cancer: long-term results. *J Clin Oncol* 2002; 20:3061-3071.
- Shipley WU, Prout GR, Kaufman SD, Perrone TL. Invasive bladder carcinoma. The importance of initial transurethral surgery and other significant prognostic factors for improved survival with full-dose irradiation. *Cancer* 1987;60:514-520.
- Weiss C, Wolze C, Engehausen DG, Ott OJ, et al. Radiochemotherapy after transurethral resection for high-risk T1 bladder cancer: An alternative to intravesical therapy or early cystectomy? *J Clin Oncol* 2006;24:2318-2324.
- Zaghloul MS, Christodouleas JP, Smith A, et al. Adjuvant sandwich chemotherapy plus radiotherapy vs adjuvant chemotherapy alone for locally advanced bladder cancer after radical cystectomy: A randomized phase 2 trial. *JAMA Surg*. 2018;153:e174591.

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Upper GU Tract Tumors

WORKUP

- Renal pelvis →
- Imaging of upper tract collecting system^a
 - Cytology
 - Cystoscopy
 - Uteroscopy and biopsy and/or selective washings
 - Renal function tests
 - Chest x-ray or CT
 - CBC, chemistry profile
 - Nuclear medicine renal scan (optional)
 - Bone scan^a if clinical suspicion or symptoms of bone metastases
 - Family history; for those at high risk, consider evaluation for Lynch syndrome (<60 y at presentation, personal history of colon/endometrial cancer)^b

Non-metastatic

Low grade^c

High grade,^c large, or parenchymal invasion

Metastatic

PRIMARY TREATMENT^d

Nephroureterectomy with cuff of bladder ± perioperative intravesical chemotherapy^e or
Endoscopic resection^f ± postsurgical intrapelvic chemotherapy or BCG

Nephroureterectomy with cuff of bladder + regional lymphadenectomy ± perioperative intravesical chemotherapy^e and consider neoadjuvant chemotherapy^g in selected patients

Systemic therapy^h

[See Adjuvant Treatment and Follow-up \(UTT-3\)](#)

^a See Principles of Imaging for Bladder/Urothelial Cancer (BL-A).

^b See NCCN Guidelines for Genetic/Familial High-Risk Assessment: Colorectal.

^c Montironi R, Lopez-Beltran A. The 2004 WHO classification of bladder tumors: A summary and commentary. Int J Surg Pathol 2005;13:143-153. See Principles of Pathology Management (BL-C).

^d See Principles of Surgical Management (BL-B).

^e See Principles of Intravesical Treatment (BL-F).

^f Complete or near complete endoscopic resection or ablation is recommended prior to mitomycin ureteral gel application, which is most suitably indicated for a residual, low-grade, low-volume (5–15 mm), solitary tumor in the upper urinary tract for a patient not a candidate for or not seeking nephroureterectomy as a definitive treatment. Mitomycin for pyelocaliceal application may be administered via ureteral catheter or a nephrostomy tube.

^g See Principles of Systemic Therapy (BL-G 1 of 7).

^h See Principles of Systemic Therapy (BL-G 2 of 7, 3 of 7, and 4 of 7).

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



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Upper GU Tract Tumors

WORKUP

Urothelial
carcinoma
of the ureter

- Imaging of upper tract collecting system^a
- Cytology
- Cystoscopy
- Ureteroscopy and biopsy and/or selective washings
- Renal function tests
- Nuclear medicine renal scan (optional)
- Chest x-ray or CT
- CBC, chemistry profile
- Bone scan^a if clinical suspicion or symptoms of bone metastases
- Family history; for those at high risk, consider evaluation for Lynch syndrome^b

Upper

Mid

Low grade^c

High grade^c

Distal

Metastatic

PRIMARY TREATMENT^d

Nephroureterectomy with cuff of bladder and regional lymphadenectomy if high grade and consider neoadjuvant chemotherapy^g in selected patients or
Endoscopic resection^f

Endoscopic resection^f
or
Nephroureterectomy with cuff of bladder
or
Excision and ureteroureterostomy/ileal ureter in highly selected patients

Nephroureterectomy with cuff of bladder and regional lymphadenectomy and consider neoadjuvant chemotherapy^g in selected patients

Distal ureterectomy and regional lymphadenectomy if high grade and reimplantation of ureter (preferred if clinically feasible) and consider neoadjuvant chemotherapy^g in selected patients
or
Endoscopic resection^f (low grade)
or
Nephroureterectomy with cuff of bladder and regional lymphadenectomy if high grade and consider neoadjuvant chemotherapy^g in selected patients

Systemic therapy^h

[See
Adjuvant
Treatment
and Follow-
up \(UTT-3\)](#)

^a See [Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\)](#).

^b See [NCCN Guidelines for Genetic/Familial High-Risk Assessment: Colorectal](#).

^c Montironi R, Lopez-Beltran A. The 2004 WHO classification of bladder tumors: A summary and commentary. *Int J Surg Pathol* 2005;13:143-153. See [Principles of Pathology Management \(BL-C\)](#).

^d See [Principles of Surgical Management \(BL-B\)](#).

^f Complete or near complete endoscopic resection or ablation is recommended prior to mitomycin ureteral gel application, which is most suitably indicated for a residual, low-grade, low-volume (5–15 mm), solitary tumor in the upper urinary tract for a patient not a candidate for or not seeking nephroureterectomy as a definitive treatment. Mitomycin for pyelocaliceal application may be administered via ureteral catheter or a nephrostomy tube.

^g See [Principles of Systemic Therapy \(BL-G 1 of 7\)](#).

^h See [Principles of Systemic Therapy \(BL-G 2 of 7, 3 of 7, and 4 of 7\)](#).

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



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Upper GU Tract Tumors

PATHOLOGIC STAGINGⁱ

ADJUVANT TREATMENT

FOLLOW-UP

Adjuvant treatment for
renal pelvis
and
urothelial carcinoma
of the ureter

pT0, pT1

None

- Cystoscopy and consider cytology for high grade every 3 months for 1 year, then at longer intervals
- If nephron-sparing surgery, imaging of upper tract collecting system^a or ureteroscopy at 3- to 12-month intervals ± abdominal/pelvic CT or MRI with and without contrast

pT2, pT3,
pT4, pN+

Consider adjuvant
chemotherapy^{g,j}
± RT^k

- Cystoscopy and cytology every 3 months for 1 year, then at longer intervals
- If nephron-sparing surgery, imaging of upper tract collecting system^a or ureteroscopy at 3- to 12-month intervals + abdominal/pelvic CT or MRI with and without contrast + chest imaging

^a See Principles of Imaging for Bladder/Urothelial Cancer (BL-A).

^g See Principles of Systemic Therapy (BL-G 1 of 7).

ⁱ The modifier “p” refers to pathologic staging based on surgical resection and lymph node dissection.

^j Follow recommendations for adjuvant chemotherapy after ensuring that patient is fully staged to rule out metastatic disease.

^k See Principles of Radiation Management of Invasive Disease (BL-H).

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

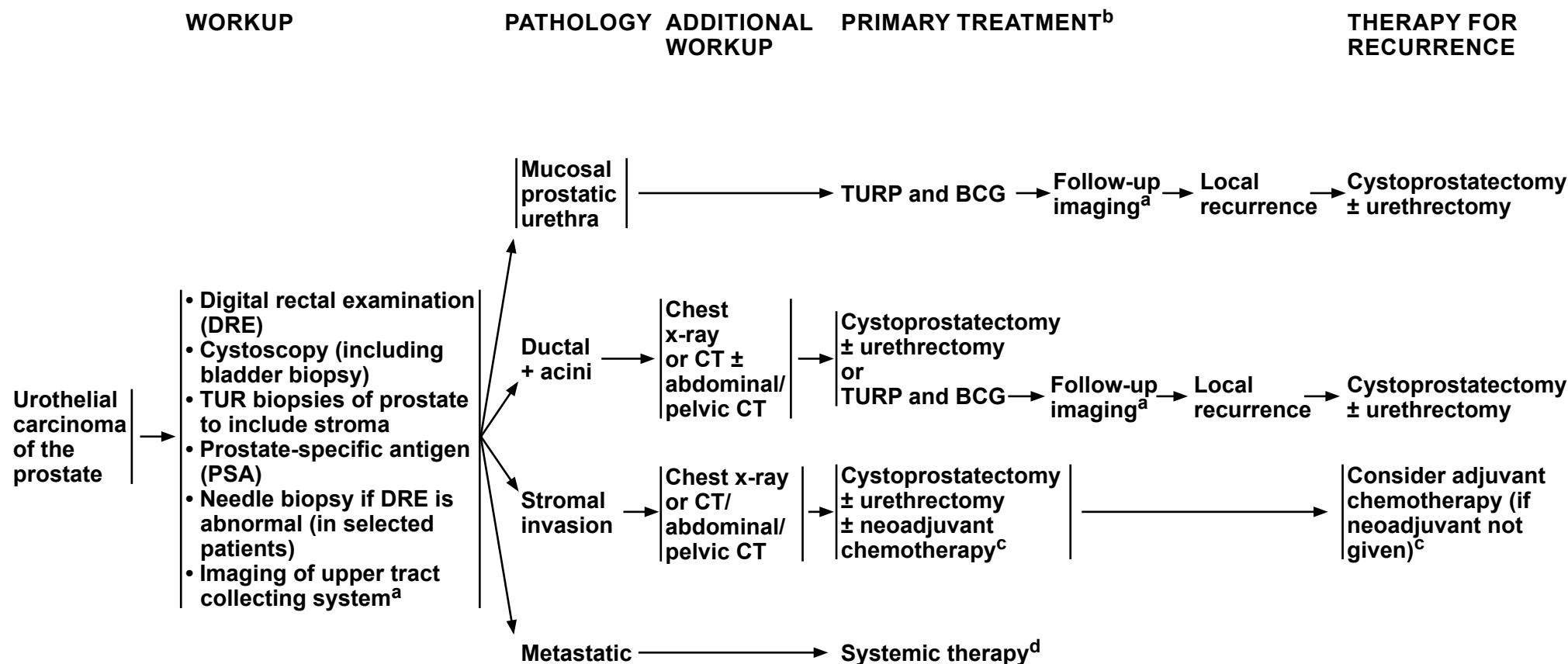


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Urothelial Carcinoma of the Prostate

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^a See Principles of Imaging for Bladder/Urothelial Cancer (BL-A).

^b See Principles of Surgical Management (BL-B).

^c See Principles of Systemic Therapy (BL-G 1 of 7).

^d See Principles of Systemic Therapy (BL-G 2 of 7, 3 of 7, and 4 of 7).

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

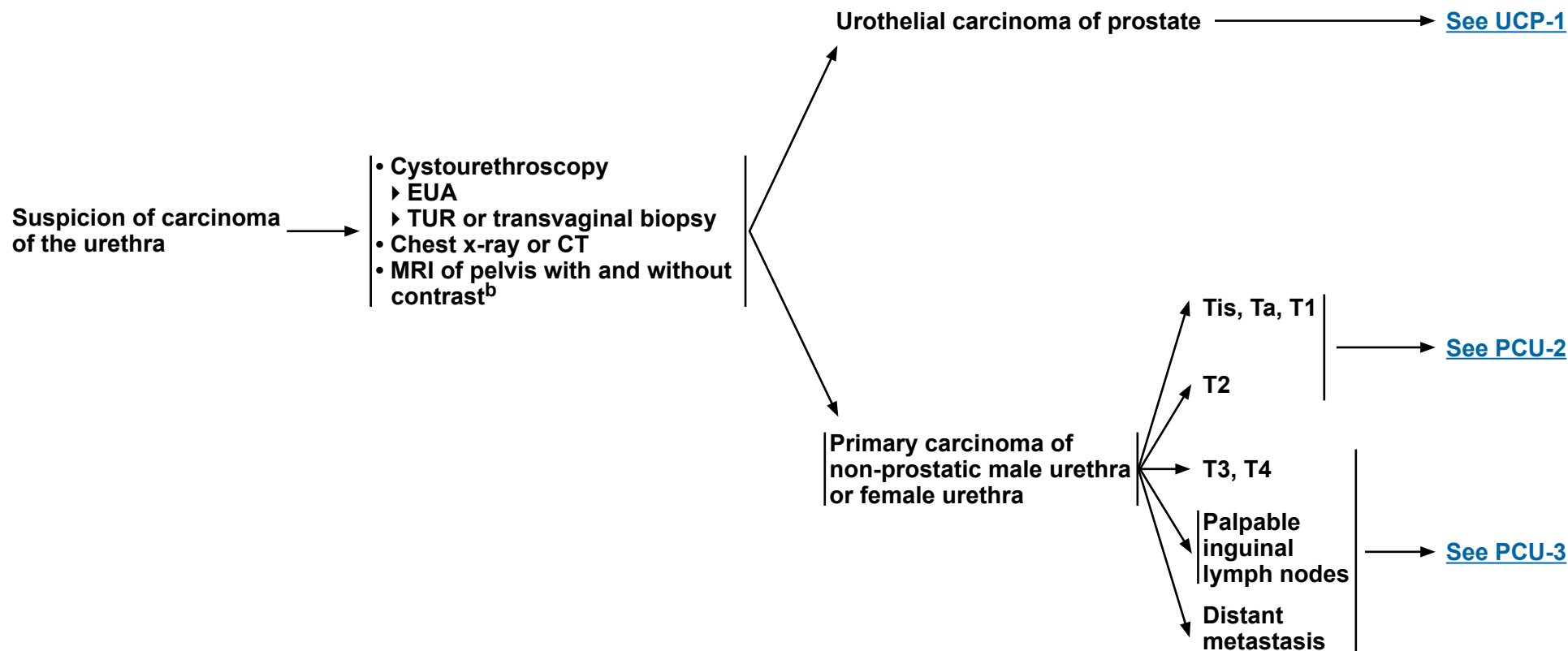


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Primary Carcinoma of the Urethra

WORKUP^a

DIAGNOSIS



^a Referral to a specialized center is recommended.

^b [See Principles of Imaging for Bladder/Urothelial Cancer \(BL-A\).](#)

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

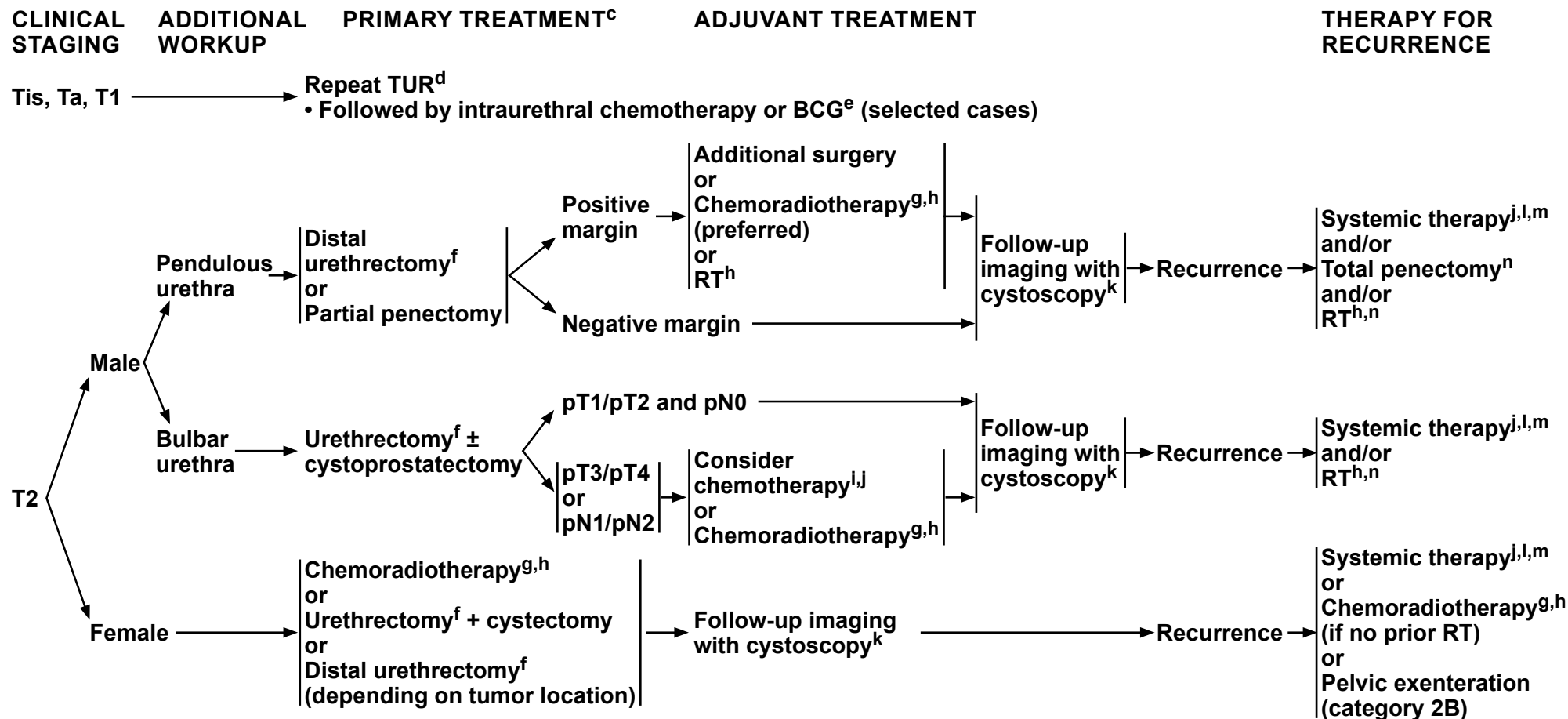


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Primary Carcinoma of the Urethra

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^c See Principles of Surgical Management (BL-B).

^d In patients with a prior radical cystectomy and a cutaneous diversion, consider a total urethrectomy.

^e See Principles of Intravesical Treatment (BL-F).

^f Consider neoadjuvant chemotherapy (category 2B) or chemoradiation.

^g See Principles of Systemic Therapy (BL-G 5 of 7).

^h See Principles of Radiation Management of Invasive Disease-Carcinoma of the Urethra (BL-H 2 of 3).

ⁱ See Principles of Systemic Therapy (BL-G 1 of 7).

^j Chemotherapy regimen based on histology. (Dayyani F, Pettaway C, Kamat A, et al. Retrospective analysis of survival outcomes and the role of cisplatin-based chemotherapy in patients with urethral carcinomas referred to medical oncologists. Urol Oncol 2013;31:1171-1177.) Also see [Non-Urothelial Cell and Urothelial with Variant Histology \(BL-D\)](#).

^k See Principles of Imaging for Bladder/Urothelial Cancer (BL-A).

^l See Principles of Systemic Therapy (BL-G 2 of 7).

^m See Principles of Systemic Therapy (BL-G 3 of 7 and 4 of 7).

ⁿ Consider for local recurrence (± chemotherapy).

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

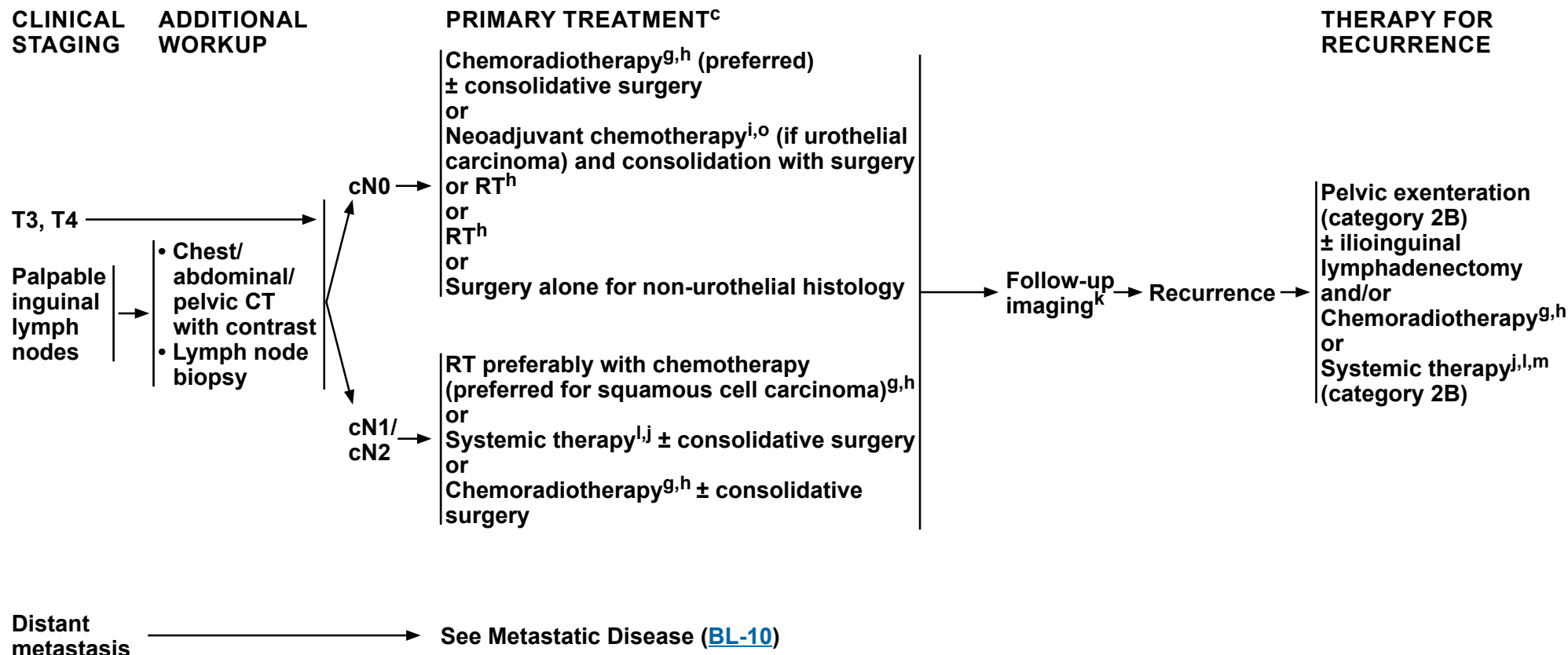


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Primary Carcinoma of the Urethra

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^c See Principles of Surgical Management ([BL-B](#)).

^g See Principles of Systemic Therapy ([BL-G 5 of 7](#)).

^h See Principles of Radiation Management of Invasive Disease-Carcinoma of the Urethra ([BL-H 2 of 3](#)).

ⁱ See Principles of Systemic Therapy ([BL-G 1 of 7](#)).

^j Chemotherapy regimen based on histology. (Dayyani F, Pettaway C, Kamat A, et al. Retrospective analysis of survival outcomes and the role of cisplatin-based chemotherapy in patients with urethral carcinomas referred to medical oncologists. Urol Oncol 2013;31:1171-1177.) Also see [Non-Urothelial Cell and Urothelial with Variant Histology \(BL-D\)](#).

^k See Principles of Imaging for Bladder/Urothelial Cancer ([BL-A](#)).

^l See Principles of Systemic Therapy ([BL-G 2 of 7](#)).

^m See Principles of Systemic Therapy ([BL-G 3 of 7](#) and [4 of 7](#)).

^o Data support neoadjuvant chemotherapy only for urothelial carcinoma.

Note: All recommendations are category 2A unless otherwise indicated.

Clinical Trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.



Table 1. American Joint Committee on Cancer (AJCC) TNM Staging System for Bladder Cancer 8th ed., 2017)

T	Primary Tumor
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Ta	Noninvasive papillary carcinoma
Tis	Urothelial carcinoma in situ: “flat tumor”
T1	Tumor invades lamina propria (subepithelial connective tissue)
T2	Tumor invades muscularis propria
pT2a	Tumor invades superficial muscularis propria (inner half)
pT2b	Tumor invades deep muscularis propria (outer half)
T3	Tumor invades perivesical tissue
pT3a	Microscopically
pT3b	Macroscopically (extravesical mass)
T4	Extravesical tumor directly invades any of the following: prostatic stroma, seminal vesicles, uterus, vagina, pelvic wall, abdominal wall
T4a	Extravesical tumor invades prostatic stroma, seminal vesicles, uterus, vagina
T4b	Extravesical tumor invades pelvic wall, abdominal wall

N	Regional Lymph Nodes
NX	Lymph nodes cannot be assessed
N0	No lymph node metastasis
N1	Single regional lymph node metastasis in the true pelvis (perivesical, obturator, internal and external iliac, or sacral lymph node)
N2	Multiple regional lymph node metastasis in the true pelvis (perivesical, obturator, internal and external iliac, or sacral lymph node metastasis)
N3	Lymph node metastasis to the common iliac lymph nodes

M	Distant Metastasis
M0	No distant metastasis
M1	Distant metastasis
M1a	Distant metastasis limited to lymph nodes beyond the common iliacs
M1b	Non-lymph-node distant metastases

Histologic Grade (G)

For urothelial histologies, a low- and high-grade designation is used to match the current World Health Organization/International Society of Urological Pathology (WHO/ISUP) recommended grading system:

LG	Low-grade
HG	High-grade

For squamous cell carcinoma and adenocarcinoma, the following grading schema is recommended:

GX	Grade cannot be assessed
G1	Well differentiated
G2	Moderately differentiated
G3	Poorly differentiated

Table 2. AJCC Prognostic Groups

	T	N	M		T	N	M
Stage 0a	Ta	N0	M0	Stage IIIB	T1-T4a	N2,N3	M0
Stage 0is	Tis	N0	M0	Stage IVA	T4b	Any N	M0
Stage I	T1	N0	M0		Any T	Any N	M1a
Stage II	T2a	N0	M0	Stage IVB	Any T	Any N	M1b
	T2b	N0	M0				
Stage IIIA	T3a	N0	M0				
	T3b	N0	M0				
	T4a	N0	M0				
	T1-T4a	N1	M0				

[Continued](#)

Used with permission of the American College of Surgeons, Chicago, Illinois. The original source for this information is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer International Publishing.



**Table 3 American Joint Committee on Cancer (AJCC)
TNM Staging System for Renal Pelvis and Ureter Cancer (8th ed., 2017)**

T Primary Tumor

- TX** Primary tumor cannot be assessed
- T0** No evidence of primary tumor
- Ta** Papillary noninvasive carcinoma
- Tis** Carcinoma *in situ*
- T1** Tumor invades subepithelial connective tissue
- T2** Tumor invades the muscularis
- T3** For renal pelvis only: Tumor invades beyond muscularis into peripelvic fat or the renal parenchyma.
For ureter only: Tumor invades beyond muscularis into periureteric fat
- T4** Tumor invades adjacent organs, or through the kidney into the perinephric fat.

N Regional Lymph Nodes

- NX** Regional lymph nodes cannot be assessed
- N0** No regional lymph node metastasis
- N1** Metastasis ≤2 cm in greatest dimension, in a single lymph node
- N2** Metastasis >2 cm in a single lymph node; or multiple lymph nodes

M Distant Metastasis

- M0** No distant metastasis
- M1** Distant metastasis

Histologic Grade (G)

For urothelial histologies, a low- and high-grade designation is used to match the current WHO/ISUP recommended grading system:

LG Low-grade

HG High-grade

For squamous cell carcinoma and adenocarcinoma, the following grading schema is recommended.

GX Grade cannot be assessed

G1 Well differentiated

G2 Moderately differentiated

G3 Poorly differentiated

Table 4. AJCC Prognostic Groups

	T	N	M
Stage 0a	Ta	N0	M0
Stage 0is	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
Stage IV	T4	NX, N0	M0
	Any T	N1	M0
	Any T	N2	M0
	Any T	Any N	M1

[Continued](#)

Used with permission of the American College of Surgeons, Chicago, Illinois. The original source for this information is the AJCC Cancer Staging Manual, Eighth Edition (2017) published by Springer International Publishing.



Table 5. American Joint Committee on Cancer (AJCC) TNM Staging System for Urethral Carcinoma (8th ed., 2017)

Male Penile Urethra and Female Urethra

T Primary Tumor

TX Primary tumor cannot be assessed

T0 No evidence of primary tumor

Ta Non-invasive papillary carcinoma

Tis Carcinoma *in situ*

T1 Tumor invades subepithelial connective tissue

T2 Tumor invades any of the following: corpus spongiosum, periurethral muscle

T3 Tumor invades any of the following: corpus cavernosum, anterior vagina

T4 Tumor invades other adjacent organs (e.g., invasion of the bladder wall)

Prostatic Urethra

T Primary Tumor

TX Primary tumor cannot be assessed

T0 No evidence of primary tumor

Ta Non-invasive papillary carcinoma

Tis Carcinoma in situ involving the prostatic urethra or periurethral or prostatic ducts without stromal invasion

T1 Tumor invades urethral subepithelial connective tissue immediately underlying the urothelium

T2 Tumor invades the prostatic stroma surrounding ducts either by direct extension from the urothelial surface or by invasion from prostatic ducts

T3 Tumor invades the periprostatic fat

T4 Tumor invades other adjacent organs (e.g., extraprostatic invasion of the bladder wall, rectal wall)

N Regional Lymph Nodes

NX Regional lymph nodes cannot be assessed

N0 No regional lymph node metastasis

N1 Single regional lymph node metastasis in the inguinal region or true pelvis [perivesical, obturator, internal (hypogastric) and external iliac], or presacral lymph node

N2 Multiple regional lymph node metastasis in the inguinal region or true pelvis [perivesical, obturator, internal (hypogastric) and external iliac], or presacral lymph node

M Distant Metastasis

M0 No distant metastasis

M1 Distant metastasis

Histologic Grade (G)

Grade is reported by the grade value. For urothelial histology, a low- and high-grade designation is used to match the current WHO/ISUP recommended grading system:

LG Low grade

HG High grade

For squamous cell carcinoma and adenocarcinoma, the following grading schema is recommended:

GX Grade cannot be assessed

G1 Well differentiated

G2 Moderately differentiated

G3 Poorly differentiated

Table 6. AJCC Prognostic Groups

	T	N	M
Stage 0is	Tis	N0	M0
Stage 0a	Ta	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T1	N1	M0
	T2	N1	M0
	T3	N0	M0
	T3	N1	M0
Stage IV	T4	N0	M0
	T4	N1	M0
	Any T	N2	M0
	Any T	Any N	M1



NCCN Categories of Evidence and Consensus

Category 1	Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2A	Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2B	Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.
Category 3	Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise indicated.

NCCN Categories of Preference

Preferred intervention	Interventions that are based on superior efficacy, safety, and evidence; and, when appropriate, affordability.
Other recommended intervention	Other interventions that may be somewhat less efficacious, more toxic, or based on less mature data; or significantly less affordable for similar outcomes.
Useful in certain circumstances	Other interventions that may be used for selected patient populations (defined with recommendation).

All recommendations are considered appropriate.



NCCN Guidelines Version 3.2021

Bladder Cancer

Discussion

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This discussion corresponds to the NCCN Guidelines for Bladder Cancer. Last full update on July 16, 2020. Sections revised to reflect removal of durvalumab and atezolizumab March 22, 2021.

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Overview

An estimated 80,470 new cases of urinary bladder cancer (61,700 men and 18,770 women) will be diagnosed in the United States in 2019 with approximately 17,670 deaths (12,870 men and 4,800 women) occurring during this same period.¹ Bladder cancer, the sixth most common cancer in the United States, is rarely diagnosed in individuals younger than 40 years of age. Given that the median age at diagnosis is 73 years,² medical comorbidities are a frequent consideration in patient management.

Risk factors for developing bladder cancer include male sex, white race, smoking, personal or family history of bladder cancer, pelvic radiation, environmental/occupational exposures, exposure to certain drugs, chronic infection or irritation of the urinary tract, and certain medical conditions including obesity and diabetes.³⁻⁵ While diabetes mellitus appears to be associated with an elevated risk of developing bladder cancer,⁴ treatment with metformin may be associated with improved prognosis in patients with bladder cancer and diabetes.⁶ Certain genetic syndromes, most notably Lynch syndrome, may also predispose an individual to urothelial carcinoma.⁷

The clinical spectrum of bladder cancer can be divided into 3 categories that differ in prognosis, management, and therapeutic aims. The first category consists of non–muscle-invasive disease, for which treatment is directed at reducing recurrences and preventing progression to a more advanced stage. The second group encompasses muscle-invasive disease. The goal of therapy is to determine whether the bladder should be removed or if it can be preserved without compromising survival, and to determine if the primary lesion can be managed independently or if patients are at high risk for distant spread requiring systemic approaches to improve the likelihood of cure. The critical concern for the third group, consisting of metastatic lesions, is

how to prolong quantity and maintain quality of life. Numerous agents with different mechanisms of action have antitumor effects on this disease. The goal is how to use these agents to achieve the best possible outcome.

Literature Search Criteria and Guidelines Update Methodology

Prior to the update of this version of the NCCN Guidelines for Bladder Cancer, an electronic search of the PubMed database was performed to obtain key literature using the following search terms: bladder cancer OR urothelial carcinoma of the ureter urothelial carcinoma of the prostate OR primary carcinoma of the urethra. The PubMed database was chosen as it remains the most widely used resource for medical literature and indexes peer-reviewed biomedical literature.⁸

The search results were narrowed by selecting studies in humans published in English. Results were confined to the following article types: Clinical Trial, Phase II; Clinical Trial, Phase III; Clinical Trial, Phase IV; Guideline; Meta-Analysis; Randomized Controlled Trials; Systematic Reviews; and Validation Studies.

The data from key PubMed articles as well as articles from additional sources deemed as relevant to these Guidelines and discussed by the panel have been included in this version of the Discussion section (eg, e-publications ahead of print, meeting abstracts). Recommendations for which high-level evidence is lacking are based on the panel's review of lower-level evidence and expert opinion.

The complete details of the Development and Update of the NCCN Guidelines are available at www.NCCN.org.



Clinical Presentation and Workup

The most common presenting symptom in patients with bladder cancer is microscopic or gross hematuria, although urinary frequency due to irritation or a reduced bladder capacity can also develop. Less commonly, the presenting symptom is a urinary tract infection. Upper tract obstruction or pain may occur in patients with a more advanced lesion. Patients presenting with these symptoms should be evaluated with office cystoscopy to determine if a lesion is present. If one is documented, the patient should be scheduled for a transurethral resection of the bladder tumor (TURBT) to confirm the diagnosis and determine the extent of disease within the bladder. Urine cytology may also be obtained around the time of cystoscopy. Being that smoking is a major risk factor for bladder cancer,⁹ screening for smoking and initiation of treatment for smoking cessation, if appropriate, is recommended during the initial evaluation (see [NCCN Guidelines for Smoking Cessation](#)).

A CT scan or MRI of the abdomen and pelvis is recommended before the TURBT, as long as it is logistically feasible, in order to allow for better anatomical characterization of the lesion and possible delineation of the suspected depth of invasion. Additional workup for all patients should include consideration of urine cytology, if not already tested, and evaluation of the upper tracts with a CT or MR urography; a renal ultrasound or CT without contrast with retrograde ureteropyelography; a ureteroscopy; or a combination of techniques. CT urography is generally the preferred approach to upper tract imaging in patients who can safely receive intravenous contrast agents.

TURBT with a bimanual examination under anesthesia (EUA) is performed to resect visible tumor and to sample muscle within the area of the tumor to assess invasion. The goal of TURBT is to correctly identify the clinical stage and grade of disease while completely

resecting all visible tumor. Therefore, an adequate sample that includes bladder muscle (ie, muscularis propria) preferentially should be obtained in the resection specimen, most notably in the setting of high-grade disease. A small fragment of tumor with few muscle fibers is inadequate for assessing the depth of invasion and guiding treatment recommendations. When a large papillary lesion is noted, more than one session may be needed to completely resect the tumor. With carcinoma in situ (CIS), biopsy of sites adjacent to the tumor and multiple random biopsies may be performed to assess for a field change. Single-dose intravesical gemcitabine or mitomycin (both category 1, although gemcitabine is preferred due to better tolerability and lower cost) within 24 hours of TURBT is recommended if non-muscle-invasive disease is suspected (see *Intravesical Therapy*). Existing data support this approach largely for low-volume, low-grade disease.¹⁰⁻¹²

While selected mapping biopsies may be indicated in specific situations for lesions that are solid (sessile) or if Tis or high-grade disease is suspected (eg, planned partial cystectomy, definitive chemoradiotherapy, evaluation of an unexplained positive urine cytology, certain clinical trials), random biopsies rarely yield positive results, especially for low-risk tumors.¹³ Therefore, mapping biopsies of normal-appearing urothelium are not necessary for most patients.

Positive urinary cytology may indicate urothelial tumor anywhere in the urinary tract. In the presence of a positive cytology and a normal cystoscopy, the upper tracts and the prostate (prostatic urethra) in men must be evaluated and ureteroscopy may be considered.

Clinical investigation of the specimen obtained by TURBT or biopsies is an important step in the diagnosis and subsequent management of bladder cancer. The modifier “c” before the stage refers to clinical staging based on bimanual EUA, endoscopic surgery (biopsy or



TURBT), and imaging studies. A modifier “p” would refer to pathologic staging based on cystectomy and lymph node dissection.

Pathology and Staging

The most commonly used staging system is the tumor, node, metastasis (TNM) staging system by the AJCC¹⁴ (see *Staging* in the algorithm). The NCCN Guidelines for Bladder Cancer divide treatment recommendations for urothelial carcinoma of the bladder according to non–muscle-invasive disease (Ta, T1, and Tis) and muscle-invasive disease (≥T2 disease). Management of bladder cancer is based on the findings of the biopsy and TURBT specimens, with attention to histology, grade, and depth of invasion. These factors are used to estimate the probability of recurrence and progression to a more advanced stage. Patient bladder function, comorbidities, and life expectancy are also important considerations.

Approximately 75% of newly detected cases are non–muscle-invasive disease—exophytic papillary tumors confined largely to the mucosa (Ta) (70%–75%) or, less often, to the lamina propria (T1) (20%–25%) or flat high-grade lesions (CIS, 5%–10%).^{15,16} These tumors tend to be friable and have a high propensity for bleeding. Their natural history is characterized by a tendency to recur in the bladder, and these recurrences can be either at the same stage as the initial tumor or at a more advanced stage.

Papillary tumors confined to the mucosa or submucosa are generally managed endoscopically with complete resection. Progression to a more advanced stage may result in local symptoms or, less commonly, symptoms related to metastatic disease. An estimated 31% to 78% of patients with a tumor confined to the mucosa or submucosa will experience a recurrence or new occurrence of urothelial carcinoma within 5 years.¹⁷ These probabilities of recurrence vary as a function of

the initial stage and grade, size, and multiplicity. Refining these estimates for individual patients is an area of active research.

Muscle-invasive disease (T2) is defined by malignant extension into the detrusor muscle while perivesical tissue involvement defines T3 disease. Extravesical invasion into the surrounding organs (ie, the prostatic stroma, seminal vesicles, uterus, vagina, pelvic wall, abdominal wall) delineates T4 disease. The depth of invasion is the most important determinant of prognosis and treatment for localized bladder cancer.

The 8th edition of the AJCC Staging Manual included changes to the staging of urinary bladder carcinoma, including the subdivision of stages III and IV disease (stage III into stage IIIA and stage IIIB; stage IV into stage IVA and stage IVB).¹⁴ Notably, the new staging system groups T1–T4a, N1 within stage IIIA and T1–T4a, N2–3 within stage IIIB; N1–3 was previously grouped within stage IV, regardless of T stage.^{14,18} The NCCN Guidelines for Bladder Cancer were updated to reflect appropriate treatment options based on this new staging system (see *Treatment of Stage II and IIIA Tumors*, *Treatment of Stage IIIB Tumors*, and *Treatment of Stage IVA Tumors*).

Enhanced Cystoscopy

White light cystoscopy (WLC) is the current standard in the evaluation and staging of bladder cancer. While WLC has a high sensitivity for detecting papillary lesions, the technique is limited in its ability to discern non-papillary and flat lesions from inflammatory lesions, thus reducing the accuracy of tumor staging. Additionally, small or multifocal lesions are more difficult to detect with WLC. Several techniques proposed to enhance imaging are available and include blue light cystoscopy (BLC) and narrow band imaging (NBI). Both methods report improved staging when used in conjunction with WLC and with



expertise; however, data are still limited for both methods and WLC remains the mainstay of bladder cancer staging.

Blue Light Cystoscopy

BLC is a technique that identifies malignant cells through the absorption of the photosensitizing drug into the urothelial cytoplasm where it enters heme-biosynthesis metabolism. In normal cells, the photosensitizer is excreted; however, enzymatic abnormalities in malignant cells result in the formation of photoactive porphyrins that remain in the cell and fluorescence with a red emission in the presence of blue light. Earlier studies used the photosensitizer 5-aminolevulinic acid (5-ALA), although more recent studies use the only FDA-approved photosensitizer hexyl-aminolevulinate (HAL).

Several prospective clinical studies have evaluated BLC in conjunction with WLC and found higher detection rates of non-muscle-invasive lesions with BLC.¹⁹⁻²⁴ Particularly CIS, which is often missed by WLC, was detected at a higher rate. A meta-analysis of BLC TURBT in non-muscle-invasive bladder cancer included 12 randomized controlled trials with a total of 2258 patients.²⁵ A lower recurrence rate was observed (overall response [OR], 0.5; $P < .00001$) with a delayed time to first recurrence by 7.39 weeks ($P < .0001$). Recurrence-free survival was improved at 1 year (HR, 0.69; $P < .00001$) and at 2 years (HR, 0.65; $P = .0004$). However, no significant reduction in the rate of progression to muscle-invasive bladder cancer was seen (OR, 0.85; $P = .39$).

In a meta-analysis from Burger et al,²⁶ 1345 patients with Ta, T1 or CIS disease showed improved detection of bladder tumors and a reduction in recurrence.²⁶ Compared to WLC, BLC detected more Ta tumors (14.7%; $P < .001$; OR, 4.898; 95% CI, 1.937–12.390) and CIS lesions (40.8%; $P < .001$; OR, 12.372; 95% CI, 6.343–0.924). Importantly, 24.9% of patients had at least one additional Ta/T1 tumor detected ($P < .001$) and improved detection was seen in both primary (20.7%;

$P < .001$) and recurrent disease (27.7%; $P < .001$). Another review of the literature included 26 studies with 5-ALA, 15 studies with HAL, and 2 studies that used both methodologies. The results from this review also support greater detection and reduced recurrence but no reduction in disease progression.²⁷

Although most studies have not found a significant reduction in disease progression, a recent analysis reported a trend towards a lower rate with the use of BLC compared to WLC (12.2% vs. 17.6%, respectively; $P = .085$) with a longer time to progression ($P = .05$).²⁸ Although BLC has demonstrated improved detection and reduced recurrence, the value of this technique in reducing disease progression remains less established. Therefore, BLC may have the greatest advantage in detecting difficult-to-visualize tumors (eg, CIS tumors) that may be missed by WLC but has more limited applicability in disease monitoring. Other impediments to BLC include the need for appropriate expertise and equipment to employ this new technology. High false positives are also attributed to this method and may be increased in patients who have had a recent TURBT or bacillus Calmette-Guérin (BCG) instillation, or who have inflammation.²⁷ The limitations of BLC require judicious application of this additional diagnostic tool.

Narrow Band Imaging

NBI uses two narrow bands of light at 415 nanometers (nm) and 540 nm that are absorbed by hemoglobin. The shorter wavelength provides analysis of the mucosa and the longer wavelength allows for evaluation of the deeper submucosal blood vessels. Studies suggest that there is an increase in bladder tumor detection compared with WLC, although the rate of false positives is higher.²⁹⁻³³

A systematic review and meta-analysis including 7 prospective studies and 1040 patients with non-muscle-invasive disease evaluated the accuracy of NBI compared to WLC. In total, 1476 tumors were detected



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by biopsy in 611 patients. The additional detection rate for NBI was higher on the patient level (17%; 95% CI, 10%–25%) and tumor level (24%; 95% CI, 17%–31%). In total, 107 patients were further identified as having non–muscle-invasive disease by NBI compared to the 16 patients by WLC. Similarly, 276 additional tumors were reported in 5 studies using NBI versus 13 additional tumors by WLC. Although individual studies demonstrated an increase in the rate of false positives, the meta-analysis reported no statistical significance. However, it was acknowledged that data are limited due to the relatively new application of this technique and interpretation is impeded by the degree of heterogeneity among the studies. Finally, the meta-analysis was unable to determine if there was a long-term advantage of NBI, as measured by a reduction in recurrence or progression.

A randomized prospective trial followed patients for 1 year after NBI- or WLC-guided transurethral resection (TUR) to evaluate recurrence. NBI had a reduced 1-year recurrence rate (32.9%; 25 of 76 patients) compared to WLC (51.4%; 25 of 49 patients; OR, 0.62).³⁴ However, the small number of patients in this study is limiting. A larger international, multicenter, randomized controlled trial compared 1-year recurrence rates in 965 patients who received either NBI- or WLC-guided TUR for treatment of non–muscle-invasive bladder cancer. This study found that while recurrence rates were similar between the two groups in the study population overall, NBI-guided TUR significantly reduced the likelihood of disease recurrence at 1 year in low-risk patients (5.6% for NBI vs. 27.3% for WLC; $P = .002$).³⁵ These results are supported by the systemic reviews and meta-analyses that have also shown reduced recurrence rates following NBI-guided TUR compared to WLC-guided TUR.^{36,37}

A benefit of NBI is that it does not require a contrast agent and can therefore be used as part of office cystoscopy. Higher detection rates of flat lesions and a reduction in tumor recurrence have been reported.^{35–38}

Histology

More than 90% of urothelial tumors originate in the urinary bladder, 8% originate in the renal pelvis, and the remaining 2% originate in the ureter and urethra. Urothelial carcinomas are classified as low or high grade as defined by the extent of nuclear anaplasia and architectural abnormalities.

Non–muscle-invasive urothelial tumors may have flat and papillary histologies. Flat lesions may be classified as Tis, or as dysplasia if the criteria for CIS are not met but atypical dysplasia is present. Papillary lesions may be benign (ie, urothelial papilloma, inverted papilloma) or of malignant potential. The latter group includes papillary urothelial neoplasms of low malignant potential and noninvasive papillary urothelial carcinomas (low and high grade). In some cases, a papillary or T1 lesion will be documented as having an associated Tis component.

Urothelial (transitional cell) carcinomas are the most common histologic subtype in the United States and Europe and may develop anywhere transitional epithelium is present, from the renal pelvis to the ureter, bladder, and proximal two thirds of the urethra. Variant histology is common with higher grades. The fourth edition of the WHO Classification of Tumors has reclassified these histologic subtypes into the following: infiltrating urothelial carcinoma with divergent differentiation; nested, including large nested; microcystic; micropapillary; lymphoepithelioma-like; plasmacytoid/signet ring cell/diffuse; sarcomatoid; giant cell; poorly differentiated; lipid-rich; and clear cell.^{39,40} The presence of histologic variants in urothelial carcinoma



should be documented as data suggest that the subtype may reflect the risk of disease progression, reflect different genetic etiology, and subsequently determine whether a more aggressive treatment approach should be considered (see *Bladder Cancer: Non-Urothelial and Urothelial With Variant Histology* in the algorithm). In some cases with a mixed histology, systemic treatment may only target cells of urothelial origin and the non-urothelial component can remain.

Squamous cell neoplasms of the urothelial tract are a second histologic subtype, which constitute 3% of the urinary tumors diagnosed in the United States. In regions where *Schistosoma* is endemic, this subtype is more prevalent and may account for up to 75% of bladder cancer cases. The distal third of the urethra is dominated by squamous epithelium. The diagnosis of squamous cell tumors requires the presence of keratinization in the pathologic specimen.⁴¹ Squamous cell carcinoma of the bladder is morphologically indistinguishable from squamous cell carcinoma of other sites and generally presents at an advanced stage. The three variants within this subtype are pure squamous cell carcinoma, verrucous carcinoma, and squamous cell papilloma.

Other histologic subtypes derived from cells of urothelial origin include glandular neoplasms, epithelial tumors of the upper urinary tract, and tumors arising in a bladder diverticulum. Glandular neoplasms include adenocarcinoma and villous adenoma. Urachal tumors are non-urothelial tumors, most commonly adenocarcinomas, which arise from the urachal ligament and secondarily involve the midline/dome of the bladder.⁴² Tumors arising within the genitourinary tract but that are not of urothelial origin (eg, tumors of Müllerian type, melanocytic tumors, mesenchymal tumors) are beyond the scope of these guidelines.

Non–Muscle-Invasive Urothelial Bladder Cancer

Non–muscle-invasive tumors were previously referred to as *superficial*, which is an imprecise term that should be avoided. The NCCN Guidelines for Bladder Cancer generally manage non–muscle-invasive disease with intravesical therapy or, for those at particularly high risk, cystectomy.

Intravesical Therapy

Intravesical therapy is implemented to reduce recurrence or delay progression of bladder cancer to a higher grade or stage.

Immediate Intravesical Therapy Post TURBT

An immediate intravesical instillation of chemotherapy may be given within 24 hours of TURBT to prevent tumor cell implantation and early recurrence. Immediate intravesical chemotherapy has been shown to decrease recurrence in select subgroups of patients. A systematic review and meta-analysis of 13 randomized trials demonstrated a decreased risk of recurrence by 35% (HR, 0.65; 95% CI, 0.58–0.74; $P < .001$) and a decreased 5-year recurrence rate from 58.8% to 44.8% when comparing immediate intravesical chemotherapy following TURBT to TURBT alone, although the instillation did not prolong the time to progression or time to death from bladder cancer.¹² This study also found that the instillation did not reduce recurrences in patients who had a prior recurrence rate of >1 recurrence per year or with an EORTC recurrence score ≥ 5 .

Phase III trials have reported a reduced risk of recurrence for patients with suspected non–muscle-invasive disease who are treated with immediate postoperative gemcitabine or mitomycin. A randomized, double-blind, phase III trial of 406 patients with suspected low-grade non–muscle-invasive bladder cancer based on cystoscopic appearance showed that immediate post-TURBT instillation of gemcitabine reduced



the rate of recurrence compared to saline instillation (placebo).¹⁰ In the intention to treat analysis, 35% of patients treated with gemcitabine and 47% of those who received placebo had disease recurrence within 4 years (HR, 0.66; 95% CI, 0.48–0.90; $P < .001$).¹⁰ Intravesical therapy for a previous non–muscle-invasive bladder cancer was allowed in the study if received at least 6 months prior to enrollment. Another phase III, prospective, multicenter, randomized study of 2844 patients with non–muscle-invasive bladder cancer showed that an immediate instillation of mitomycin C after TURBT reduces recurrence regardless of the number of adjuvant instillations. Recurrence risk was 27% for immediate instillation versus 36% for delayed instillation ($P < .001$) for all patients in the study, with the benefit of immediate instillation present across risk groups.¹¹ Previous intravesical chemotherapy was permitted in study participants as long as it was received at least 3 years prior to participation. For both studies, the rate of adverse events (AEs) did not significantly differ between the treatment and control groups, indicating that immediate intravesical instillation of gemcitabine or mitomycin was well tolerated.^{10,11} Gemcitabine is preferred over mitomycin based on toxicity profiles and lower cost.⁴³ For tumors with an intermediate or high risk of progression, subsequent treatment with intravesical induction (adjuvant) therapy may be given. Perioperative intravesical treatment should not be given if there is extensive TURBT or suspected bladder perforation.

Induction (Adjuvant) Intravesical Chemotherapy or BCG

Although only intravesical chemotherapy is recommended in the immediate postoperative setting, both intravesical chemotherapy and BCG have been given as induction therapy in patients with non–muscle-invasive bladder cancer.⁴⁴ The most commonly used chemotherapy agents are mitomycin C and gemcitabine, although gemcitabine is preferred over mitomycin due to better tolerability and cost.

Induction BCG has been shown to decrease the risk of bladder cancer recurrences following TURBT. BCG therapy is commonly given once a week for 6 weeks, followed by a rest period of 4 to 6 weeks, with a full re-evaluation at week 12 (ie, 3 months) after the start of therapy.⁴⁵ There are 4 meta-analyses demonstrating that BCG after TURBT is superior to TURBT alone, or TURBT and chemotherapy in preventing recurrences of high-grade Ta and T1 tumors.^{46–49} A meta-analysis including 9 trials of 2820 patients with non–muscle-invasive bladder cancer reported that mitomycin C was superior to BCG without maintenance in preventing recurrence, but inferior to BCG in trials using BCG maintenance.⁵⁰ Using the SEER database, a reduction in mortality of 23% was reported in patients receiving BCG therapy.⁵¹ Another study reported long-term data that BCG was better at reducing recurrence in intermediate- and high-risk non–muscle-invasive bladder cancer when compared to mitomycin C.⁵²

BCG has also been compared to gemcitabine and epirubicin. A prospective, randomized phase II trial compared the quality of life in patients receiving either BCG ($n = 59$) or intravesical gemcitabine ($n = 61$) and found no significant difference.⁵³ There were more frequent local and systemic side effects in the BCG arm; however, they were mild to moderate and the treatment was well-tolerated in both groups. The benefit of BCG with or without isoniazid compared to epirubicin alone in a long-term study of 957 patients with intermediate- or high-risk Ta or T1 disease was measured by a reduced recurrence, greater time to distant metastases, and greater overall survival (OS) and disease-specific survival (DSS); progression was similar.⁵⁴ Long-term data comparing BCG to epirubicin in combination with interferon^{54,55} in patients with T1 disease showed a better reduction in recurrence with BCG; however, no differences in progression or AEs were seen.⁵⁵ Patients in both studies received 2 to 3 years of maintenance therapy.



Maintenance Therapy

Maintenance intravesical therapy may be considered following induction with chemotherapy or BCG. The role of maintenance chemotherapy is controversial. When given, maintenance chemotherapy is generally monthly. The role of maintenance BCG in those patients with intermediate to high-risk non–muscle-invasive bladder cancer is more established, though the exact regimens have varied across studies. Some of the previous controversy over the effectiveness of BCG maintenance reflects the wide array of schedules and conflicting reports of efficacy. Quarterly and monthly installations as well as 3-week and 6-week schedules have been evaluated. To date, the strongest data support the 3-week BCG regimen used in the SWOG trial that demonstrated reduced disease progression and metastasis.⁵⁶ The 3-week timing of BCG has shown improved outcomes compared with epirubicin⁵⁵ or isoniazid.⁵⁴ Most patients receive maintenance BCG for 1 to 3 years. In an evaluation of randomized controlled trials and meta-analyses, limited evidence was found for 1 year of BCG maintenance.⁵⁷ A study of 1355 patients with a median follow-up of 7.1 years found no benefit in 3 years of maintenance BCG compared to 1 year for intermediate-risk patients.⁵⁸ Conversely, 3-year maintenance BCG reduced recurrence compared to 1-year maintenance but did not impact progression or survival in high-risk patients. These data suggest that 1 year may be suitable for patients at intermediate risk while 3 years of maintenance is preferred for high-risk disease. It should also be noted that duration of treatment may be limited by toxicity and patient refusal to continue.

For patients showing no residual disease at the follow-up cystoscopy, whether 1 or 2 courses of induction therapy were administered, maintenance therapy with BCG is preferred. This recommendation is based on findings that an induction course of intravesical therapy

followed by a maintenance regimen produced better outcomes than intravesical chemotherapy.^{44,46,47,56,59,60}

BCG Toxicity

There are concerns regarding potentially severe local and systemic side effects and the inconsistent availability of BCG. BCG induces a systemic nonspecific immunostimulatory response leading to secretion of proinflammatory cytokines. This causes patients to experience flu-like symptoms that may last 48 to 72 hours.⁶¹ Installation of BCG into the bladder also mimics a urinary tract infection and may produce intense local discomfort. The side effects of treatment have translated to patient refusal of BCG therapy. Dysuria has been reported in 60% of patients in clinical trials.⁶¹ However, the side effects are treatable in almost all cases⁶² and no increase in toxicity has been reported with cumulative doses. Symptom management with single-dose, short-term quinolones and/or anticholinergics have been reported to reduce AEs.^{63,64}

A reduced (one-third) dose of BCG was evaluated for the possible reduction of side effects. In a phase III study, 1316 patients with intermediate- or high-risk Ta, T1 papillary carcinoma of the bladder were randomized to receive reduced- or full-dose BCG with either 1 or 3 years of maintenance.⁶⁵ Among all 4 groups, the percentage of patients with greater than or equal to 1 side effect was similar ($P = .41$). Though the one-third dose of BCG was effective, side effects were not reduced. Conversely, other publications suggest that the one-third dose may reduce side effects.⁶⁶⁻⁶⁸ Full-dose BCG is recommended by the panel until more data are available to evaluate the low-dose BCG regimen. However, dose reduction may be used if there are substantial local symptoms during maintenance.



BCG Shortage

An ongoing shortage of BCG has existed in the United States, necessitating development of strategies to prioritize use of intravesical BCG and identify alternative treatment approaches for some patients with non–muscle-invasive bladder cancer.⁶⁹ Several organizations, including the American Urological Association (AUA), American Association of Clinical Urologists (AACU), Bladder Cancer Advocacy Network (BCAN), Society of Urologic Oncology (SUO), the Large Urology Group Practice Association (LUGPA), and the Urology Care Foundation (UCF), issued a [notice](#) outlining strategies to maximize care for patients with non–muscle-invasive bladder cancer in the context of this shortage.⁷⁰ NCCN Panel Members recommend several strategies to help alleviate problems associated with this shortage.

In the event of a BCG shortage, priority for treatment should be to provide patients with high-risk non–muscle-invasive bladder cancer (cT1 high grade or CIS) with induction BCG. For patients who do not receive BCG, intravesical chemotherapy may be used as an alternative. The intravesical chemotherapies most commonly used for this purpose are gemcitabine^{43,71} and mitomycin.⁷² Two separate meta-analyses of randomized trials reported that there were no differences in risk of recurrence between BCG and mitomycin,^{44,73} although BCG may show more favorable outcomes from maintenance regimens.⁴⁴ Other options include epirubicin,^{54,74} valrubicin,⁷⁵ docetaxel,⁷⁶ sequential gemcitabine/docetaxel,⁷⁷ or gemcitabine/mitomycin.⁷⁸ Another alternative to intravesical BCG for patients with non–muscle-invasive bladder cancer at high risk of recurrence and, particularly, at high risk of progression, is initial radical cystectomy.⁷⁹

Another option during a shortage is splitting the dose of BCG so that multiple patients may be treated using a single vial. While several randomized trials have reported that one-third dose BCG showed

similar outcomes when compared to full-dose BCG,^{67,80,81} a phase 3 trial of 1355 patients with intermediate- or high-risk non–muscle-invasive bladder cancer reported that patients receiving the full dose of BCG show a longer disease-free interval, compared with those receiving the one-third dose.⁵⁸ In this study, the 5-year disease-free rate was 58.5% for the one-third dose compared to 61.7% for the full dose; therefore, the null hypothesis of inferiority for duration of the disease-free interval of one-third dose BCG could not be rejected (HR, 1.15; 95% CI, 0.98–1.35; $P = .045$), although there were no differences in progression or survival rates.⁵⁸ Based on these data, the panel recommends that one-half or one-third dose may be considered for BCG induction during times of shortage and should be used for BCG maintenance, if supply allows. Maintenance BCG should be prioritized for patients with high-risk non–muscle-invasive bladder cancer (cT1 high grade or CIS) in the early maintenance period (eg, 3- and 6-months post-induction), although in cases of shortage, BCG induction therapy should be prioritized over maintenance BCG.

Pembrolizumab for Non–Muscle-Invasive Bladder Cancer

Pembrolizumab is a PD-1 inhibitor that has been evaluated as treatment for BCG-unresponsive, non–muscle-invasive bladder cancer with CIS in the single-arm, phase II KEYNOTE-057 study, reported to date in abstract form (pembrolizumab is also indicated for treatment of metastatic urothelial carcinoma; for the metastatic setting see the *Targeted Therapies* section below). In the KEYNOTE-057 study, 103 patients with high-risk CIS, with or without papillary tumor, who received previous BCG therapy and were either unable or unwilling to undergo cystectomy were treated with pembrolizumab. The 3-month complete response rate was 38.8% (95% CI, 29.4%–48.9%), with 72.5% of complete responses maintained at last follow-up (median 14.0 months). Therefore, of the total study population, 28% had a complete response at the time of last follow-up. The median duration of complete response



had not yet been reached at the time of analysis. Grade ≥ 3 treatment-related AEs were reported in 12.6% of patients, and immune-mediated AEs in 18.4%. One patient died as a result of treatment-related colitis.⁸² Clinical data included in the package insert for 96 patients on this trial report a complete response rate of 41% (95% CI, 31%–51%) and a median duration of response (DOR) of 16.2 months with 46% of complete responses maintained for at least a year.⁸³

NCCN Recommendations for Treatment of Non–Muscle-Invasive Bladder Cancer

Treatment of cTa, Low-Grade Tumors

TURBT is the standard treatment for cTa, low-grade tumors. Although a complete TURBT alone can eradicate these tumors, there is a relatively high risk for recurrence. Therefore, after TURBT, the panel recommends administering a single dose of immediate intravesical chemotherapy (gemcitabine or mitomycin [both category 1], although gemcitabine is preferred due to better tolerability and cost) within 24 hours of resection. The immediate intravesical chemotherapy may be followed by observation or a 6-week induction course of intravesical therapy. While intravesical chemotherapy is preferred in these patients due to the low risk of disease progression, BCG may be considered when not in a shortage.

The need for adjuvant therapy depends on the patient prognosis. If the patient has a low risk for recurrence, a single immediate intravesical treatment may be sufficient. Factors to consider include the size, number, T category, and grade of the tumor(s), as well as concomitant CIS and prior recurrence.¹⁷ Meta-analyses have confirmed the efficacy of adjuvant intravesical chemotherapy in reducing the risk of recurrence.^{84,85} Close follow-up of all patients is needed, although the risk for progression to a more advanced stage is low (see *Surveillance* in the discussion and algorithm).

Treatment of cTa, High-Grade Tumors

Tumors staged as cTa, high-grade lesions are papillary tumors with a relatively high risk for recurrence and progression towards more invasiveness. Restaging TURBT detected residual disease in 27% of Ta patients when muscle was present in the original TURBT.⁸⁶ In the absence of muscularis propria in the initial TURBT specimen, 49% of patients with non–muscle-invasive disease will be understaged versus 14% if muscle is present.⁸⁷ Repeat resection is recommended if there is incomplete resection, or should be strongly considered if there is no muscle in the specimen. Repeat resection may also be considered for high-risk (large or multifocal) lesions, as recommended in the AUA/SUO Guideline.¹⁵

After TURBT, patients with cTa, high-grade tumors may be treated with intravesical BCG (preferred), intravesical chemotherapy, or observation. In the literature, there are 4 meta-analyses confirming that BCG after TURBT is superior to TURBT alone, or TURBT and chemotherapy in preventing recurrences of high-grade Ta and T1 tumors.^{46–49} The NCCN Bladder Cancer Panel Members recommend BCG as the preferred option over intravesical chemotherapy for adjuvant treatment of high-grade lesions, followed by maintenance therapy according to risk and availability of intravesical agents.

Treatment of cT1 Tumors

Based on the histologic differentiation, most cT1 lesions are high grade and considered to be potentially dangerous with a higher risk for recurrence and progression. These tumors may occur as solitary lesions or as multifocal tumors with or without an associated Tis component.

These tumors are treated with a complete endoscopic resection, and repeat TURBT is strongly advised.⁸⁸ This is supported by a trial that prospectively randomized 142 patients with pT1 tumors to a second



TURBT within 2 to 6 weeks of the initial TURBT or no repeat TURBT.⁸⁹ All patients received adjuvant intravesical therapy. Although OS was similar, the 3-year recurrence-free survival was significantly higher in the repeat TURBT arm versus the control arm (69% vs. 37%, respectively), especially among patients with high-grade tumors.

If residual cT1 disease is found at repeat TURBT, treatment should consist of BCG (category 1) or cystectomy. Within T1 disease, a particularly high-risk stratum can be identified: multifocal lesions, tumors associated with CIS or lymphovascular invasion, variant histology (eg, micropapillary, plasmacytoid, nested variants), or lesions that recur after BCG treatment. There are data suggesting that early cystectomy may be preferred in these patients because of the high risk for progression to a more advanced stage.^{90,91}

If no residual disease is found after the second resection, intravesical therapy with BCG (preferred; category 1) or intravesical chemotherapy is recommended. Observation may be reasonable in highly select cases where low-grade, small-volume tumors had limited lamina propria invasion and no CIS.^{92,93}

Treatment of Tis

Primary Tis is a high-grade lesion of the urothelium. Standard therapy for this lesion is resection followed by intravesical therapy with BCG. BCG is preferred over intravesical chemotherapy based on a meta-analysis of randomized trials showing that patients with CIS treated with BCG had higher complete response rates (68.1% vs. 51.5%) and a longer DOR compared to intravesical chemotherapy.⁴⁴ If the patient is unable to tolerate BCG, intravesical chemotherapy may be considered, but data supporting this approach are limited.

Surveillance

For cTa high grade, cT1, and Tis, follow-up is recommended with a urinary cytology and cystoscopy at 3- to 6-month intervals for the first 2 years, and at longer intervals as appropriate thereafter. Imaging of the upper tract should be considered every 1 to 2 years for high-risk tumors (see *Follow-up* in the algorithm). Urine molecular tests for urothelial tumor markers are now available.⁹⁴ Many of these tests have a better sensitivity for detecting bladder cancer than urinary cytology, but specificity is lower. Considering this, evaluation of urinary urothelial tumor markers may be considered during surveillance of high-risk non-muscle-invasive bladder cancer. However, it remains unclear whether these tests offer additional information that is useful for detection and management of non-muscle-invasive bladder tumors. Therefore, the panel considers this to be a category 2B recommendation.

For patients with low-risk non-muscle-invasive bladder cancer, if the initial follow-up surveillance cystoscopy is negative within 4 months of TURBT, the next cystoscopy is recommended 6 to 9 months later and then yearly for up to 5 years. Follow-up cystoscopy after 5 years should only be performed based on clinical indication. Beyond baseline imaging, upper tract imaging is not indicated without symptoms for patients with low-risk non-muscle-invasive bladder cancer.

Posttreatment of Recurrent or Persistent Disease

Treatment of Patients With Positive Cystoscopy

Patients under observation after initial TURBT, who show a documented recurrence by positive cystoscopy, should undergo another TURBT and then adjuvant intravesical therapy or cystectomy based on the stage and grade of the recurrent lesion. Patients should be followed as indicated based on the risk of their disease (see *Follow-up* in the algorithm).

**Recurrence Following Intravesical Treatment**

In a phase II multicenter study of non–muscle-invasive bladder cancer that recurred following 2 courses of BCG, intravesical gemcitabine demonstrated activity that was relegated to high-risk non–muscle-invasive bladder cancer.⁹⁵ In the 47 patients with evaluable response, 47% had disease-free survival (DFS) at 3 months. The 1-year relapse-free survival (RFS) was 28% with all cases except for two attributed to the high-risk group. The 2-year RFS was 21%. Intravesical gemcitabine had some activity in the high-risk group, and may be an option if a candidate is not eligible for a cystectomy; however, the study results indicate that cystectomy is preferred when possible. Similarly, for patients with recurrence of high-grade cT1 disease after TURBT and induction BCG, cystectomy is the recommended option with the best data for cure,⁹⁶ although pembrolizumab may be appropriate for patients with BCG-unresponsive, high-risk, non–muscle-invasive bladder cancer with CIS, with or without papillary tumors, who are ineligible for or have elected not to undergo cystectomy (see *Pembrolizumab for Non–Muscle-Invasive Bladder Cancer*, above). The data are currently not mature enough to determine if pembrolizumab can be considered curative in this setting.

After the initial intravesical treatment and 12-week evaluation, patients with persistent cTa, cT1, or Tis disease tumors can be given a second induction course of induction therapy (see *Recurrent or Persistent Disease* in the algorithm). No more than two consecutive induction courses should be given. If a second course is given, TURBT is performed to determine the presence of residual disease at the second 12-week follow-up. If no residual disease is found, maintenance BCG is recommended for patients who received prior BCG.

If residual disease is seen following TURBT, patients with persistent cT1 tumors are recommended to proceed to cystectomy. Non-surgical

candidates can consider concurrent chemoradiation, change of the intravesical agent, or a clinical trial. Patients with persistent Tis or cTa disease after TURBT may be treated with a different intravesical agent, cystectomy, or pembrolizumab if Tis is present and the patient is not a candidate for cystectomy. Concurrent chemoradiotherapy can be considered for non-cystectomy candidates with persistent Ta or Tis disease after TURBT, although it is a category 2B recommendation for this setting. Valrubicin is approved for CIS that is refractory to BCG, although panelists disagree on its value.⁷⁵ For patients with disease that does not respond or shows an incomplete response to treatment, subsequent management is cystectomy. Recurrences that are found to be muscle-invasive or metastatic disease should be treated as described in the appropriate section below.

Treatment of Patients With Positive Cytology

In patients without a documented recurrence but with positive cytology and negative cystoscopy and imaging, selected mapping biopsies including transurethral resection of the prostate (TURP) is indicated. In addition, the upper tract must be evaluated and ureteroscopy may be considered for detecting tumors of the upper tract. If available, enhanced cystoscopy should be considered (see *Enhanced Cystoscopy*, above).

If the selected mapping biopsy of the bladder is positive (eg, Tis), then the recommendation is to administer intravesical BCG followed by maintenance BCG (preferred) if a complete response is seen. For tumors that are unresponsive to BCG, the subsequent management options include cystectomy, changing the intravesical agent, or participation in a clinical trial. Pembrolizumab is also an option for patients with BCG-unresponsive, high-risk, non–muscle-invasive bladder cancer with Tis, with or without papillary tumors, who are ineligible for or have elected not to undergo cystectomy (see



Pembrolizumab for Non–Muscle-Invasive Bladder Cancer, above). Further investigation and validation of results is warranted for establishing the efficacy of alternative agents in second-line treatments.

If transurethral biopsy of the prostate is positive, treatment of the prostate should be initiated as described below (see *Urothelial Carcinomas of the Prostate*). If upper tract urothelial carcinoma is identified, then the treatment described below should be followed [see *Upper Tract Urothelial Carcinoma (UTUC)*].

If the transurethral biopsies of the bladder, prostate, and upper tract are negative, follow-up at 3 months and then at longer intervals is recommended. If prior BCG was given, maintenance therapy with BCG should be considered.

Muscle-Invasive Urothelial Bladder Cancer

Additional Workup

Several workup procedures are recommended to accurately determine clinical staging of muscle-invasive disease. Laboratory studies, such as a complete blood cell count and chemistry profile, including alkaline phosphatase, must be performed, and the patient should be assessed for the presence of regional or distant metastases. This evaluation should include chest imaging (CT [preferred], x-ray, or FDG-PET/CT [category 2B]) and evaluation for suspected bone metastasis in patients with symptoms or clinical suspicion of bone metastasis (eg, elevated alkaline phosphatase, focal bone pain). Chest imaging with CT is preferred over chest x-ray based on studies showing better sensitivity of CT for detection of metastatic disease.^{97,98} Bone imaging may include a bone scan, MRI, or FDG-PET/CT (category 2B). Imaging studies help assess the extent of tumor spread to lymph nodes or distant organs.^{99,100} An abdominal/pelvic CT or MRI is used to assess the local and regional extent of disease.^{101,102} Unfortunately, CT scans,

ultrasound, and MRI cannot accurately predict the true depth of invasion.

The overwhelming majority of muscle-invasive tumors are high-grade urothelial carcinomas. Further treatment following initial TURBT is often required for muscle-invasive tumors, although select patients may be treated with TURBT alone.^{103,104} Different treatment modalities are discussed below. These include radical cystectomy, partial cystectomy, neoadjuvant or adjuvant therapy, bladder-preserving approaches, and systemic therapy for advanced disease.

Radical Cystectomy

Radical surgical treatment of bladder cancer involves a cystoprostatectomy in men and a cystectomy and commonly a hysterectomy in women, followed by the formation of a urinary diversion. This surgery can be performed in an open or robotic manner.¹⁰⁵⁻¹⁰⁷ Prostatectomy includes removal of the prostate, seminal vesicles, proximal vas deferens, and proximal urethra. Hysterectomy should include removal of the uterus, ovaries, fallopian tubes, urethra, and part of the vagina. Forms of urinary diversion include an ileal conduit or directing urine to an internal urinary reservoir (such as a continent pouch), with drainage to the abdominal wall or the urethra (orthotopic neobladder). Relative contraindications to urethral drainage include Tis in the prostatic ducts or positive urethral margin. Orthotopic diversion or a neobladder provides the closest bladder function to that of a native bladder albeit with an increased risk for nighttime incontinence as well as urinary retention requiring intermittent self-catheterization.

Unfortunately, the accuracy of the staging cystoscopy, EUA, and TURBT is modest, even when combined with cross-sectional imaging and when understaging is frequently encountered. A retrospective study



of 778 patients with bladder cancer found that 42% of patients were upstaged following cystectomy.¹⁰⁸ A pelvic lymph node dissection (PLND) is considered an integral part of the surgical management of bladder cancer. A more extensive PLND, which may include the common iliac or even lower para-aortic or para-caval nodes, yields more nodes to be examined, increases yield of positive nodes, and may be associated with better survival and a lower pelvic recurrence rate.¹⁰⁹⁻¹¹³ Conversely, a 2019 prospective, randomized trial concluded that an extended LND did not show a significant advantage over limited LND for RFS, cancer-specific survival, or OS.¹¹⁴ However, differing definitions of “extended” versus “limited” LND between studies and specifics on how the study was powered complicate these results. Therefore, additional information will be needed to determine whether extended LND leads to improved outcomes. Results from the SWOG-1011 trial, which is fully accrued but not yet reported, may help to further inform this question.¹¹⁵ Patient factors that may preclude a PLND include severe scarring secondary to previous treatments or surgery, advanced age, or severe comorbidities.

Partial Cystectomy

In fewer than 5% of cases, an initial invasive tumor develops in an area of the bladder where an adequate margin of soft tissue and an adequate amount of noninvolved urothelium can be removed along with the tumor without compromising continence or significantly reducing bladder capacity. Partial cystectomy is most frequently recommended for lesions that develop on the dome of the bladder and have no associated Tis in other areas of the urothelium. Relative contraindications to this procedure are lesions that occur in the trigone or bladder neck. The requirement for a ureteral reimplantation, however, is not an absolute contraindication. Outcome data on partial cystectomy are varied and, in general, partial cystectomy is not considered the gold-standard surgical treatment of muscle-invasive bladder cancer. Ideal

candidates are patients with cancer in a diverticulum or with significant medical comorbidities.

Similar to radical cystectomy, partial cystectomy begins with a laparotomy (intraperitoneal) and resection of the pelvic lymph nodes. Alternatively, partial cystectomy may be safely done laparoscopically. If the intraoperative findings preclude a partial cystectomy, a radical cystectomy is performed. The decision to recommend adjuvant radiation or chemotherapy is based on the pathologic stage (ie, positive nodes or perivesical tissue involvement) or presence of a positive margin, similar to that for patients who undergo a radical cystectomy.

Neoadjuvant Chemotherapy

One of the most noteworthy issues in the treatment of bladder cancer is the optimal use of perioperative chemotherapy for muscle-invasive disease. Data support the role of neoadjuvant chemotherapy before cystectomy for stage II and IIIA lesions.¹¹⁶⁻¹²¹ In a SWOG randomized trial of 307 patients with muscle-invasive disease, radical cystectomy alone versus 3 (28-day) cycles of neoadjuvant methotrexate, vinblastine, doxorubicin, and cisplatin (MVAC) followed by radical cystectomy were compared. Neoadjuvant chemotherapy increased median survival (77 months vs. 46 months, $P = .06$) and lowered the rate of residual disease (15% vs. 38%, $P < .001$) with no apparent increase in treatment-related morbidity or mortality.¹¹⁶ In a meta-analysis of 11 trials involving 3005 patients, cisplatin-based multiagent neoadjuvant chemotherapy was associated with improved 5-year OS and DFS (5% and 9% absolute improvement, respectively).¹²² A review of the National Cancer Database supports initiation of neoadjuvant chemotherapy as soon as possible, but not more than 8 weeks, after diagnosis to prevent upstaging after radical cystectomy.¹²³



Since the neoadjuvant trial with MVAC, the use of dose-dense MVAC (ddMVAC) with growth factor support in the metastatic setting has been shown to have good comparable tolerance with an increased CR rate compared to standard (28-day) dosing of MVAC (11% vs. 25%; 2-sided $P = .006$).¹²⁴ Based on these findings, ddMVAC has also been investigated in the neoadjuvant setting. In a multicenter prospective phase II trial, patients with cT2 to cT4a tumor staging and N0 or N1 muscle-invasive bladder cancer ($n = 44$) were given 3 cycles of ddMVAC with pegfilgrastim followed by radical cystectomy and lymph node dissection.¹²⁵ ddMVAC was anticipated to have a safer profile, a shorter time to surgery, and a similar pathologic complete response rate compared to historical control data for neoadjuvant MVAC chemotherapy given in previous studies. Patients receiving ddMVAC had no grade 3 or 4 renal toxicities and no toxicity-related deaths. Grade 1 or 2 treatment-related toxicities were seen in 82% of patients. The median time to cystectomy was 9.7 weeks from the start of chemotherapy.¹²⁵ A separate single-arm phase II study also reported pathologic downstaging in 49% of patients receiving neoadjuvant ddMVAC with a similar safety profile.¹²⁶ An additional neoadjuvant clinical trial of ddMVAC with bevacizumab reported 5-year survival outcomes of 63% and 64% (OS and DSS, respectively; median follow-up, 49 months), with pT0N0 and less than or equal to pT1N0 downstaging rates of 38% and 53%, respectively.¹²⁷ Bevacizumab had no definitive impact on overall outcomes. In an international, multicenter, randomized trial (BA06 30894) that investigated the effectiveness of neoadjuvant cisplatin, methotrexate, and vinblastine (CMV) in 976 patients, neoadjuvant CMV resulted in a 16% reduction in mortality risk (HR, 0.84; 95% CI, 0.72–0.99; $P = .037$) at a median follow-up of 8 years.¹²¹

The NCCN Panel recommends neoadjuvant chemotherapy followed by radical cystectomy for patients with stage II or IIIA bladder cancer.

Neoadjuvant chemotherapy followed by radical cystectomy is a category 1 recommendation based on high-level data supporting its use. For highly select patients with stage II disease who receive a partial cystectomy, neoadjuvant chemotherapy is a category 2A recommendation. Patients with hearing loss or neuropathy, poor performance status, or renal insufficiency may not be eligible for cisplatin-based chemotherapy. If neoadjuvant cisplatin-based chemotherapy cannot be given, neoadjuvant chemotherapy is not recommended. Cystectomy alone is an appropriate option for these patients. For patients with borderline renal function or minimal dysfunction, a split-dose administration of cisplatin may be considered (category 2B). Although split-dose is a safer alternative, the relative efficacy remains undefined.

Adjuvant Chemotherapy

Data are less clear regarding the role of adjuvant systemic chemotherapy in invasive bladder cancer. Studies have shown that adjuvant chemotherapy may delay recurrences and improve OS;¹²⁸⁻¹³⁰ however, no randomized comparisons of adequate sample size have definitively shown a survival benefit, in large part due to poor accrual.¹³¹ Clinical trials of adjuvant chemotherapy with cyclophosphamide, doxorubicin, and cisplatin (CAP); MVAC; and methotrexate, vinblastine, epirubicin, and cisplatin (MVEC) regimens have each suggested a survival advantage.¹³²⁻¹³⁴ However, methodologic issues call into question the applicability of these studies to all patients with urothelial tumors. In the MVEC trial, patients who experienced relapse in the control arm did not receive chemotherapy, which is not typical of more contemporary treatment approaches. Many of these trials were not randomized, raising the question of selection bias in the analysis of outcomes.



A meta-analysis of 6 trials found a 25% mortality reduction with adjuvant chemotherapy, but the authors pointed out several limitations of the data and concluded that evidence is insufficient for treatment decisions.¹³⁵ Interestingly, the follow-up analysis included 3 more studies for a total of 9 trials (N = 945 patients).¹³⁰ A 23% risk reduction for death was observed in the updated analysis (HR, 0.77; 95% CI, 0.59–0.99; *P* = .049) and improved DFS was achieved (HR, 0.66; 95% CI, 0.45–0.91; *P* = .014). Patients with node-positive disease had an even greater DFS benefit.¹³⁰ An observational study evaluated 5653 patients of which 23% received adjuvant chemotherapy post-cystectomy.¹²⁹ Patients who received adjuvant chemotherapy had an improved OS (HR, 0.70; 95% CI, 0.06–0.76).¹²⁹ Although evidence for adjuvant therapy is not as strong as for neoadjuvant therapy, the growing body of data support the administration of adjuvant chemotherapy for patients with a high risk for relapse who did not receive neoadjuvant therapy.

The NCCN Guidelines suggest that adjuvant chemotherapy may be given to patients with high-risk pathology who did not receive neoadjuvant chemotherapy and is considered a category 2A recommendation. A minimum of 3 cycles of a cisplatin-based combination, such as ddMVAC; gemcitabine plus cisplatin (GC); or CMV, may be used in patients undergoing perioperative chemotherapy. Regimen and dosing recommendations are mainly based on studies in advanced disease.^{116,121,136-138} Carboplatin has not demonstrated a survival benefit and should not be substituted for cisplatin in the perioperative setting. It should be noted that patients with tumors that are pT2 or less and have no nodal involvement or lymphovascular invasion after cystectomy are considered to have lower risk and are not recommended to receive adjuvant chemotherapy.

Adjuvant Radiation

Patients with locally advanced disease (pT3–4) have high rates of pelvic recurrence and poor OS after radical cystectomy, PLND, and perioperative chemotherapy (pelvic failure 20%–45% and survival 10%–50% at 5 years, depending on risk factors).¹³⁹⁻¹⁴² There is an interest in using adjuvant radiation to improve these outcomes, but data are limited and further prospective studies are needed to confirm its benefits. One older randomized study of 236 patients with pT3a to pT4a bladder cancer demonstrated improvement in 5-year DFS and local control compared to surgery alone.¹⁴³ A more recent randomized phase II trial compared adjuvant sequential chemotherapy and radiation versus adjuvant chemotherapy alone in 120 patients with locally advanced disease with 1 or more risk factors (≥pT3b, grade 3, or node-positive), in a study population with a high proportion of squamous cell carcinoma. This study demonstrated a significant improvement in local control for chemoradiation (3-year local control of 96% vs. 69%; *P* < .01) and marginal improvements in DFS and OS. Late-grade ≥3 gastrointestinal toxicity on the chemoradiation arm was low (7% of patients).¹⁴⁴ A 2019 systematic review evaluating the oncologic efficacy of adjuvant radiation for bladder cancer or upper tract urothelial carcinoma concluded that there was no clear benefit of adjuvant radiation following radical surgery (eg, cystectomy), although the combination of adjuvant radiation with chemotherapy may be beneficial in locally advanced disease.¹⁴⁵

While there are no conclusive data demonstrating improvements in OS, it is reasonable to consider adjuvant radiation in patients with pT3/pT4 pN0–2 urothelial bladder cancer following radical cystectomy, although this approach has been evaluated in only a limited number of studies, reflected by the category 2B designation. Patients meeting these characteristics with positive surgical margins and/or lymph nodes identified in the pelvic dissection have especially high pelvic recurrence rates (40%–45% by 5 years), and adjuvant radiation is reasonably well



tolerated and improves local control. Radiation with a dose range of 45 to 50.4 Gy without concurrent chemotherapy may be used. In patients who have not had prior neoadjuvant chemotherapy, it may be reasonable to sandwich adjuvant radiation between cycles of adjuvant chemotherapy.¹⁴⁴ The safety and efficacy of concurrent sensitizing chemotherapy and radiation in the adjuvant setting needs to be further studied.

Bladder Preservation

All bladder-sparing approaches are based on the principle that not all cases require an immediate cystectomy, and the decision to remove the bladder can be deferred until the response to organ-sparing therapy is assessed. Bladder-preserving approaches are reasonable alternatives to cystectomy for patients who are medically unfit for surgery and those seeking an alternative to radical cystectomy.^{146,147} Combined modality chemoradiation therapy as an alternative to immediate cystectomy for muscle-invasive bladder cancer is endorsed by multiple international organizations that have developed evidence-based consensus guidelines and recommendations, including the International Consultation on Urologic Diseases-European Association of Urology (ICUD-EAU), UK National Institute for Health and Care Excellence (NICE), and the AUA/ASCO/ASTRO/SUO.¹⁴⁸⁻¹⁵⁰ There is an apparent underutilization of aggressive bladder-preserving therapies for non-cystectomy candidates, especially the elderly and racial minorities.^{151,152} Between 23% and 50% of patients with muscle-invasive bladder cancer who are 65 years of age and older receive no treatment or non-aggressive therapy, despite prospective, phase II data showing that bladder preservation with trimodality therapy has positive outcomes and an acceptable toxicity profile for patients ≥65 years of age, with a 2-year OS of 94.4% and 2-year DFS of 72.6%.¹⁵³ For tools to aid in the optimal assessment and management of older adults with cancer, see the [NCCN Guidelines for Older Adult Oncology](#).

With any of the alternatives to cystectomy, there is a concern that bladders that appear to be endoscopically free of tumor based on a clinical assessment (cT0) that includes a repeat TURBT may not be pathologically free of tumor (pT0). Reports have suggested that up to 45% of bladders may be clinically understaged after TURBT.^{152,154,155} Conversely, one series reported that all patients who achieved a complete response after radiotherapy with concurrent cisplatin and 5-FU were pT0 on immediate cystectomy.¹⁵⁶ Although studies report differing frequencies of residual disease after cytotoxic agents (either radiation or chemotherapy), there is consensus that the rate is lower for patients who present with T2 disease than with T3 disease, which should be considered when proposing a bladder-sparing approach.

The decision to use a bladder-preserving approach is partially based on the location of the lesion, depth of invasion, size of the tumor, status of the “uninvolved” urothelium, and status of the patient (eg, bladder capacity, bladder function, comorbidities). Bladder preservation as an alternative to cystectomy is generally reserved for patients with smaller solitary tumors, negative nodes, no extensive or multifocal CIS, no tumor-related hydronephrosis, and good pre-treatment bladder function. Patients who are medically fit for radical cystectomy but who have hydronephrosis are poor candidates for bladder-sparing procedures.^{157,158} Maximal TURBT with concurrent chemoradiotherapy should be given as primary treatment for these patients, with radiotherapy alone or TURBT alone reserved for select patients (see *TURBT Alone as Primary Treatment for Muscle-Invasive Bladder Cancer* below for more information). When possible, bladder-sparing options should be chosen in the context of clinical trials.

Radiotherapy with Concurrent Chemotherapy Following TURBT as Primary Treatment for Muscle-Invasive Bladder Cancer

Several groups have investigated the combination of concurrent or sequential chemotherapy and radiotherapy after TURBT. First, an



endoscopic resection that is as complete as possible is performed. Incomplete resection is an unfavorable prognostic factor for the ability to preserve the bladder.¹⁵⁹⁻¹⁶¹

Radiation Therapy Oncology Group (RTOG) protocol 89-03 compared concurrent cisplatin and radiotherapy with or without 2 cycles of induction MCV (methotrexate, cisplatin, and vinblastine) chemotherapy.¹⁵⁸ No difference in complete clinical response or 5-year OS was observed between the treatment arms. Other studies also reported no significant survival benefit for neoadjuvant chemotherapy before bladder-preserving chemotherapy with radiation therapy (RT).^{160,162}

Conversely, results from several prospective trials have demonstrated the effectiveness of this approach. In the phase 3 RTOG 89-03 trial in which 123 patients with clinical stage T2–T4a were treated with radiotherapy plus concurrent cisplatin, with or without induction MCV chemotherapy, 5-year OS was approximately 49% in both arms.¹⁵⁸ The subsequent RTOG 95-06 trial treated 34 patients with twice-daily irradiation and concurrent cisplatin and 5-FU and reported a 3-year OS of 83%.¹⁶³ The RTOG 97-06 trial treated 47 patients with twice-daily irradiation and concurrent cisplatin; patients also received adjuvant chemotherapy with CMV.¹⁶⁴ Three-year OS was 61%. In the RTOG 99-06 study, 80 patients received twice-daily irradiation plus cisplatin and paclitaxel, followed by adjuvant cisplatin and gemcitabine. Five-year OS was 56%.¹⁶⁵ In RTOG 0233, 97 patients received twice-daily radiation with concurrent paclitaxel plus cisplatin or 5-FU plus cisplatin. Five-year OS was 73%.¹⁶⁶ RTOG 0712 investigated 5-FU plus cisplatin with twice-daily radiation or gemcitabine with once daily radiation, with 33 patients eligible for analysis on each arm. Three-year distant metastasis-free survival rates were 78% and 84%,

respectively.¹⁶⁷ Taken together, the complete response rates ranged from 59% to 88%.

Up to about 80% of long-term survivors maintain an intact bladder, while other patients ultimately require radical cystectomy.¹⁵⁷⁻¹⁶⁵ A combined analysis of survivors from 4 of these trials, with a median follow-up of 5.4 years, showed that combined-modality therapy was associated with low rates of late grade 3 toxicity (5.7% genitourinary and 1.9% gastrointestinal).¹⁶⁸ No late grade 4 toxicities or treatment-related deaths were recorded.

Based on the trials described above, as well as the phase 3 BC2001 trial that demonstrated a locoregional DFS benefit for those treated with fluorouracil and mitomycin concurrently with radiotherapy compared to radiotherapy alone, with no significant increase in AEs,¹⁶⁹ bladder preservation with concurrent chemoradiotherapy was given a category 1 designation for primary treatment of stage II or IIIA bladder cancer.

Chemotherapy Following TURBT as Primary Treatment for Muscle-Invasive Bladder Cancer

Chemotherapy alone is considered to be inadequate without additional treatment to the bladder and remains investigational. Studies showed that the proportions of complete pathologic response in the bladder using neoadjuvant chemotherapy alone were only up to 38%.¹¹⁶ A higher proportion of bladders can be rendered tumor-free and therefore preserved when chemotherapy is combined with concurrent radiotherapy.

Radiotherapy Following TURBT as Primary Treatment for Muscle-Invasive Bladder Cancer

Radiotherapy alone is inferior to radiotherapy combined with chemotherapy for patients with an invasive bladder tumor, and is not considered standard for patients who can tolerate combined



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therapy.^{169,170} In a randomized trial of 360 patients, radiotherapy with concurrent mitomycin C and 5-FU improved 2-year locoregional DFS from 54% (radiotherapy alone) to 67% ($P = .01$), and 5-year OS from 35% to 48% ($P = .16$), without increasing grade 3–4 acute or late toxicity.¹⁶⁹ Hence, radiotherapy alone is only indicated for those who cannot tolerate a cystectomy or chemotherapy because of medical comorbidities.

TURBT Alone as Primary Treatment for Muscle-Invasive Bladder Cancer

TURBT alone may be an option for patients with stage II disease who are not candidates for cystectomy. TURBT alone may be curative in selected cases that include solitary lesions less than 2 cm in size that have minimally invaded the muscle. These cases should also have no associated in situ component, palpable mass, or associated hydronephrosis.¹⁷¹

If primary treatment consists of TURBT alone, patients should undergo an aggressive re-resection of the site within 4 weeks of the primary procedure to ensure that no residual disease is present. If the repeat TURBT is negative for residual tumor, the patient can be managed conservatively with repeat endoscopic evaluations and cytologies every 3 months until a relapse is documented. The stage of the lesion documented at relapse would determine further management decisions.

NCCN Recommendations for Treatment of Muscle-Invasive Bladder Cancer

Treatment of Stage II and IIIA Tumors

The critical issues in the management and prognosis of these patients are whether a palpable mass is appreciated at EUA and if the tumor has extended through the bladder wall. Tumors that are organ-confined (T2, stage II) have a better prognosis than those that have extended through the bladder wall into the perivesical fat (T3) and beyond. T4a tumors

involve the prostatic stroma, uterus, or vagina and are typically surgically managed similar to T3 tumors.

Primary surgical treatment for stage II and IIIA disease is a radical cystectomy and pelvic lymphadenectomy. Neoadjuvant chemotherapy is recommended (category 1). Partial cystectomy along with neoadjuvant cisplatin-based chemotherapy can be considered for stage II (cT2, N0) disease with a single tumor in a suitable location and no presence of Tis. Partial cystectomy is not an option for stage III patients. If no neoadjuvant cisplatin-based chemotherapy is given, postoperative adjuvant chemotherapy may be considered based on pathologic risk, such as positive nodes, positive margins, or pT3–T4 lesions.¹⁴² Adjuvant RT is another option for these patients (category 2B).

Bladder preservation with maximal TURBT followed by concurrent chemoradiotherapy is another category 1 primary treatment option for these patients. Candidates for this bladder-sparing approach include patients with tumors that present without hydronephrosis or with tumors that allow a visibly complete or a maximally debulking TURBT. Radiotherapy with concurrent cisplatin-based chemotherapy or 5-FU plus mitomycin as a radiosensitizer is the most common and well-studied chemoradiation method used to treat muscle-invasive bladder cancer.^{156-160,169,170,172} The following radiosensitizing regimens are recommended: cisplatin plus 5-FU; cisplatin plus paclitaxel; 5-FU plus mitomycin C; and cisplatin alone. Doublet chemotherapy is generally preferred. Low-dose gemcitabine (category 2B) may be considered as an alternative regimen.

After a complete TURBT, 60 to 66 Gy of external beam RT (EBRT) is administered. Two doses of concurrent radiosensitizing chemotherapy may be given on weeks 1 and 4 (though weekly schedules are possible as well). Alternatively, an induction dose of 40 to 45 Gy radiotherapy may be given following complete TURBT. The overall tumor status



should be reassessed 2 to 3 months after treatment. If no residual tumor is detected, observation is appropriate. If residual disease is present, surgical consolidation of bladder-only residual disease or treatment as metastatic disease are appropriate. If residual disease is Tis, Ta, or T1, intravesical BCG may be considered.

In patients with extensive comorbid disease or poor performance status who are non-cystectomy candidates, treatment options include concurrent chemoradiation (preferred, category 1) or radiotherapy alone. TURBT is another option for patients with stage II disease who are non-cystectomy candidates. Based on high-level evidence showing superiority to radiotherapy alone, the NCCN Panel recommends chemoradiotherapy as the preferred option for these patients.^{169,170} The overall tumor status should be reassessed 2 to 3 months after treatment. If no tumor is evident, the patient should be observed. If tumor is observed, systemic therapy, concurrent chemoradiotherapy or radiotherapy alone (if no prior radiotherapy), TURBT, or best supportive care may be given.

Treatment of Stage IIIB Tumors

Primary treatment for stage IIIB (cT1–T4a, N2–3) disease can include either downstaging systemic therapy or concurrent chemoradiotherapy.^{173,174} A population-based study of 659 patients with cT1–T4a, node-positive urothelial bladder cancer tested the effectiveness of induction chemotherapy for pathologic downstaging.¹⁷⁴ For cN1 disease, complete pathologic downstaging was achieved in 39% of patients who received induction chemotherapy compared to 5% of patients who did not receive induction chemotherapy. For cN2–3, the rate of pathologic downstaging was 27% versus 3% for these two groups. OS was also improved in patients who received induction chemotherapy ($P < .001$), although the nature of the study limits interpretation of the OS results.¹⁷⁴

Another study used the National Cancer Database to analyze outcomes of 1783 patients with clinically node-positive bladder cancer who were treated with chemotherapy alone ($n = 1388$) or chemoradiotherapy ($n = 395$).¹⁷³ This study found that patients treated with chemoradiotherapy had a higher median OS than those treated with chemotherapy (19.0 months vs. 13.8 months, $P < .001$). The improvement in outcome with chemoradiotherapy persisted upon evaluation of propensity-matched populations ($P < .001$).¹⁷³ Cystectomy as primary treatment or for surgical palliation may be appropriate in very select situations, such as in patients with limiting local symptoms and/or those with comorbidities that prevent administration of chemotherapy.

Tumor status should be reassessed 2 to 3 months after treatment by imaging the chest, abdomen, and pelvis using CT with contrast. If there is no evidence of distant disease on imaging reassessment, further cystoscopic assessment of tumor response in the bladder is recommended.

Subsequent disease management depends on the response to primary treatment. Patients who received downstaging systemic therapy and had a complete disease response may then be subsequently treated with cystectomy or chemoradiotherapy or may be observed until disease relapse, depending on patient-specific features. Patients who received downstaging systemic therapy and showed a partial response may be treated with cystectomy or chemoradiotherapy (for persistent disease confined to the bladder) or treated as metastatic disease with additional lines of systemic therapy (for distant disease). Patients who had disease progression following primary downstaging systemic therapy may be treated as with metastatic disease, with additional lines of systemic therapy.



Patients with complete disease response following concurrent chemoradiotherapy should be observed until disease relapse. Partial responses to concurrent chemoradiotherapy may be subsequently treated with surgical consolidation (for residual disease confined to the bladder), consideration of intravesical BCG (for Tis, Ta, or T1 residual disease), or treated as metastatic disease with systemic therapy (for remaining disease outside of the bladder). Progression following concurrent chemoradiotherapy may be treated as metastatic disease with systemic therapy.

Treatment of Stage IVA Tumors

Stage IVA includes patients with cT4b, any N, M0 or any T, any N, M1a disease.¹⁴ For patients with stage IVA disease, treatment options differ depending on the presence of distant metastasis (M0 vs. M1a).

Primary treatment recommendations for patients with M0 disease include systemic therapy or concurrent chemoradiotherapy followed by evaluation with cystoscopy, EUA, TURBT, and imaging of the abdomen and pelvis. If no evidence of tumor is present after primary treatment, the patient may be treated with consolidation systemic therapy or adjuvant treatment with chemoradiotherapy may be initiated if the patient did not receive prior radiotherapy. In general, stage IVA disease is considered unresectable. However, in patients with disease that responds to treatment, cystectomy may be an option if the tumor becomes technically resectable. If residual disease is noted upon evaluation after primary therapy, systemic therapy or cystectomy is recommended. Systemic therapy may include a checkpoint inhibitor, chemoradiotherapy (if no prior radiotherapy), or chemotherapy. Cystectomy, if feasible, is an option.

Patients with M1a disease should receive systemic therapy as primary treatment. Those select patients with metastatic disease treated with curative intent should be evaluated with cystoscopy, EUA, TURBT,

and abdominal/pelvic imaging. If a complete response is noted following primary treatment of metastatic disease, these patients may receive concurrent chemoradiotherapy or a cystectomy. If the disease remains stable or progresses following primary therapy, these patients should follow treatment for metastatic disease.

Follow-up

Results from a meta-analysis of 13,185 patients who have undergone cystectomy reported a 0.75% to 6.4% prevalence of upper tract recurrence.¹⁷⁵ Surveillance by urine cytology or upper tract imaging detected recurrences in 7% and 30% of cases, respectively.

Follow-up after a cystectomy should include urine cytology, liver function tests, creatinine, and electrolytes. Imaging of the chest, upper tract abdomen, and pelvis should be conducted at intervals based on the risk of recurrence. Patients should be monitored annually for vitamin B₁₂ deficiency if a continent urinary diversion was created. Consider urethral wash cytology for patients with an ileal conduit or continent catheterizable diversion, particularly if Tis was found within the bladder or prostatic urethra. For details of follow-up recommendations, see *Follow-up* in the algorithm.

Follow-up after a partial cystectomy is similar to that for a radical cystectomy, with the addition of monitoring for relapse in the bladder by serial cytologic examinations and cystoscopies (may include selected mapping biopsy).

For patients who have a preserved bladder, there is a risk for recurrence in the bladder or elsewhere in the urothelial tract and distantly. Imaging studies and laboratory testing should be performed as outlined under post-cystectomy follow-up. Additionally, continued monitoring of the urothelium with cystoscopy and urinary cytologies with



or without mapping biopsy is a routine part of the management of all cases in which the bladder is preserved.

Recurrent or Persistent Disease

Metastatic or local recurrence of muscle-invasive disease may be managed with cystectomy, systemic therapy, or palliative TURBT and best supportive care.

A positive cytology with no evidence of disease in the bladder should prompt retrograde selective washings of the upper tract and a biopsy of the prostatic urethra. If the results are positive, patients are managed as described in the sections below for treatment of UTUC or urothelial carcinoma of the prostate.

For patients with a preserved bladder, local recurrence or persistent disease should be evaluated as a new cancer. Recurrences are treated based on the extent of disease at relapse, with consideration of prior treatment. As previously discussed, Tis, Ta, or T1 tumors are generally managed with intravesical therapy or cystectomy. If no response is noted following intravesical treatment, a cystectomy is advised. Invasive disease is generally managed with radical cystectomy, and a second attempt at bladder preservation is not advisable. Cystectomy may not be possible in a patient who has undergone a full course of EBRT and has bulky residual disease. For these patients, systemic therapy or palliative TURBT and best supportive care is advised.

Subsequent-line therapy for metastatic disease or local recurrence includes systemic therapy, chemoradiotherapy (if no previous RT), or RT (see *Follow-up, Recurrent or Persistent Disease* in the algorithm).

Chemotherapy is sometimes combined with palliative radiation to treat metastases or pelvic recurrence after cystectomy. However, concurrent chemotherapy is inappropriate if high-dose radiation (>3 Gy fractions) is

used. The radiosensitizing chemotherapy regimens remain controversial in this setting. Possible options include cisplatin (category 2A); docetaxel or paclitaxel (category 2B); 5-FU with or without mitomycin C (category 2B); capecitabine (category 3); and low-dose gemcitabine (category 2B). Radiotherapy alone can also be considered as a subsequent-line therapy for patients with metastatic disease or local recurrence following cystectomy, especially in selected cases with regional-only recurrence or with clinical symptoms.

Metastatic (Stage IVB) Urothelial Bladder Cancer

Approximately 5% of patients have metastatic disease at the time of diagnosis.² Additionally, about half of all patients relapse after cystectomy depending on the pathologic stage of the tumor and nodal status. Local recurrences account for about 10% to 30% of relapses, whereas distant metastases are more common.

Evaluation of Metastatic Disease

If metastasis is suspected, additional workup to evaluate the extent of the disease is necessary. This includes a chest CT and a bone scan if enzyme levels are abnormal or the patient shows signs or symptoms of skeletal involvement. Central nervous system (CNS) imaging should be considered. An estimated glomerular filtration rate (GFR) should be obtained to assess patient eligibility for cisplatin. For patients with borderline GFR results, a timed or measured urine collection may be considered to more accurately determine cisplatin eligibility.¹⁷⁶ If the evidence of spread is limited to nodes and biopsy is technically feasible, nodal biopsy should be considered and patients should be managed as previously outlined for positive nodal disease (stage IIIA, stage IIIB, or stage IVA). Molecular testing should also be performed for patients with metastatic disease (see *Molecular/Genomic Testing*, below).



Patients who present with disseminated metastatic disease are generally treated with systemic therapy. Metastasectomy and/or palliative radiotherapy of metastases may also be useful for select patients.

Metastasectomy for Oligometastatic Disease

Highly select patients with oligometastatic disease who are without evidence of rapid progression may benefit from metastasectomy following response to systemic therapy. While there are limited prospective data supporting the role of metastasectomy for treatment of urothelial bladder cancer, several retrospective studies have demonstrated that metastasectomy can be a valid treatment option for certain patients with metastatic bladder cancer, particularly those with favorable response to systemic therapy, solitary metastatic lesions, and lung or lymph node sites of disease.

A phase II trial of 11 patients with bladder primary urothelial carcinoma metastatic to the retroperitoneal lymph nodes who underwent complete bilateral retroperitoneal lymph node dissection reported 4-year DSS and RFS rates of 36% and 27%. Patients with viable tumor in no more than 2 lymph nodes and/or excellent response to presurgical systemic chemotherapy showed the best survival rates indicating that a low burden of disease or good response to presurgical chemotherapy may be important in achieving benefit from metastasectomy.¹⁷⁷ Another phase II trial of 70 patients who underwent complete surgical resection of bladder cancer metastases investigated survival, performance status, and quality of life following surgery. This study reported no survival advantage from surgery, although the quality of life and performance status were improved for symptomatic patients.¹⁷⁸

Beyond these prospective data, several retrospective studies have demonstrated a survival advantage following metastasectomy.¹⁷⁹⁻¹⁸² A

retrospective series of 55 patients with bladder primary urothelial carcinoma metastatic to the pelvic or retroperitoneal lymph nodes, who underwent post-chemotherapy lymph node dissection, reported 5-year DSS and RFS rates of 40% and 39%. The best outcomes were associated with radiologic nodal complete response to preoperative chemotherapy and pN0 versus pN+, but similar for cN1–3 versus cM1.¹⁸³ A systematic review and meta-analysis of available studies, including a total of 412 patients with metastatic urothelial carcinoma, reported an improved OS for patients who underwent metastasectomy compared to non-surgical treatment of metastatic lesions. Five-year survival in these studies ranged from 28% to 72%.¹⁸⁴ Another population-based analysis of 497 patients aged ≥65 years who had at least one metastasectomy for treatment of urothelial carcinoma found that with careful patient selection, metastasectomy is safe and can be associated with long-term survival in this patient population.¹⁸⁵

Due to the limited evidence supporting metastasectomy for bladder cancer, and the often extensive and difficult nature of the surgery, it is important to carefully select appropriate patients for metastasectomy, including consideration of patient performance status, comorbidities, and overall clinical picture.

Molecular/Genomic Testing

The panel recommends that molecular/genomic testing be performed for stages IVA and IVB bladder cancer and may be considered for stage IIIB. This testing should be performed only in laboratories that are certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA-88) as qualified to perform highly complex molecular pathology testing.¹⁸⁶ The NCCN Bladder Cancer Panel recommends that molecular/genomic testing be carried out early, ideally at diagnosis of advanced bladder cancer, in order to facilitate treatment decision-making and to prevent delays in administering later lines of therapy. In



addition to determining eligibility for FDA-approved therapies, molecular/genomic testing may be used to screen for clinical trial eligibility.

Based on the FDA approval of erdafitinib (see *Targeted Therapies*, below), molecular testing should include analysis for *FGFR3* or *FGFR2* genetic alterations. The *therascreen* FGFR RGQ RT-PCR Kit has been approved as a companion diagnostic for erdafitinib.^{187,188} For certain patients who are ineligible to receive cisplatin, the checkpoint inhibitors atezolizumab or pembrolizumab may be considered for first-line therapy based on PD-L1 testing results (see *Targeted Therapies*, below). Companion diagnostics have been approved for each of these therapies when used in this setting.^{188,189}

Genetic alterations are known to be common in bladder cancer, with data from the Cancer Genome Atlas ranking bladder cancer as the third highest mutated cancer.^{190,191} Supporting this, a study that looked at comprehensive genomic profiling of 295 cases of advanced urothelial carcinoma found that 93% of cases had at least 1 clinically relevant genetic alteration, with a mean of 2.6 clinically relevant genetic alterations per case. The most commonly identified clinically relevant genetic alterations were cyclin-dependent kinase inhibitor 2A (*CDKN2A*, 34%), *FGFR3* (21%), phosphatidylinositol 3-kinase catalytic subunit alpha (*PIK3CA*, 20%), and *ERBB2* (17%).¹⁹²

Chemotherapy for Metastatic Disease

The specific chemotherapy regimen recommended partially depends on the presence or absence of medical comorbidities, such as cardiac disease and renal dysfunction, along with the risk classification of the patient based on disease extent. In general, long-term survival with combination chemotherapy alone has been reported only in good-risk patients, defined as those with good performance status, no visceral (ie,

liver, lung) or bone disease, and normal alkaline phosphatase or lactic dehydrogenase levels. Poor-risk patients, defined as those with poor performance status or visceral disease, have consistently shown very poor tolerance to multiagent combination programs and few complete remissions, which are prerequisites for cure.

GC^{193,194} and ddMVAC^{124,136} are commonly used in combinations that have shown clinical benefit. A large, international, phase III study randomized 405 patients with locally advanced or metastatic disease to GC or standard (28-day) MVAC.¹³⁸ At a median follow-up of 19 months, OS and time to progression were similar in the two arms. Fewer toxic deaths were recorded among patients receiving GC compared to MVAC (1% vs. 3%), although this did not reach statistical significance. A 5-year update analysis confirmed that GC was not superior to MVAC in terms of survival (OS, 13.0% vs. 15.3%; progression-free survival [PFS], 9.8% vs. 11.3%, respectively).¹⁹⁴ Another large, randomized, phase III trial compared ddMVAC to standard (28-day) MVAC.^{124,136} At a median follow-up of 7.3 years, 24.6% of patients were alive in the ddMVAC cohort compared with 13.2% in the standard MVAC cohort. There was one toxic death in each arm, but less overall toxicity was seen in the dose-dense group. From these data, ddMVAC had improved toxicity and efficacy as compared to standard MVAC; therefore, standard (28-day) MVAC is no longer used. Both GC and ddMVAC with growth factor support are category 1 recommendations for metastatic disease. Alternative first-line regimens also include carboplatin or taxane-based regimens (category 2B) or single-agent chemotherapy (category 2B).

The performance status of the patient is a major determinant in the selection of a regimen. Regimens with lower toxicity profiles are recommended in patients with compromised liver or renal status or serious comorbid conditions. In patients who are not cisplatin-eligible and whose tumors express PD-L1 or in patients who are not eligible for



any platinum-containing chemotherapy, atezolizumab or pembrolizumab are appropriate first-line options (see *Targeted Therapies* in the discussion). Alternatively, carboplatin may be substituted for cisplatin in the metastatic setting for cisplatin-ineligible patients such as those with a GFR less than 60 mL/min. A phase II/III study assessed 2 carboplatin-containing regimens in medically unfit patients (performance status 2).¹⁹⁵ The overall response rate (ORR) was 42% for gemcitabine plus carboplatin and 30% for methotrexate, carboplatin, and vinblastine. However, the response rates dropped to 26% and 20%, respectively, with increased toxicity among patients who were both unfit and had renal impairment (GFR <60 mL/min).

Taxanes have been shown to be active as treatment options for urothelial bladder cancer.¹⁹⁶⁻¹⁹⁹ Based on these results, several groups are exploring 2- and 3-drug combinations using these agents, with and without cisplatin. A randomized phase III trial was conducted to compare GC and GC plus paclitaxel in 626 patients with locally advanced or metastatic urothelial cancer.²⁰⁰ The addition of paclitaxel to GC resulted in higher response rates and a borderline OS advantage, which was not statistically significant in the intent-to-treat analysis. Analysis of eligible patients only (92%) resulted in a small (3.2 months) but statistically significant survival advantage in favor of the 3-drug regimen ($P = .03$). There was no difference in PFS. The incidence of neutropenic fever was substantially higher with the 3-drug combination (13.2% vs. 4.3%; $P < .001$). Panelists feel that the risk of adding paclitaxel outweighs the limited benefit reported from the trial. The alternative regimens, including cisplatin/paclitaxel,²⁰¹ gemcitabine/paclitaxel,²⁰² cisplatin/gemcitabine/paclitaxel,²⁰³ carboplatin/gemcitabine/paclitaxel,²⁰⁴ and cisplatin/gemcitabine/docetaxel,²⁰⁵ have shown modest activity in patients with bladder cancer in phase I–II trials. Category 1 level evidence now supports the use of checkpoint inhibitors in patients with

advanced disease previously treated with a platinum-containing regimen (see *Targeted Therapies* in the discussion).

Although current data are insufficient to recommend the above alternative regimens as routine first-line options, non–cisplatin-containing regimens may be considered in patients who cannot tolerate cisplatin because of renal impairment or other comorbidities (see *Principles of Systemic Therapy* in the algorithm). Additionally, two checkpoint inhibitors, atezolizumab and pembrolizumab, have been FDA approved for use as a first-line therapy in certain patients. Consideration of checkpoint inhibitors must be integrated into the therapeutic planning for all patients with locally advanced and metastatic disease (see *Targeted Therapies* in the discussion). The NCCN Panel recommends enrollment in clinical trials of potentially less toxic therapies.

Independent of the specific regimen used, patients with metastatic disease are re-evaluated after 2 to 3 cycles of chemotherapy, and treatment is continued for 2 more cycles in patients whose disease responds or remains stable. Chemotherapy may be continued for a maximum of 6 cycles, depending on response. If no response is noted after 2 cycles or if significant morbidities are encountered, a change in therapy is advised, taking into account the patient's current performance status, extent of disease, and specific prior therapy. A change in therapy is also advised for patients who experience systemic relapse after adjuvant chemotherapy.

For patients who show either response or stable disease through their full course of platinum-based first-line chemotherapy, maintenance therapy with the PD-L1 inhibitor, avelumab, is recommended. Interim results from the randomized, phase III JAVELIN Bladder 100 trial showed that avelumab significantly prolonged OS in all randomized patients compared to best supportive care alone (median OS of 21.4



months vs. 14.3 months; HR, 0.69; 95% CI, 0.56-0.86; $p = 0.0005$).²⁰⁶ The OS benefit was observed in all prespecified subgroups, including patients with PD-L1-positive tumors. Grade ≥ 3 AEs were reported in 47.4% of patients treated with avelumab compared to 25.2% of those with best supportive care alone.

Surgery or radiotherapy may be feasible in highly select cases for patients who show a major partial response in a previously unresectable primary tumor or who have a solitary site of residual disease that is resectable after chemotherapy. In selected series, this approach has been shown to afford a survival benefit. If disease is completely resected, 2 additional cycles of chemotherapy can be considered, depending on patient tolerance.

Clinical trial enrollment is recommended by the NCCN Panel for all patients when appropriate, but is strongly recommended for second-line and subsequent therapies since data for locally advanced or metastatic disease treated with subsequent-line therapy are highly variable. The available options depend on what was given as first line. Regimens used in this setting include checkpoint inhibitors, erdafitinib, enfortumab vedotin, and the following chemotherapies: docetaxel; paclitaxel; gemcitabine; ifosfamide, doxorubicin, and gemcitabine; gemcitabine and paclitaxel; GC; and ddMVAC.

Targeted Therapies

Platinum-based chemotherapy has been the standard of care in patients with metastatic disease with an OS of 9 to 15 months.^{194,207}

However, in patients with disease that relapses after this type of chemotherapy, the median survival is reduced to 5 to 7 months.²⁰⁸

Several new agents, notably checkpoint inhibitors, have data supporting improved outcomes compared to standard therapies for metastatic urothelial carcinoma. Additionally, the FGFR inhibitor, erdafitinib, and

the antibody-drug conjugate, enfortumab vedotin, have demonstrated effectiveness for the treatment of previously treated urothelial carcinoma. Cancers with higher rates of somatic mutations have been shown to respond better to checkpoint inhibitors.²⁰⁹⁻²¹⁴ Data from the Cancer Genome Atlas rank bladder cancer as the third highest mutated cancer,^{190,191} suggesting that checkpoint inhibitors may have a substantial impact as a treatment option for this cancer.

The FDA has approved the PD-L1 inhibitors atezolizumab and avelumab as well as the PD-1 inhibitors nivolumab and pembrolizumab for patients with urothelial carcinoma. Pembrolizumab, nivolumab, and avelumab are approved for the treatment of locally advanced or metastatic urothelial cell carcinoma that has progressed during or after platinum-based chemotherapy or that has progressed within 12 months of neoadjuvant or adjuvant platinum-containing chemotherapy, regardless of PD-L1 expression levels. Additionally, atezolizumab and pembrolizumab are approved as a first-line treatment option for patients with locally advanced or metastatic urothelial cell carcinoma who are not eligible for cisplatin-containing chemotherapy and whose tumors express PD-L1 or in patients who are not eligible for any platinum-containing chemotherapy regardless of PD-L1 expression. Companion diagnostic tests have been approved by the FDA for measurement of PD-L1 expression.^{188,189} All of these approvals have been based on category 2 level evidence with the exception of pembrolizumab as a subsequent treatment option, which has category 1 level evidence supporting the approval.²¹⁵

Pembrolizumab

Pembrolizumab is a PD-1 inhibitor that has been evaluated as second-line therapy for patients with bladder cancer who previously received platinum-based therapy and subsequently progressed or metastasized.²¹⁶ An open-label, randomized, phase III trial compared



pembrolizumab to chemotherapy (paclitaxel, docetaxel, or vinflunine) in 542 patients with advanced urothelial carcinoma that recurred or progressed after platinum-based chemotherapy. Data from this trial showed a longer median OS for patients treated with pembrolizumab compared to chemotherapy (10.3 months vs. 7.4 months; $P = .002$). In addition, fewer grade 3, 4, or 5 treatment-related AEs occurred in the pembrolizumab-treated patients compared to those treated with chemotherapy (15.0% vs. 49.4%).²¹⁷ Long-term results (>2 years' follow-up) from this same phase III trial were consistent with earlier reports, with longer 1- and 2- year OS and PFS results for pembrolizumab compared to chemotherapy.²¹⁸ The median DOR was not reached for pembrolizumab compared to 4.4 months for chemotherapy. Pembrolizumab also showed lower rates of any grade (62% vs. 90.6%) and grade ≥ 3 AEs (16.5% vs. 50.2%) compared to chemotherapy. Results from this phase 3 trial have led the NCCN Panel to assign pembrolizumab a category 1 recommendation as a second-line therapy.

A single-arm, phase II trial evaluated pembrolizumab as a first-line therapy in 370 patients with advanced urothelial carcinoma who were ineligible for cisplatin-based therapy. Data from this study showed an ORR of 24%, with 5% of patients achieving a complete response. Grade 3 or higher treatment-related AEs occurred in 16% of patients treated with pembrolizumab at the time of data cutoff.²¹⁹ In May 2018, the FDA issued a safety alert for the use of first-line pembrolizumab and atezolizumab, which warned that early reviews of data from 2 ongoing clinical trials (KEYNOTE-361 and IMvigor-130) showed decreased survival for patients receiving pembrolizumab or atezolizumab as first-line monotherapy compared to those receiving cisplatin- or carboplatin-based therapy.¹⁸⁹ Based on these data, the pembrolizumab prescribing information was subsequently amended to restrict first-line use to patients who either 1) are not eligible for cisplatin-containing

chemotherapy and whose tumors express PD-L1 as measured by a combined positive score (CPS) of at least 10; or 2) are not eligible for any platinum-containing chemotherapy regardless of PD-L1 status.⁸³

Atezolizumab

Data from the two-cohort, multicenter, phase II IMvigor-210 trial evaluated atezolizumab in patients with metastatic disease. In cohort 1, atezolizumab was evaluated as a first-line therapy in 119 patients with locally advanced or metastatic urothelial carcinoma who were ineligible for cisplatin. Data from this study showed an ORR of 23% with 9% of patients showing a complete response. Median OS was 15.9 months. Grade 3 or 4 treatment-related AEs occurred in 16% of patients.²²⁰ In May 2018, the FDA issued a safety alert for the use of first-line pembrolizumab and atezolizumab, which warned that early reviews of data from 2 ongoing clinical trials (KEYNOTE-361 and IMvigor-130) showed decreased survival for patients receiving pembrolizumab or atezolizumab as first-line monotherapy compared to those receiving cisplatin- or carboplatin-based therapy.¹⁸⁹ Based on these data, the atezolizumab prescribing information was subsequently amended to restrict first-line use to patients who either 1) are not eligible for cisplatin-containing chemotherapy and whose tumors express PD-L1 as measured by PD-L1–stained tumor-infiltrating immune cells covering at least 5% of the tumor area; or 2) are not eligible for any platinum-containing chemotherapy regardless of the level of tumor PD-L1 expression.²²¹

Atezolizumab has also been investigated for patients with metastatic urothelial carcinoma post-platinum treatment, although it is no longer FDA-approved or recommended by the NCCN in that setting. Cohort 2 of the IMvigor 210 trial enrolled 310 patients with metastatic urothelial carcinoma post-platinum treatment and showed a significantly improved ORR compared to historical controls (15% vs. 10%; $P = .0058$).²²²



Follow-up to date suggests these responses may be durable with ongoing responses recorded in 38 (84%) of 45 responders with a median follow-up of 11.7 months. At the investigator's discretion, patients on this trial could continue atezolizumab beyond RECIST progression.²²³ An analysis of post-progression outcomes showed that those who continued atezolizumab had longer post-progression OS (8.6 months) compared to those who received a different treatment (6.8 months) and those who received no further treatment (1.2 months).

The multicenter, randomized phase III IMvigor-211 study compared atezolizumab to chemotherapy (vinflunine, paclitaxel, or docetaxel) in 931 patients with locally advanced or metastatic urothelial carcinoma following progression with platinum-based chemotherapy.²²⁴ The primary endpoint of this study, median OS in patients with IC2/3 PD-L1 expression levels (n = 234), showed no significant difference between atezolizumab and chemotherapy (11.1 months vs. 10.6 months; $P = .41$). Likewise, confirmed ORR was similar between atezolizumab and chemotherapy treatments in this group of patients (23% vs. 22%). While atezolizumab was not associated with significantly longer OS compared to chemotherapy, the safety profile of atezolizumab was favorable, with 20% of patients experiencing grade 3 or 4 adverse effects compared to 43% with chemotherapy.

The phase IIIb SAUL study and another expanded access study of atezolizumab evaluated the safety and efficacy of atezolizumab in patients who more closely resembled the real-world population, including those ineligible for IMvigor-211.^{225,226} These studies reported similar efficacy and safety results compared to the pivotal clinical trial.

In March 2021, the makers of atezolizumab voluntarily withdrew its indication for patients with locally advanced or metastatic urothelial carcinoma that was previously treated with a platinum based chemotherapy.²²⁷ This withdrawal was based on the IMvigor211 trial

failing to meet its primary endpoint of improved OS. Therefore, the NCCN Panel does not recommend atezolizumab as an option following platinum-based first-line therapy, although it is still recommended in its first-line indication.

Nivolumab

Data from a phase II trial in patients with locally advanced or metastatic urothelial carcinoma who progressed after at least one platinum-containing regimen reported an ORR in 52 of 265 patients (19.6%; 95% CI, 15.0–24.9) following treatment with nivolumab that was unaffected by PD-1 tumor status.²²⁸ Out of the 270 patients enrolled in the study, grade 3 or 4 treatment-related AEs were reported in 18% of patients. Three patient deaths were the result of treatment.²²⁸ The median OS was 8.74 months (95% CI, 6.05–not yet reached). Based on PD-L1 expression of less than 1% and 1% or greater, OS was 5.95 months to 11.3 months, respectively. These data are comparable to the phase I/II data that reported an ORR of 24.4% (95% CI, 15.3%–35.4%) that was unaffected by PD-1 tumor status. Out of the 78 patients enrolled in this study, 2 experienced grade 5 treatment-related AEs, and grade 3 or 4 treatment-related AEs were reported in 22% of patients.²²⁹ An extended follow-up of this same phase I/II study (minimum follow-up of 37.7 months) reported a similar ORR of 25.6% (95% CI, 16.4%–36.8%) for nivolumab monotherapy, with a median DOR of 30.5 months.²³⁰

Avelumab

Avelumab is another PD-L1 inhibitor currently in clinical trials to evaluate its activity in the treatment of bladder cancer. Results from the phase 1b trial for 44 patients with platinum-refractory disease demonstrated an ORR of 18.2% that consisted of 5 complete responses and 3 partial responses following treatment with avelumab. The median PFS was 11.6 weeks and the median OS was 13.7 months with a



54.3% OS rate at 12 months. Grade 3 or 4 treatment-related AEs occurred in 6.8% of patients treated with avelumab.²³¹ A pooled analysis of two expansion cohorts of the same trial reported results for 249 patients with platinum-refractory metastatic urothelial carcinoma or who were ineligible for cisplatin-based chemotherapy. Of the 161 post-platinum patients with at least 6 months of follow-up, the ORR as determined by independent review was 17%, with 6% reporting complete responses and 11% reporting partial responses. Grade 3 or 4 treatment-related AEs occurred in 8% of patients and, likewise, 8% of patients had a serious AE related to treatment with avelumab.²³²

Avelumab is also recommended as a maintenance therapy following first-line platinum-containing treatment. For this setting, see *Chemotherapy for Metastatic Disease*, above.

Erdafitinib

Erdafitinib is a pan-FGFR inhibitor that has been evaluated in a global, open-label phase II trial of 99 patients with a prespecified *FGFR* alteration who had either previously received chemotherapy or who were cisplatin ineligible, chemotherapy naïve. Of these patients, 12% were chemotherapy naïve and 43% had received 2 or more prior lines of therapy. The confirmed ORR was 40% (95% CI, 31%–50%), consisting of 3% complete responses and 37% partial responses. Among patients who had previously received immunotherapy, the confirmed ORR was 59%. Median PFS was 5.5 months and the median OS was 13.8 months. Grade ≥3 treatment-related AEs were reported in 46% of patients and 13% of patients discontinued treatment due to AEs.²³³ Based on these data, the FDA has approved erdafitinib for patients with locally advanced or metastatic urothelial carcinoma that has progressed during or after platinum-based chemotherapy and whose tumors have susceptible *FGFR3* or *FGFR2* genetic alterations.²³⁴

Enfortumab Vedotin

Enfortumab vedotin is a Nectin-4-directed antibody–drug conjugate that has been evaluated in a global, phase II, single-arm study of 125 patients with metastatic urothelial carcinoma who had previously received both a platinum-containing chemotherapy regimen and a PD-1/PD-L1 checkpoint inhibitor. The confirmed ORR was 44% (95% CI, 35.1%–53.2%), including 12% complete responses. Similar response rates were seen in subgroups of patients with liver metastases and in those with no response to prior checkpoint inhibitor therapy. The median DOR was 7.6 months. Grade ≥3 treatment-related AEs were reported in 54% of patients and treatment-related AEs lead to dose reductions or discontinuation of therapy in 32% and 12% of patients, respectively.²³⁵

NCCN Recommendations for Targeted Therapies

Based on these data, the NCCN Panel recommends pembrolizumab, nivolumab, avelumab, or erdafitinib as preferred second-line systemic therapy options after platinum-based therapy. Atezolizumab and pembrolizumab are also recommended as preferred first-line therapy options for patients who are not eligible for cisplatin-containing chemotherapy and whose tumors express PD-L1 or in patients who are not eligible for any platinum-containing chemotherapy regardless of PD-L1 expression for locally advanced or metastatic disease. Avelumab is also recommended as maintenance therapy following treatment with a first-line platinum-containing regimen. In addition to chemotherapy options, erdafitinib is also recommended for second-line systemic therapy following a first-line checkpoint inhibitor and as a third- or subsequent-line therapy option for patients who have already received both a platinum-containing therapy and a checkpoint inhibitor, if eligible on the basis of *FGFR3* or *FGFR2* genetic alterations. Enfortumab vedotin is also recommended as a preferred subsequent-line systemic therapy option. See the *Principles of Systemic Therapy* within the



algorithm for more information on these recommendations. With the exception of pembrolizumab as a second-line, post-platinum treatment option (category 1), the use of targeted therapies are all category 2A recommendations.

Targeted Therapies Not Recommended

Early results from a phase I/II multicenter study of durvalumab for 61 patients with PD-L1–positive inoperable or metastatic urothelial bladder cancer that progressed following a platinum-based regimen showed that 46.4% of patients who were PD-L1 positive had disease that responded to treatment; no response was seen in patients who were PD-L1 negative.²³⁶ A 2017 update on this study (N = 191) showed an ORR of 17.8% and a median OS of 18.2 months, with 55% of patients surviving at 1 year.²³⁷ In May 2017, the FDA granted accelerated approval to durvalumab based on these initial results.²³⁸ Subsequently, in February 2021, the makers of durvalumab voluntarily withdrew this indication based on negative results from the phase III DANUBE trial.²³⁹ DANUBE evaluated the use of durvalumab, with or without tremelimumab, compared to chemotherapy for first-line treatment of advanced urothelial carcinoma.²⁴⁰ The trial did not meet its primary endpoints as both durvalumab alone and in combination with tremelimumab failed to improve overall survival compared to chemotherapy.

Likewise, in March 2021, the makers of atezolizumab voluntarily withdrew its indication for patients with locally advanced or metastatic urothelial carcinoma that was previously treated with a platinum-based chemotherapy.²²⁷ This withdrawal was based on the IMvigor211 trial failing to meet its primary endpoint of improved OS. More information and the data from this trial is described above in the *Atezolizumab* section.

In response to these voluntary withdrawals,, the NCCN Panel voted to remove atezolizumab and durvalumab as a treatment options for

patients with metastatic urothelial carcinoma in the post-platinum setting.

Non-Urothelial Carcinomas of the Bladder

Approximately 10% of bladder tumors are non-urothelial (non-transitional cell) carcinoma. These pathologic entities include mixed histology, pure squamous, adenocarcinoma, small cell tumors, urachal carcinoma, or primary bladder sarcoma. Depending on the pathologic findings, adjuvant chemotherapy may or may not be recommended. The regimens effective for urothelial carcinoma histologies have limited efficacy for patients with non-urothelial carcinomas.

These individuals are often treated based on the identified histology. In general, patients with non-urothelial invasive disease are treated with cystectomy, although those with certain urachal tumors require complete urachal resection (en bloc resection of the urachal ligament with the umbilicus) or may be appropriately treated with partial cystectomy. For example, adenocarcinomas are managed surgically with radical or partial cystectomy and with individualized adjuvant chemotherapy and radiotherapy for maximum benefit. Pure squamous cell tumors are treated by cystectomy, RT, or agents commonly used for squamous cell carcinoma of other sites such as 5-FU or taxanes. However, overall experience with chemotherapy in non-urothelial carcinomas is limited.

Data are limited to support perioperative chemotherapy for non-urothelial carcinomas; however, neoadjuvant chemotherapy may have benefit in patients with small cell carcinoma of the bladder and is recommended by the panel for any patient with small-cell component histology with localized disease regardless of stage.²⁴¹⁻²⁴⁵ In addition, a retrospective analysis has shown that neoadjuvant chemotherapy may



have a modest benefit for other variant histologies.²⁴⁶ In patients with non-urothelial carcinomas of any stage, no data support the use of adjuvant chemotherapy, although the risk for relapse may be high. Some of the general principles of management applicable to urothelial carcinomas are appropriate with minor variations.

Patients with small cell carcinoma of the bladder are best treated with initial chemotherapy (see [NCCN Guidelines for Small Cell Lung Cancer](#)) followed by either RT or cystectomy as consolidation, if there is no metastatic disease. Concurrent chemoradiotherapy is also an option for these patients.²⁴⁷ Primary bladder sarcomas are treated as per the [NCCN Guidelines for Soft Tissue Sarcoma](#).

Upper Tract Urothelial Carcinoma (UTUC)

Upper tract tumors, including those that originate in the renal pelvis or in the ureter, are relatively uncommon.²⁴⁸ The treatment recommendations discussed in this section are based on the most common histology of upper tract tumors, urothelial carcinoma.

Renal Pelvis Tumors

Tumors that develop in the renal pelvis may be identified during evaluation of hematuria or a renal mass. In the latter case, renal pelvic tumors must be distinguished from the more typical adenocarcinomas that originate in the renal parenchyma. These tumors may also be detected during an assessment to pinpoint the source of a positive cytology in the setting of a negative cystoscopy with a retrograde ureteropyelography.

Workup

The evaluation of a patient with a suspected renal pelvic tumor should include cystoscopy and imaging of the upper tract collecting system with CT or MR urography; renal ultrasound or CT without contrast with

retrograde ureteropyelography; or ureteroscopy with biopsy and/or selective washings. A chest radiograph can help evaluate for possible metastasis and assess any comorbid diseases that may be present. Urine cytology obtained from a urine sample or during a cystoscopy may help identify carcinoma cells. Hematologic, renal, and hepatic function should also be evaluated. Additional imaging studies, such as a renal scan or bone scan, may be needed if indicated by the test results or by the presence of specific symptoms. Recent evidence has suggested a high prevalence of Lynch syndrome in patients with UTUC.^{7,249} Therefore, it is recommended to take a thorough family history for all patients with UTUC and consider evaluation for Lynch syndrome for those who are at high risk (see [NCCN Guidelines for Genetic/Familial High-Risk Assessment: Colorectal](#) for more information).

Primary Treatment

In general, the primary form of treatment for renal pelvic tumors is surgery.

Well-differentiated tumors of low grade may be managed with a nephroureterectomy with a bladder cuff with or without perioperative intravesical chemotherapy. Several prospective, randomized, clinical trials have shown a reduction of risk of bladder recurrence following nephroureterectomy when a single postoperative intravesical instillation of chemotherapy was administered.²⁵⁰⁻²⁵² While the studies have generally looked at early instillation (within 24–48 hours of surgery),^{251,252} some centers are delaying intravesical instillation of chemotherapy by up to a week to administer a cystogram confirming there is no perforation. The data supporting the use of neoadjuvant chemotherapy for UTUC are more limited and retrospective; however, a meta-analysis of 4 trials shows that neoadjuvant chemotherapy may also improve outcomes compared to no perioperative treatment.²⁵³



While mitomycin is most commonly used, gemcitabine is an option for select patients.

Alternatively, a nephron-sparing procedure through a transureteroscopic approach or a percutaneous approach may be used, with or without postsurgical intrapelvic chemotherapy or BCG. High-grade tumors or those that are large and/or invade the renal parenchyma are managed through nephroureterectomy with a bladder cuff and regional lymphadenectomy with or without perioperative intravesical chemotherapy. Decline in renal function following surgery may preclude adjuvant therapy. Hence, in selected patients, neoadjuvant chemotherapy may be considered based on extrapolation of data from bladder cancer series.¹¹⁶⁻¹¹⁸ If metastatic disease is documented, or comorbid conditions that do not allow for surgical resection are present, treatment should include systemic therapy with regimens similar to those used for metastatic urothelial bladder tumors.

In the settings of positive upper tract cytology but negative imaging and biopsy studies, treatment remains controversial and appropriate management is currently poorly defined. Frequent monitoring for disease is necessary for these patients.

Endoscopic Management of UTUC

Nephron-sparing endoscopic treatment is a treatment option for certain patients with UTUC, depending on clinical and pathologic criteria and/or the presence of comorbid conditions that may contraindicate nephroureterectomy. Favorable clinical and pathologic criteria for nephron preservation include a papillary, unifocal, low-grade tumor, and size <1.5 cm, where cross-sectional imaging shows no concern for invasive disease.^{248,254} Although there are no randomized controlled trials, systematic reviews of retrospective studies have shown that nephron-sparing approaches show similar outcomes compared to nephroureterectomy for these patients.^{255,256} In addition, patients with

bilateral disease, solitary functional or anatomic kidney, chronic kidney disease, renal insufficiency, or a hereditary predisposition to genitourinary cancers are contraindicated from nephroureterectomy and should receive nephron-sparing treatment.^{248,257} Long-term surveillance (>5 years), including urine cytology and cross-sectional urography or endoscopic visualization, is required following nephron-sparing treatment due to a high risk of disease recurrence.²⁴⁸

Mitomycin for pyelocalyceal solution (also called UGN-101 or mitomycin gel) has been FDA-approved for treatment of adult patients with low-grade UTUC.²⁵⁸ This approval was based on OLYMPUS, a single-arm, multicenter, phase 3 trial of patients with treatment-naïve or recurrent low-grade noninvasive UTUC with at least one measurable papillary tumor above the ureteropelvic junction who were scheduled to receive six weekly instillations of mitomycin ureteral gel via retrograde catheter to the renal pelvis and calyces.^{259,260} Of the 71 patients who received at least one dose of mitomycin gel, 59% showed a complete response at the primary disease evaluation visit (95% CI, 47%–71%; $p < .0001$). CR rates at six and 12 months were estimated at 89% and 84%, respectively, with a median time to recurrence of 13 months. The most common all-cause AEs in this study were ureteric stenosis, urinary tract infections, hematuria, flank pain, and nausea. Based on these data, the NCCN Panel recommends mitomycin gel be considered for use in this setting, with the caveat that complete or near complete endoscopic resection or ablation is recommended prior to gel application. Treatment with mitomycin gel is most appropriate for patients with a solitary residual, low-grade, UTUC tumor that is low volume (eg, 5-15 mm) and who are not candidates for or are not seeking nephroureterectomy as a definitive treatment.



Follow-up

Subsequent management is dictated by the extent of disease at surgery. Tumors that are pT0 or pT1 should be followed up with serial cystoscopies at 3-month intervals for the first year and, if negative, at longer intervals. Cytology may also be considered at similar intervals for high-grade tumors. Tumors that are pT0 or pT1 and were treated with nephron-sparing surgery should also be followed up with ureteroscopy and upper tract imaging at 3- to 12-month intervals.

Data on role of adjuvant chemotherapy for patients with pT2, pT3, pT4, or nodal disease has been mixed. A retrospective study of 1544 patients meeting these criteria across 15 centers showed no difference in OS between adjuvant chemotherapy and observation following radical nephroureterectomy (HR, 1.14; 95% CI, 0.91–1.43).²⁶¹ On the other hand, initial findings from a phase 3 trial that randomized patients to 4 cycles of gemcitabine plus cisplatin/carboplatin or surveillance post nephroureterectomy reported that adjuvant chemotherapy improved PFS in this population (HR, 0.49; 95% CI, 0.30–.079; $P = .003$).²⁶² OS analysis is ongoing for this trial. Based on these data, adjuvant chemotherapy may be considered for patients with pT2–4 or nodal disease. Follow-up should be the same as pT0/pT1 disease with the addition of chest imaging and a stronger recommendation for cytology.

Urothelial Carcinoma of the Ureter

Ureteral tumors may develop de novo or in patients who have undergone successful treatment for superficial tumors that originate in the bladder. The presentation varies as a function of disease extent. Ureteral tumors may be identified in patients who have a positive cytology with a negative cystoscopy in whom selective catheterization of the ureters is performed. More extensive lesions may result in pain or obstruction.

Workup

The evaluation is similar to that outlined for tumors that originate in the renal pelvis.

Primary Treatment

For resectable ureteral tumors, the primary management is surgery (see *Endoscopic Management of UTUC* within the *Renal Pelvis Tumors* section of this Discussion for more discussion of nephron-sparing approaches). The specific procedure required varies depending on the location of the tumor (upper, mid, or distal location) and disease extent. Neoadjuvant chemotherapy may be considered in selected patients, such as when the degree of invasiveness is established before definitive surgery.^{253,263}

Tumors that originate in the upper ureter occasionally can be managed endoscopically but more commonly are treated with nephroureterectomy with a bladder cuff plus regional lymphadenectomy for high-grade tumors. Neoadjuvant chemotherapy should be considered in select patients, including patients with retroperitoneal lymphadenopathy; bulky (>3 cm) high-grade tumor; sessile histology; or suspected parenchymal invasion. A portion of the bladder is removed to ensure complete removal of the entire intramural ureter.

Tumors that originate in the mid portion can be divided by grade and size. Small, low-grade tumors can be managed with excision followed by ureteroureterostomy, segmental or complete ureterectomy, or ileal ureter interposition in highly selected patients. Alternatively, endoscopic resection or nephroureterectomy with a bladder cuff can be performed. Larger, high-grade lesions are managed with nephroureterectomy with a bladder cuff and regional lymphadenectomy. Neoadjuvant chemotherapy can be considered in select patients.



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Bladder Cancer

Distal ureteral tumors may be managed with a distal ureterectomy and regional lymphadenectomy if high grade followed by reimplantation of the ureter (preferred if clinically feasible). Other primary treatment options include endoscopic resection, or, in some cases, a nephroureterectomy with a bladder cuff, and regional lymphadenectomy if high grade. Neoadjuvant chemotherapy can be considered for select patients with distal ureteral tumors following distal ureterectomy or the nephroureterectomy with bladder cuff.

Follow-up

The final pathologic stage is used to guide subsequent management, as is the case for tumors that originate in other sites. No adjuvant therapy is advised for lesions that are pT1 or less, but serial follow-up of the urothelial tracts or remaining unit (as previously described under *Renal Pelvis Tumors*) is recommended.

Patients with more extensive disease are advised to consider systemic adjuvant treatment with chemotherapy, depending on the patient's anticipated tolerance to the regimen based on comorbidities. The reasons for considering adjuvant therapy are similar to those for tumors that originate in the bladder. Please see *Follow-up for Renal Pelvis Tumors*, above, for more discussion of the data on adjuvant therapy for UTUC.

Urothelial Carcinomas of the Prostate

Urothelial (transitional cell) carcinomas of the prostate represent a distinct entity with a unique staging system. In this respect, they must be distinguished from urothelial carcinomas of bladder origin that invade into the prostate through the bladder wall. Urothelial carcinomas of the prostate may occur de novo or, more typically, concurrently or after treatment of bladder cancer. Similar to tumors originating in other sites of the urothelium, management of prostate urothelial carcinomas is

based on the extent of disease with particular reference to the urethra, duct, acini, and stroma.

Workup

The evaluation of a suspected urothelial carcinoma of the prostate includes a digital rectal examination (DRE), cystoscopy with bladder biopsy, and TURP that includes the prostatic stroma. Prostate-specific antigen testing should be performed. Multiple stromal biopsies are advised and, if the DRE is abnormal, additional needle biopsies may be required in selected patients to exclude primary adenocarcinoma of the prostate. Upper tract collecting system imaging is also recommended.

Primary Treatment

Pending histologic confirmation, tumors that are limited to the mucosal prostatic urethra with no acinar or stromal invasion can be managed with TURP and intravesical BCG, with follow-up similar to that for superficial disease of the bladder. If local recurrence is seen, cystoprostatectomy with or without urethrectomy is recommended. Patients with tumors that invade the ducts, acini, or stroma should undergo an additional workup with chest radiograph, and abdominal/pelvic CT if necessary, to exclude metastatic disease, and then a cystoprostatectomy with or without urethrectomy should be performed. Based on data extrapolated from bladder cancer therapy, neoadjuvant chemotherapy may be considered in patients with stromal invasion.¹¹⁶⁻¹¹⁸ Adjuvant chemotherapy may be advised for stromal invasion after primary treatment if neoadjuvant therapy was not given. Alternatively, TURP and intravesical BCG may be offered to patients with only ductal and acini invasion. Local recurrences in patients undergoing TURP and BCG therapy are treated with cystoprostatectomy with or without urethrectomy.



Primary Carcinoma of the Urethra

Primary carcinoma that arises in the urethra is rare. Unlike for bladder cancer, squamous cell carcinoma is the most common histologic subtype for urethral cancer.²⁶⁴ The 5-year OS is 42%.^{265,266} Stage and disease location are the most important prognostic factors for male patients, while tumor size and histology are prognostically significant for female patients.^{264,266} Unfortunately, there is a lack of robust, prospective data to support treatment decisions due to disease rarity. Treatment recommendations typically encompass all of the respective histologies (ie, squamous, transitional, adenocarcinomas) with the treatment approach based on location (ie, proximal vs. distal urethral tumors).

Workup

A cystourethroscopy should be performed if carcinoma of the urethra is suspected. This includes EUA and transurethral or transvaginal biopsy. Chest x-ray and MRI of the pelvis are recommended to evaluate the extent of the disease.

If palpable inguinal lymph nodes are present, a chest/abdominal/pelvic CT and lymph node biopsy should be performed.

Treatment

Patients with Tis, Ta, or T1 disease should have a repeat transurethral or transvaginal resection. In select cases, TURBT is followed by intraurethral therapy with BCG, mitomycin, or gemcitabine. A total urethrectomy may be considered if the patient has undergone a radical cystectomy and cutaneous diversion.

Treatment for T2 disease is based on patient gender and tumor location. For male patients with pendulous urethra, a distal urethrectomy or partial penectomy are viable options. Patients may consider neoadjuvant chemotherapy (category 2B) or chemoradiation

(category 2A) before a urethrectomy. Patients who have positive margins may undergo additional surgery or radiation, preferably with chemotherapy. At recurrence, options include systemic therapy, total penectomy, radiation, or a combination.

Male patients with T2 tumors in the bulbar urethra should undergo urethrectomy with or without cystoprostatectomy. Adjuvant chemotherapy or chemoradiation may be considered if pT3, pT4, or nodal disease is found. Recurrent cases may be treated with systemic therapy and/or radiation.

Initial treatment options for female patients with T2 tumors include chemoradiation or urethrectomy with cystectomy. Partial urethrectomy is possible in a minority of cases, depending on tumor location, and has been associated with a high local recurrence rate.²⁶⁷ At recurrence, the patient may receive systemic therapy or chemoradiotherapy (both category 2A) or pelvic exenteration (category 2B). Pelvic exenteration for T2 urethral cancer consists of *en bloc* removal of the urethra, bladder, and anterior vagina.

A multimodal treatment approach (ie, surgery, systemic therapy, radiation) is common for advanced disease. A cohort study reported a 72% response rate with the following treatment scheme before surgery: cisplatin, gemcitabine, and ifosfamide for squamous cell carcinoma; 5-FU, gemcitabine, and cisplatin-based regimens for adenocarcinoma; and MVAC for urothelial tumors.²⁶⁸ Combined chemoradiation with 5-FU and mitomycin C has shown efficacy in a series of male patients with squamous cell carcinoma of the urethra.²⁶⁹ Patients receiving surgery after chemoradiation had a higher 5-year DFS rate (72%) than those receiving chemoradiation alone (54%). If systemic therapy is used, the choice of regimen should be based on histology.



Both male and female patients with T3 or T4 disease but no clinical nodes should receive neoadjuvant chemotherapy (if urothelial carcinoma) followed by consolidative surgery or, if ineligible for standard systemic chemotherapy, radiation or chemoradiation with or without consolidative surgery. Consolidative surgery alone is an option for non-urothelial histologies. If node-positive, chemoradiation is the preferred treatment for squamous cell carcinoma. Systemic therapy or chemoradiotherapy with or without consolidative surgery are also treatment options. At recurrence, the patient may undergo pelvic exenteration (category 2B) with or without ilioinguinal lymphadenectomy and/or chemoradiotherapy. Pelvic exenteration for T3 urethral cancer consists of urethrectomy, cystectomy, prostatectomy in males, and anterior vaginectomy with hysterectomy in females. In women with highly local advanced T4 tumors, the posterior vagina and rectum may also need to be removed *en bloc* with the specimen. Systemic therapy is a category 2B option.

Patients with distant metastases should receive similar treatment as metastatic bladder cancer. Systemic therapies include chemotherapy and checkpoint inhibitors as subsequent-line options. However, it should be noted that checkpoint inhibitors have only been evaluated in patients with urothelial histology.

Summary

Urothelial tumors represent a spectrum of diseases with a range of prognoses. After a tumor is diagnosed anywhere within the urothelial tract, the patient remains at risk for developing a new lesion at the same or a different location and with a similar or more advanced stage. For patients with non–muscle-invasive disease, continued monitoring for recurrence is an essential part of management, because most recurrences are non–muscle-invasive and can be treated endoscopically. Within each category of disease, more refined methods

to determine prognosis and guide management, based on molecular staging, are under development with the goal of optimizing each patient's likelihood of cure and chance for organ preservation.

For patients with more extensive disease, newer treatments typically involve combined modality approaches using recently developed surgical procedures or 3-dimensional treatment planning for more precise delivery of RT. Although these are not appropriate in all cases, they offer the promise of an improved quality of life and prolonged survival.

Finally, within the category of metastatic disease, several new agents have been identified that seem superior to those currently considered standard therapies. Checkpoint inhibitors, in particular, have emerged as a new therapy for the treatment of persistent disease. Experts surmise that the treatment of urothelial tumors will evolve rapidly over the next few years, with improved outcomes across all disease stages.



References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. *CA Cancer J Clin* 2019;69:7-34. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30620402>.
2. Cancer Stat Facts: Bladder Cancer. NIH NCI: Surveillance, Epidemiology, and End Results Program; 2019. Available at: <https://seer.cancer.gov/statfacts/html/urinb.html>. Accessed June 20, 2019.
3. DeGeorge KC, Holt HR, Hodges SC. Bladder Cancer: Diagnosis and Treatment. *Am Fam Physician* 2017;96:507-514. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29094888>.
4. Xu Y, Huo R, Chen X, Yu X. Diabetes mellitus and the risk of bladder cancer: A PRISMA-compliant meta-analysis of cohort studies. *Medicine (Baltimore)* 2017;96:e8588. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29145273>.
5. Antoni S, Ferlay J, Soerjomataram I, et al. Bladder Cancer Incidence and Mortality: A Global Overview and Recent Trends. *Eur Urol* 2017;71:96-108. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27370177>.
6. Hu J, Chen JB, Cui Y, et al. Association of metformin intake with bladder cancer risk and oncologic outcomes in type 2 diabetes mellitus patients: A systematic review and meta-analysis. *Medicine (Baltimore)* 2018;97:e11596. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30045293>.
7. Carlo MI, Ravichandran V, Srinivasan P, et al. Cancer Susceptibility Mutations in Patients With Urothelial Malignancies. *J Clin Oncol* 2019;Jco1901395. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31794323>.
8. U.S. National Library of Medicine-Key MEDLINE® Indicators. Available at: http://www.nlm.nih.gov/bsd/bsd_key.html. Accessed June 20, 2019.
9. Welty CJ, Wright JL, Hotaling JM, et al. Persistence of urothelial carcinoma of the bladder risk among former smokers: results from a contemporary, prospective cohort study. *Urol Oncol* 2014;32:25.e21-25. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23506963>.
10. Messing EM, Tangen CM, Lerner SP, et al. Effect of intravesical instillation of gemcitabine vs saline immediately following resection of suspected low-grade non-muscle-invasive bladder cancer on tumor recurrence: SWOG S0337 randomized clinical trial. *JAMA* 2018;319:1880-1888. Available at: <http://dx.doi.org/10.1001/jama.2018.4657>.
11. Bosschiet J, Nieuwenhuijzen JA, van Ginkel T, et al. Value of an immediate intravesical instillation of mitomycin C in patients with non-muscle-invasive bladder cancer: A prospective multicentre randomised study in 2243 patients. *Eur Urol* 2018;73:226-232. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28705539>.
12. Sylvester RJ, Oosterlinck W, Holmang S, et al. Systematic review and individual patient data meta-analysis of randomized trials comparing a single immediate instillation of chemotherapy after transurethral resection with transurethral resection alone in patients with stage pTa-pT1 urothelial carcinoma of the bladder: Which patients benefit from the instillation? *Eur Urol* 2016;69:231-244. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26091833>.
13. van der Meijden A, Oosterlinck W, Brausi M, et al. Significance of bladder biopsies in Ta,T1 bladder tumors: a report from the EORTC Genito-Urinary Tract Cancer Cooperative Group. EORTC-GU Group Superficial Bladder Committee. *Eur Urol* 1999;35:267-271. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/10419345>.
14. Amin MB, Edge SB, Greene F, et al., eds. *AJCC Cancer Staging Manual*, 8th ed. New York: Springer International Publishing; 2017.
15. American Urological Association. Diagnosis and treatment of non-muscle invasive bladder cancer: AUA/SUO joint guideline. 2016. Available at: <https://www.auanet.org/guidelines/bladder-cancer-non-muscle-invasive-guideline>. Accessed June 20, 2019.



16. Pascin E, Josephson DY, Mitra AP, et al. Superficial bladder cancer: an update on etiology, molecular development, classification, and natural history. *Rev Urol* 2008;10:31-43. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/18470273>.
17. Sylvester RJ, van der Meijden AP, Oosterlinck W, et al. Predicting recurrence and progression in individual patients with stage Ta T1 bladder cancer using EORTC risk tables: a combined analysis of 2596 patients from seven EORTC trials. *Eur Urol* 2006;49:466-465; discussion 475-467. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16442208>.
18. Edge SB, Byrd DR, Compton CC, et al. *AJCC Cancer Staging Manual*, 7th ed. New York: Springer; 2010:1-646.
19. Schmidbauer J, Witjes F, Schmeller N, et al. Improved detection of urothelial carcinoma in situ with hexaminolevulinate fluorescence cystoscopy. *J Urol* 2004;171:135-138. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/14665861>.
20. Jocham D, Witjes F, Wagner S, et al. Improved detection and treatment of bladder cancer using hexaminolevulinate imaging: a prospective, phase III multicenter study. *J Urol* 2005;174:862-866; discussion 866. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16093971>.
21. Grossman HB, Gomella L, Fradet Y, et al. A phase III, multicenter comparison of hexaminolevulinate fluorescence cystoscopy and white light cystoscopy for the detection of superficial papillary lesions in patients with bladder cancer. *J Urol* 2007;178:62-67. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/17499283>.
22. Fradet Y, Grossman HB, Gomella L, et al. A comparison of hexaminolevulinate fluorescence cystoscopy and white light cystoscopy for the detection of carcinoma in situ in patients with bladder cancer: a phase III, multicenter study. *J Urol* 2007;178:68-73; discussion 73. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/17499291>.
23. Stenzl A, Burger M, Fradet Y, et al. Hexaminolevulinate guided fluorescence cystoscopy reduces recurrence in patients with nonmuscle invasive bladder cancer. *J Urol* 2010;184:1907-1913. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/20850152>.
24. Hermann GG, Mogensen K, Carlsson S, et al. Fluorescence-guided transurethral resection of bladder tumours reduces bladder tumour recurrence due to less residual tumour tissue in Ta/T1 patients: a randomized two-centre study. *BJU Int* 2011;108:E297-303. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21414125>.
25. Yuan H, Qiu J, Liu L, et al. Therapeutic outcome of fluorescence cystoscopy guided transurethral resection in patients with non-muscle invasive bladder cancer: a meta-analysis of randomized controlled trials. *PLoS One* 2013;8:e74142. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24058522>.
26. Burger M, Grossman HB, Droller M, et al. Photodynamic diagnosis of non-muscle-invasive bladder cancer with hexaminolevulinate cystoscopy: a meta-analysis of detection and recurrence based on raw data. *Eur Urol* 2013;64:846-854. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23602406>.
27. Rink M, Babjuk M, Catto JW, et al. Hexyl aminolevulinate-guided fluorescence cystoscopy in the diagnosis and follow-up of patients with non-muscle-invasive bladder cancer: a critical review of the current literature. *Eur Urol* 2013;64:624-638. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23906669>.
28. Kamat AM, Cookson M, Witjes JA, et al. The impact of blue light cystoscopy with hexaminolevulinate (HAL) on progression of bladder cancer - A new analysis. *Bladder Cancer* 2016;2:273-278. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27376146>.
29. Cauberg EC, Kloen S, Visser M, et al. Narrow band imaging cystoscopy improves the detection of non-muscle-invasive bladder cancer. *Urology* 2010;76:658-663. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/20223505>.



30. Chen G, Wang B, Li H, et al. Applying narrow-band imaging in complement with white-light imaging cystoscopy in the detection of urothelial carcinoma of the bladder. *Urol Oncol* 2013;31:475-479. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22079940>.
31. Geavlete B, Jecu M, Multescu R, Geavlete P. Narrow-band imaging cystoscopy in non-muscle-invasive bladder cancer: a prospective comparison to the standard approach. *Ther Adv Urol* 2012;4:211-217. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23024703>.
32. Shen YJ, Zhu YP, Ye DW, et al. Narrow-band imaging flexible cystoscopy in the detection of primary non-muscle invasive bladder cancer: a "second look" matters? *Int Urol Nephrol* 2012;44:451-457. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/21792663>.
33. Tatsugami K, Kuroiwa K, Kamoto T, et al. Evaluation of narrow-band imaging as a complementary method for the detection of bladder cancer. *J Endourol* 2010;24:1807-1811. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/20707727>.
34. Naselli A, Introini C, Timossi L, et al. A randomized prospective trial to assess the impact of transurethral resection in narrow band imaging modality on non-muscle-invasive bladder cancer recurrence. *Eur Urol* 2012;61:908-913. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22280855>.
35. Naito S, Algaba F, Babjuk M, et al. The Clinical Research Office of the Endourological Society (CROES) multicentre randomised trial of narrow band imaging-assisted transurethral resection of bladder tumour (TURBT) versus conventional white light imaging-sssisted TURBT in primary non-muscle-invasive bladder cancer patients: Trial protocol and 1-year results. *Eur Urol* 2016;70:506-515. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27117749>.
36. Xiong Y, Li J, Ma S, et al. A meta-analysis of narrow band imaging for the diagnosis and therapeutic outcome of non-muscle invasive bladder cancer. *PLoS One* 2017;12:e0170819. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28192481>.
37. Kang W, Cui Z, Chen Q, et al. Narrow band imaging-assisted transurethral resection reduces the recurrence risk of non-muscle invasive bladder cancer: A systematic review and meta-analysis. *Oncotarget* 2017;8:23880-23890. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27823975>.
38. Herr HW, Donat SM. A comparison of white-light cystoscopy and narrow-band imaging cystoscopy to detect bladder tumour recurrences. *BJU Int* 2008;102:1111-1114. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/18778359>.
39. Moch H, Cubilla AL, Humphrey PA, et al. The 2016 WHO Classification of Tumours of the Urinary System and Male Genital Organs-Part A: Renal, Penile, and Testicular Tumours. *Eur Urol* 2016;70:93-105. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26935559>.
40. Humphrey PA, Moch H, Cubilla AL, et al. The 2016 WHO classification of tumours of the urinary system and male genital organs-Part B: Prostate and bladder tumours. *Eur Urol* 2016;70:106-119. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26996659>.
41. Chalasani V, Chin JL, Izawa JI. Histologic variants of urothelial bladder cancer and nonurothelial histology in bladder cancer. *Can Urol Assoc J* 2009;3:S193-198. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/20019984>.
42. Siefker-Radtke A. Urachal adenocarcinoma: a clinician's guide for treatment. *Semin Oncol* 2012;39:619-624. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23040259>.
43. Jones G, Cleves A, Wilt TJ, et al. Intravesical gemcitabine for non-muscle invasive bladder cancer. *Cochrane Database Syst Rev* 2012;1:Cd009294. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22259002>.
44. Sylvester RJ, van der Meijden AP, Witjes JA, Kurth K. Bacillus calmette-guerin versus chemotherapy for the intravesical treatment of patients with carcinoma in situ of the bladder: a meta-analysis of the



published results of randomized clinical trials. J Urol 2005;174:86-91; discussion 91-92. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/15947584>.

45. Morales A, Eidinger D, Bruce AW. Intracavitary Bacillus Calmette-Guerin in the treatment of superficial bladder tumors. J Urol 1976;116:180-183. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/820877>.

46. Bohle A, Jocham D, Bock PR. Intravesical bacillus Calmette-Guerin versus mitomycin C for superficial bladder cancer: a formal meta-analysis of comparative studies on recurrence and toxicity. J Urol 2003;169:90-95. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/12478111>.

47. Han RF, Pan JG. Can intravesical bacillus Calmette-Guerin reduce recurrence in patients with superficial bladder cancer? A meta-analysis of randomized trials. Urology 2006;67:1216-1223. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/16765182>.

48. Shelley MD, Kynaston H, Court J, et al. A systematic review of intravesical bacillus Calmette-Guerin plus transurethral resection vs transurethral resection alone in Ta and T1 bladder cancer. BJU Int 2001;88:209-216. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/11488731>.

49. Shelley MD, Wilt TJ, Court J, et al. Intravesical bacillus Calmette-Guerin is superior to mitomycin C in reducing tumour recurrence in high-risk superficial bladder cancer: a meta-analysis of randomized trials. BJU Int 2004;93:485-490. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/15008714>.

50. Malmstrom PU, Sylvester RJ, Crawford DE, et al. An individual patient data meta-analysis of the long-term outcome of randomised studies comparing intravesical mitomycin C versus bacillus Calmette-Guerin for non-muscle-invasive bladder cancer. Eur Urol 2009;56:247-256. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19409692>.

51. Spencer BA, McBride RB, Herschman DL, et al. Adjuvant intravesical bacillus calmette-guerin therapy and survival among elderly patients with non-muscle-invasive bladder cancer. J Oncol Pract 2013;9:92-98. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23814517>.

52. Jarvinen R, Kaasinen E, Sankila A, et al. Long-term efficacy of maintenance bacillus Calmette-Guerin versus maintenance mitomycin C instillation therapy in frequently recurrent TaT1 tumours without carcinoma in situ: a subgroup analysis of the prospective, randomised FinnBladder I study with a 20-year follow-up. Eur Urol 2009;56:260-265. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19395154>.

53. Gontero P, Oderda M, Mehnert A, et al. The impact of intravesical gemcitabine and 1/3 dose Bacillus Calmette-Guerin instillation therapy on the quality of life in patients with nonmuscle invasive bladder cancer: results of a prospective, randomized, phase II trial. J Urol 2013;190:857-862. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23545101>.

54. Sylvester RJ, Brausi MA, Kirkels WJ, et al. Long-term efficacy results of EORTC genito-urinary group randomized phase 3 study 30911 comparing intravesical instillations of epirubicin, bacillus Calmette-Guerin, and bacillus Calmette-Guerin plus isoniazid in patients with intermediate- and high-risk stage Ta T1 urothelial carcinoma of the bladder. Eur Urol 2010;57:766-773. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/20034729>.

55. Duchek M, Johansson R, Jahnson S, et al. Bacillus Calmette-Guerin is superior to a combination of epirubicin and interferon-alpha2b in the intravesical treatment of patients with stage T1 urinary bladder cancer. A prospective, randomized, Nordic study. Eur Urol 2010;57:25-31. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19819617>.

56. Lamm DL, Blumenstein BA, Crissman JD, et al. Maintenance bacillus Calmette-Guerin immunotherapy for recurrent TA, T1 and carcinoma in situ transitional cell carcinoma of the bladder: a randomized Southwest Oncology Group Study. J Urol 2000;163:1124-1129. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10737480>.



57. Ehdaie B, Sylvester R, Herr HW. Maintenance bacillus Calmette-Guerin treatment of non-muscle-invasive bladder cancer: a critical evaluation of the evidence. *Eur Urol* 2013;64:579-585. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23711538>.

58. Oddens J, Brausi M, Sylvester R, et al. Final results of an EORTC-GU cancers group randomized study of maintenance bacillus Calmette-Guerin in intermediate- and high-risk Ta, T1 papillary carcinoma of the urinary bladder: one-third dose versus full dose and 1 year versus 3 years of maintenance. *Eur Urol* 2013;63:462-472. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23141049>.

59. Bohle A, Bock PR. Intravesical bacille Calmette-Guerin versus mitomycin C in superficial bladder cancer: formal meta-analysis of comparative studies on tumor progression. *Urology* 2004;63:682-686; discussion 686-687. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15072879>.

60. Sylvester RJ, van der MA, Lamm DL. Intravesical bacillus Calmette-Guerin reduces the risk of progression in patients with superficial bladder cancer: a meta-analysis of the published results of randomized clinical trials. *J Urol* 2002;168:1964-1970. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12394686>.

61. U.S. Food and Drug Administration. Prescribing Information. TICE® (BCG live), for intravesical use. 2009. Available at: <http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM163039.pdf>. Accessed June 20, 2019.

62. van der Meijden AP, Sylvester RJ, Oosterlinck W, et al. Maintenance bacillus Calmette-Guerin for Ta T1 bladder tumors is not associated with increased toxicity: results from a European Organisation for Research and Treatment of Cancer Genito-Urinary Group Phase III trial. *Eur Urol* 2003;44:429-434. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/14499676>.

63. Colombel M, Saint F, Chopin D, et al. The effect of ofloxacin on bacillus calmette-guerin induced toxicity in patients with superficial bladder cancer: results of a randomized, prospective, double-blind,

placebo controlled, multicenter study. *J Urol* 2006;176:935-939. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16890660>.

64. Damiano R, De Sio M, Quarto G, et al. Short-term administration of prulifloxacin in patients with nonmuscle-invasive bladder cancer: an effective option for the prevention of bacillus Calmette-Guerin-induced toxicity? *BJU Int* 2009;104:633-639. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19298412>.

65. Brausi M, Oddens J, Sylvester R, et al. Side effects of Bacillus Calmette-Guerin (BCG) in the treatment of intermediate- and high-risk Ta, T1 papillary carcinoma of the bladder: results of the EORTC genito-urinary cancers group randomised phase 3 study comparing one-third dose with full dose and 1 year with 3 years of maintenance BCG. *Eur Urol* 2014;65:69-76. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23910233>.

66. Lebre T, Bohin D, Kassardjian Z, et al. Recurrence, progression and success in stage Ta grade 3 bladder tumors treated with low dose bacillus Calmette-Guerin instillations. *J Urol* 2000;163:63-67. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10604315>.

67. Martinez-Pineiro JA, Martinez-Pineiro L, Solsona E, et al. Has a 3-fold decreased dose of bacillus Calmette-Guerin the same efficacy against recurrences and progression of T1G3 and Tis bladder tumors than the standard dose? Results of a prospective randomized trial. *J Urol* 2005;174:1242-1247. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16145378>.

68. Mugiya S, Ozono S, Nagata M, et al. Long-term outcome of a low-dose intravesical bacillus Calmette-Guerin therapy for carcinoma in situ of the bladder: results after six successive instillations of 40 mg BCG. *Jpn J Clin Oncol* 2005;35:395-399. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15976065>.

69. Bandari J, Maganty A, MacLeod LC, Davies BJ. Manufacturing and the Market: Rationalizing the Shortage of Bacillus Calmette-Guerin. *Eur Urol Focus* 2018;4:481-484. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30005997>.



70. BCG Shortage Notice. American Urological Association (AUA), American Association of Clinical Urologists (AACU), Bladder Cancer Advocacy Network (BCAN), Society of Urologic Oncology (SUO), the Large Urology Group Practice Association (LUGPA), and the Urology Care Foundation (UCF); 2019. Available at: <https://www.auanet.org/bcg-shortage-notice>. Accessed March 4, 2019.

71. Di Lorenzo G, Perdoni S, Damiano R, et al. Gemcitabine versus bacille Calmette-Guerin after initial bacille Calmette-Guerin failure in non-muscle-invasive bladder cancer: a multicenter prospective randomized trial. *Cancer* 2010;116:1893-1900. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/20162706>.

72. Friedrich MG, Pichlmeier U, Schwaibold H, et al. Long-term intravesical adjuvant chemotherapy further reduces recurrence rate compared with short-term intravesical chemotherapy and short-term therapy with Bacillus Calmette-Guerin (BCG) in patients with non-muscle-invasive bladder carcinoma. *Eur Urol* 2007;52:1123-1129. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/17383080>.

73. Chou R, Selph S, Buckley DI, et al. Intravesical Therapy for the Treatment of Nonmuscle Invasive Bladder Cancer: A Systematic Review and Meta-Analysis. *J Urol* 2017;197:1189-1199. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28027868>.

74. van der Meijden AP, Brausi M, Zamboni V, et al. Intravesical instillation of epirubicin, bacillus Calmette-Guerin and bacillus Calmette-Guerin plus isoniazid for intermediate and high risk Ta, T1 papillary carcinoma of the bladder: a European Organization for Research and Treatment of Cancer genito-urinary group randomized phase III trial. *J Urol* 2001;166:476-481. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/11458050>.

75. Steinberg G, Bahnson R, Brosman S, et al. Efficacy and safety of valrubicin for the treatment of Bacillus Calmette-Guerin refractory carcinoma in situ of the bladder. The Valrubicin Study Group. *J Urol* 2000;163:761-767. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10687972>.

76. Barlow LJ, McKiernan JM, Benson MC. The novel use of intravesical docetaxel for the treatment of non-muscle invasive bladder cancer refractory to BCG therapy: a single institution experience. *World J Urol* 2009;27:331-335. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19214528>.

77. Milbar N, Kates M, Chappidi MR, et al. Oncological outcomes of sequential intravesical gemcitabine and docetaxel in patients with non-muscle invasive bladder cancer. *Bladder Cancer* 2017;3:293-303. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29152553>.

78. Breyer BN, Whitson JM, Carroll PR, Konety BR. Sequential intravesical gemcitabine and mitomycin C chemotherapy regimen in patients with non-muscle invasive bladder cancer. *Urol Oncol* 2010;28:510-514. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19171491>.

79. Klaassen Z, Kamat AM, Kassouf W, et al. Treatment strategy for newly diagnosed T1 high-grade bladder urothelial carcinoma: New insights and updated recommendations. *Eur Urol* 2018;74:597-608. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30017405>.

80. Pfister C, Kerkeni W, Rigaud J, et al. Efficacy and tolerance of one-third full dose bacillus Calmette-Guerin maintenance therapy every 3 months or 6 months: two-year results of URO-BCG-4 multicenter study. *Int J Urol* 2015;22:53-60. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/25256813>.

81. Yokomizo A, Kanimoto Y, Okamura T, et al. Randomized controlled study of the efficacy, safety and quality of life with low dose bacillus Calmette-Guerin instillation therapy for nonmuscle invasive bladder cancer. *J Urol* 2016;195:41-46. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26307162>.

82. Balar AV, Kulkarni GS, Uchio EM, et al. Keynote 057: Phase II trial of Pembrolizumab (pembro) for patients (pts) with high-risk (HR) nonmuscle invasive bladder cancer (NMIBC) unresponsive to bacillus calmette-guérin (BCG) [abstract]. *Journal of Clinical Oncology*



2019;37:350-350. Available at:
https://ascopubs.org/doi/abs/10.1200/JCO.2019.37.7_suppl.350.

83. U. S. Food and Drug Administration. Prescribing Information. KEYTRUDA® (pembrolizumab) injection, for intravenous use. 2020. Available at:
https://www.accessdata.fda.gov/drugsatfda_docs/label/2020/125514s084lbl.pdf. Accessed August 14, 2020.

84. Huncharek M, McGarry R, Kupelnick B. Impact of intravesical chemotherapy on recurrence rate of recurrent superficial transitional cell carcinoma of the bladder: results of a meta-analysis. *Anticancer Res* 2001;21:765-769. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/11299841>.

85. Huncharek M, Geschwind JF, Witherspoon B, et al. Intravesical chemotherapy prophylaxis in primary superficial bladder cancer: a meta-analysis of 3703 patients from 11 randomized trials. *J Clin Epidemiol* 2000;53:676-680. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/10941943>.

86. Grimm MO, Steinhoff C, Simon X, et al. Effect of routine repeat transurethral resection for superficial bladder cancer: a long-term observational study. *J Urol* 2003;170:433-437. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/12853793>.

87. Herr HW. The value of a second transurethral resection in evaluating patients with bladder tumors. *J Urol* 1999;162:74-76. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10379743>.

88. Ramirez-Backhaus M, Dominguez-Escrig J, Collado A, et al. Restaging transurethral resection of bladder tumor for high-risk stage Ta and T1 bladder cancer. *Curr Urol Rep* 2012;13:109-114. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22367558>.

89. Divrik RT, Yildirim U, Zorlu F, Ozen H. The effect of repeat transurethral resection on recurrence and progression rates in patients with T1 tumors of the bladder who received intravesical mitomycin: a

prospective, randomized clinical trial. *J Urol* 2006;175:1641-1644. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16600720>.

90. Herr HW, Sogani PC. Does early cystectomy improve the survival of patients with high risk superficial bladder tumors? *J Urol* 2001;166:1296-1299. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/11547061>.

91. Mari A, Kimura S, Foerster B, et al. A systematic review and meta-analysis of the impact of lymphovascular invasion in bladder cancer transurethral resection specimens. *BJU Int* 2019;123:11-21. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29807387>.

92. Gofrit ON, Pode D, Lazar A, et al. Watchful waiting policy in recurrent Ta G1 bladder tumors. *Eur Urol* 2006;49:303-306; discussion 306-307. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16413659>.

93. Soloway MS, Bruck DS, Kim SS. Expectant management of small, recurrent, noninvasive papillary bladder tumors. *J Urol* 2003;170:438-441. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12853794>.

94. Chou R, Gore JL, Buckley D, et al. Urinary biomarkers for diagnosis of bladder cancer: A systematic review and meta-analysis. *Ann Intern Med* 2015;163:922-931. Available at:
<https://www.ncbi.nlm.nih.gov/pubmed/26501851>.

95. Skinner EC, Goldman B, Sakr WA, et al. SWOG S0353: Phase II trial of intravesical gemcitabine in patients with nonmuscle invasive bladder cancer and recurrence after 2 prior courses of intravesical bacillus Calmette-Guerin. *J Urol* 2013;190:1200-1204. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/23597452>.

96. Raj GV, Herr H, Serio AM, et al. Treatment paradigm shift may improve survival of patients with high risk superficial bladder cancer. *J Urol* 2007;177:1283-1286; discussion 1286. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/17382713>.

97. Kang EY, Staples CA, McGuinness G, et al. Detection and differential diagnosis of pulmonary infections and tumors in patients with



AIDS: value of chest radiography versus CT. *AJR Am J Roentgenol* 1996;166:15-19. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/8571866>.

98. Ebner L, Butikofer Y, Ott D, et al. Lung nodule detection by microdose CT versus chest radiography (standard and dual-energy subtracted). *AJR Am J Roentgenol* 2015;204:727-735. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/25794062>.

99. Verma S, Rajesh A, Prasad SR, et al. Urinary bladder cancer: role of MR imaging. *Radiographics* 2012;32:371-387. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/22411938>.

100. Ha HK, Koo PJ, Kim SJ. Diagnostic accuracy of F-18 FDG PET/CT for preoperative lymph node staging in newly diagnosed bladder cancer patients: A systematic review and meta-analysis. *Oncology* 2018;95:31-38. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29847834>.

101. Huang L, Kong Q, Liu Z, et al. The diagnostic value of MR imaging in differentiating T staging of bladder cancer: A meta-analysis. *Radiology* 2018;286:502-511. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/29206594>.

102. Woo S, Suh CH, Kim SY, et al. Diagnostic performance of MRI for prediction of muscle-invasiveness of bladder cancer: A systematic review and meta-analysis. *Eur J Radiol* 2017;95:46-55. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/28987698>.

103. Solsona E, Iborra I, Collado A, et al. Feasibility of radical transurethral resection as monotherapy for selected patients with muscle invasive bladder cancer. *J Urol* 2010;184:475-480. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/20620402>.

104. Leibovici D, Kassouf W, Pisters LL, et al. Organ preservation for muscle-invasive bladder cancer by transurethral resection. *Urology* 2007;70:473-476. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/17905099>.

105. Parekh DJ, Reis IM, Castle EP, et al. Robot-assisted radical cystectomy versus open radical cystectomy in patients with bladder cancer (RAZOR): an open-label, randomised, phase 3, non-inferiority trial. *Lancet* 2018;391:2525-2536. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/29976469>.

106. Rai BP, Bondad J, Vasdev N, et al. Robotic versus open radical cystectomy for bladder cancer in adults. *Cochrane Database Syst Rev* 2019;4:Cd011903. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/31016718>.

107. Bochner BH, Dalbagni G, Marzouk KH, et al. Randomized Trial Comparing Open Radical Cystectomy and Robot-assisted Laparoscopic Radical Cystectomy: Oncologic Outcomes. *Eur Urol* 2018;74:465-471. Available at:

<https://www.ncbi.nlm.nih.gov/pubmed/29784190>.

108. Shariat SF, Palapattu GS, Karakiewicz PI, et al. Discrepancy between clinical and pathologic stage: impact on prognosis after radical cystectomy. *Eur Urol* 2007;51:137-149; discussion 149-151. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/16793197>.

109. Leissner J, Hohenfellner R, Thuroff JW, Wolf HK. Lymphadenectomy in patients with transitional cell carcinoma of the urinary bladder; significance for staging and prognosis. *BJU Int* 2000;85:817-823. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/10792159>.

110. Herr HW, Bochner BH, Dalbagni G, et al. Impact of the number of lymph nodes retrieved on outcome in patients with muscle invasive bladder cancer. *J Urol* 2002;167:1295-1298. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/11832716>.

111. Herr HW, Faulkner JR, Grossman HB, et al. Surgical factors influence bladder cancer outcomes: a cooperative group report. *J Clin Oncol* 2004;22:2781-2789. Available at:

<http://www.ncbi.nlm.nih.gov/pubmed/15199091>.

112. Konety BR, Joslyn SA, O'Donnell MA. Extent of pelvic lymphadenectomy and its impact on outcome in patients diagnosed with



bladder cancer: analysis of data from the Surveillance, Epidemiology and End Results Program data base. J Urol 2003;169:946-950. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12576819>.

113. Wright JL, Lin DW, Porter MP. The association between extent of lymphadenectomy and survival among patients with lymph node metastases undergoing radical cystectomy. Cancer 2008;112:2401-2408. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/18383515>.

114. Gschwend JE, Heck MM, Lehmann J, et al. Extended Versus Limited Lymph Node Dissection in Bladder Cancer Patients Undergoing Radical Cystectomy: Survival Results from a Prospective, Randomized Trial. Eur Urol 2019;75:604-611. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30337060>.

115. Mulwijk T, Akand M, Gevaert T, Joniau S. No survival difference between super extended and standard lymph node dissection at radical cystectomy: what can we learn from the first prospective randomized phase III trial? Transl Androl Urol 2019;8:S112-s115. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31143684>.

116. Grossman HB, Natale RB, Tangen CM, et al. Neoadjuvant chemotherapy plus cystectomy compared with cystectomy alone for locally advanced bladder cancer. N Engl J Med 2003;349:859-866. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12944571>.

117. Sherif A, Holmberg L, Rintala E, et al. Neoadjuvant cisplatin-based combination chemotherapy in patients with invasive bladder cancer: a combined analysis of two Nordic studies. Eur Urol 2004;45:297-303. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15036674>.

118. Winquist E, Kirchner TS, Segal R, et al. Neoadjuvant chemotherapy for transitional cell carcinoma of the bladder: a systematic review and meta-analysis. J Urol 2004;171:561-569. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/14713760>.

119. Vashistha V, Quinn DI, Dorff TB, Daneshmand S. Current and recent clinical trials for perioperative systemic therapy for muscle

invasive bladder cancer: a systematic review. BMC Cancer 2014;14:966. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/25515347>.

120. Advanced Bladder Cancer Meta-analysis C. Neoadjuvant chemotherapy in invasive bladder cancer: update of a systematic review and meta-analysis of individual patient data advanced bladder cancer (ABC) meta-analysis collaboration. Eur Urol 2005;48:202-205; discussion 205-206. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15939524>.

121. Griffiths G, Hall R, Sylvester R, et al. International phase III trial assessing neoadjuvant cisplatin, methotrexate, and vinblastine chemotherapy for muscle-invasive bladder cancer: long-term results of the BA06 30894 trial. J Clin Oncol 2011;29:2171-2177. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21502557>.

122. Neoadjuvant chemotherapy in invasive bladder cancer: update of a systematic review and meta-analysis of individual patient data advanced bladder cancer (ABC) meta-analysis collaboration. Eur Urol 2005;48:202-205; discussion 205-206. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15939524>.

123. Audenet F, Sfakianos JP, Waingankar N, et al. A delay ≥ 8 weeks to neoadjuvant chemotherapy before radical cystectomy increases the risk of upstaging. Urol Oncol 2019;37:116-122. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30509868>.

124. Sternberg CN, de Mulder P, Schornagel JH, et al. Seven year update of an EORTC phase III trial of high-dose intensity M-VAC chemotherapy and G-CSF versus classic M-VAC in advanced urothelial tract tumours. Eur J Cancer 2006;42:50-54. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16330205>.

125. Plimack ER, Hoffman-Censits JH, Viterbo R, et al. Accelerated methotrexate, vinblastine, doxorubicin, and cisplatin is safe, effective, and efficient neoadjuvant treatment for muscle-invasive bladder cancer: results of a multicenter phase II study with molecular correlates of



response and toxicity. J Clin Oncol 2014;32:1895-1901. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24821881>.

126. Choueiri TK, Jacobus S, Bellmunt J, et al. Neoadjuvant dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin with pegfilgrastim support in muscle-invasive urothelial cancer: pathologic, radiologic, and biomarker correlates. J Clin Oncol 2014;32:1889-1894. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24821883>.

127. McConkey DJ, Choi W, Shen Y, et al. A prognostic gene expression signature in the molecular classification of chemotherapy-naive urothelial cancer is predictive of clinical outcomes from neoadjuvant chemotherapy: A phase 2 trial of dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin with bevacizumab in urothelial cancer. Eur Urol 2016;69:855-862. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26343003>.

128. Millikan R, Dinney C, Swanson D, et al. Integrated therapy for locally advanced bladder cancer: final report of a randomized trial of cystectomy plus adjuvant M-VAC versus cystectomy with both preoperative and postoperative M-VAC. J Clin Oncol 2001;19:4005-4013. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11600601>.

129. Galsky MD, Stensland KD, Moshier E, et al. Effectiveness of adjuvant chemotherapy for locally advanced bladder cancer. J Clin Oncol 2016;34:825-832. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26786930>.

130. Leow JJ, Martin-Doyle W, Rajagopal PS, et al. Adjuvant chemotherapy for invasive bladder cancer: a 2013 updated systematic review and meta-analysis of randomized trials. Eur Urol 2014;66:42-54. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24018020>.

131. Hussain MH, Wood DP, Bajorin DF, et al. Bladder cancer: narrowing the gap between evidence and practice. J Clin Oncol 2009;27:5680-5684. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19858384>.

132. Lehmann J, Franzaring L, Thuroff J, et al. Complete long-term survival data from a trial of adjuvant chemotherapy vs control after radical cystectomy for locally advanced bladder cancer. BJU Int 2006;97:42-47. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16336326>.

133. Stockle M, Wellek S, Meyenburg W, et al. Radical cystectomy with or without adjuvant polychemotherapy for non-organ-confined transitional cell carcinoma of the urinary bladder: prognostic impact of lymph node involvement. Urology 1996;48:868-875. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/8973669>.

134. Skinner DG, Daniels JR, Russell CA, et al. The role of adjuvant chemotherapy following cystectomy for invasive bladder cancer: a prospective comparative trial. J Urol 1991;145:459-464; discussion 464-457. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/1997689>.

135. Adjuvant chemotherapy in invasive bladder cancer: a systematic review and meta-analysis of individual patient data Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. Eur Urol 2005;48:189-199; discussion 199-201. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15939530>.

136. Sternberg CN, de Mulder PH, Schornagel JH, et al. Randomized phase III trial of high-dose-intensity methotrexate, vinblastine, doxorubicin, and cisplatin (MVAC) chemotherapy and recombinant human granulocyte colony-stimulating factor versus classic MVAC in advanced urothelial tract tumors: European Organization for Research and Treatment of Cancer Protocol no. 30924. J Clin Oncol 2001;19:2638-2646. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11352955>.

137. Dash A, Pettus JAt, Herr HW, et al. A role for neoadjuvant gemcitabine plus cisplatin in muscle-invasive urothelial carcinoma of the bladder: a retrospective experience. Cancer 2008;113:2471-2477. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/18823036>.

138. von der Maase H, Hansen SW, Roberts JT, et al. Gemcitabine and cisplatin versus methotrexate, vinblastine, doxorubicin, and cisplatin in



advanced or metastatic bladder cancer: results of a large, randomized, multinational, multicenter, phase III study. *J Clin Oncol* 2000;18:3068-3077. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11001674>.

139. Novotny V, Froehner M, May M, et al. Risk stratification for locoregional recurrence after radical cystectomy for urothelial carcinoma of the bladder. *World J Urol* 2015;33:1753-1761. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/25663359>.

140. Ku JH, Kim M, Jeong CW, et al. Risk prediction models of locoregional failure after radical cystectomy for urothelial carcinoma: external validation in a cohort of Korean patients. *Int J Radiat Oncol Biol Phys* 2014;89:1032-1037. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/25035206>.

141. Christodouleas JP, Baumann BC, He J, et al. Optimizing bladder cancer locoregional failure risk stratification after radical cystectomy using SWOG 8710. *Cancer* 2014;120:1272-1280. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/24390799>.

142. Sargos P, Baumann BC, Eapen L, et al. Risk factors for locoregional recurrence after radical cystectomy of muscle-invasive bladder cancer: A systematic-review and framework for adjuvant radiotherapy. *Cancer Treat Rev* 2018;70:88-97. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30125800>.

143. Zaghloul MS, Awwad HK, Akoush HH, et al. Postoperative radiotherapy of carcinoma in bilharzial bladder: improved disease free survival through improving local control. *Int J Radiat Oncol Biol Phys* 1992;23:511-517. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/1612951>.

144. Zaghloul MS, Christodouleas JP, Smith A, et al. Adjuvant Sandwich Chemotherapy Plus Radiotherapy vs Adjuvant Chemotherapy Alone for Locally Advanced Bladder Cancer After Radical Cystectomy. *JAMA Surgery* 2018;153:e174591. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29188298>.

145. Iwata T, Kimura S, Abufaraj M, et al. The role of adjuvant radiotherapy after surgery for upper and lower urinary tract urothelial carcinoma: A systematic review. *Urol Oncol* 2019;37:659-671. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31255542>.

146. Garcia-Perdomo HA, Montes-Cardona CE, Guacheta M, et al. Muscle-invasive bladder cancer organ-preserving therapy: systematic review and meta-analysis. *World J Urol* 2018;36:1997-2008. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29943218>.

147. Royce TJ, Feldman AS, Mossanen M, et al. Comparative Effectiveness of Bladder-preserving Tri-modality Therapy Versus Radical Cystectomy for Muscle-invasive Bladder Cancer. *Clin Genitourin Cancer* 2019;17:23-31.e23. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30482661>.

148. Gakis G, Efsthathiou J, Lerner SP, et al. ICUD-EAU International Consultation on Bladder Cancer 2012: Radical cystectomy and bladder preservation for muscle-invasive urothelial carcinoma of the bladder. *Eur Urol* 2013;63:45-57. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22917985>.

149. Bladder cancer: diagnosis and management. National Institute for Health and Care Excellence (NICE); 2015. Available at: <https://www.nice.org.uk/guidance/ng2>. Accessed June 20, 2019.

150. Chang SS, Bochner BH, Chou R, et al. Treatment of Non-Metastatic Muscle-Invasive Bladder Cancer: AUA/ASCO/ASTRO/SUO Guideline. *J Urol* 2017;198:552-559. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28456635>.

151. Fedeli U, Fedewa SA, Ward EM. Treatment of muscle invasive bladder cancer: evidence from the National Cancer Database, 2003 to 2007. *J Urol* 2011;185:72-78. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21074192>.

152. Gray PJ, Fedewa SA, Shipley WU, et al. Use of potentially curative therapies for muscle-invasive bladder cancer in the United States:



results from the National Cancer Data Base. Eur Urol 2013;63:823-829. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23200811>.

153. Mohamed HAH, Salem MA, Elnaggar MS, et al. Trimodalities for bladder cancer in elderly: Transurethral resection, hypofractionated radiotherapy and gemcitabine. Cancer Radiother 2018;22:236-240. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29678595>.

154. Herr HW, Bajorin DF, Scher HI. Neoadjuvant chemotherapy and bladder-sparing surgery for invasive bladder cancer: ten-year outcome. J Clin Oncol 1998;16:1298-1301. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9552029>.

155. Splinter T, Denis L. Restaging procedures, criteria of response, and relationship between pathological response and survival. Semin Oncol 1990;17:606-612. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/2218573>.

156. Housset M, Maulard C, Chretien Y, et al. Combined radiation and chemotherapy for invasive transitional-cell carcinoma of the bladder: a prospective study. J Clin Oncol 1993;11:2150-2157. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/8229129>.

157. Shipley WU, Kaufman DS, Zehr E, et al. Selective bladder preservation by combined modality protocol treatment: long-term outcomes of 190 patients with invasive bladder cancer. Urology 2002;60:62-67; discussion 67-68. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12100923>.

158. Shipley WU, Winter KA, Kaufman DS, et al. Phase III trial of neoadjuvant chemotherapy in patients with invasive bladder cancer treated with selective bladder preservation by combined radiation therapy and chemotherapy: initial results of Radiation Therapy Oncology Group 89-03. J Clin Oncol 1998;16:3576-3583. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9817278>.

159. Rodel C, Grabenbauer GG, Kuhn R, et al. Combined-modality treatment and selective organ preservation in invasive bladder cancer:

long-term results. J Clin Oncol 2002;20:3061-3071. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/12118019>.

160. Efstathiou JA, Spiegel DY, Shipley WU, et al. Long-term outcomes of selective bladder preservation by combined-modality therapy for invasive bladder cancer: the MGH experience. Eur Urol 2012;61:705-711. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22101114>.

161. Giacalone NJ, Shipley WU, Clayman RH, et al. Long-term Outcomes After Bladder-preserving Tri-modality Therapy for Patients with Muscle-invasive Bladder Cancer: An Updated Analysis of the Massachusetts General Hospital Experience. Eur Urol 2017;71:952-960. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28081860>.

162. Zapatero A, Martin De Vidales C, Arellano R, et al. Long-term results of two prospective bladder-sparing trimodality approaches for invasive bladder cancer: neoadjuvant chemotherapy and concurrent radio-chemotherapy. Urology 2012;80:1056-1062. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22999456>.

163. Kaufman DS, Winter KA, Shipley WU, et al. The initial results in muscle-invading bladder cancer of RTOG 95-06: phase I/II trial of transurethral surgery plus radiation therapy with concurrent cisplatin and 5-fluorouracil followed by selective bladder preservation or cystectomy depending on the initial response. Oncologist 2000;5:471-476. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11110598>.

164. Hagan MP, Winter KA, Kaufman DS, et al. RTOG 97-06: initial report of a phase I-II trial of selective bladder conservation using TURBT, twice-daily accelerated irradiation sensitized with cisplatin, and adjuvant MCV combination chemotherapy. Int J Radiat Oncol Biol Phys 2003;57:665-672. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/14529770>.

165. Kaufman DS, Winter KA, Shipley WU, et al. Phase I-II RTOG study (99-06) of patients with muscle-invasive bladder cancer undergoing transurethral surgery, paclitaxel, cisplatin, and twice-daily radiotherapy followed by selective bladder preservation or radical cystectomy and



adjuvant chemotherapy. Urology 2009;73:833-837. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19100600>.

166. Mitin T, Hunt D, Shipley WU, et al. Transurethral surgery and twice-daily radiation plus paclitaxel-cisplatin or fluorouracil-cisplatin with selective bladder preservation and adjuvant chemotherapy for patients with muscle invasive bladder cancer (RTOG 0233): a randomised multicentre phase 2 trial. Lancet Oncol 2013;14:863-872. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23823157>.

167. Coen JJ, Zhang P, Saylor PJ, et al. Bladder Preservation With Twice-a-Day Radiation Plus Fluorouracil/Cisplatin or Once Daily Radiation Plus Gemcitabine for Muscle-Invasive Bladder Cancer: NRG/RTOG 0712-A Randomized Phase II Trial. J Clin Oncol 2019;37:44-51. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30433852>.

168. Efsthathiou JA, Bae K, Shipley WU, et al. Late pelvic toxicity after bladder-sparing therapy in patients with invasive bladder cancer: RTOG 89-03, 95-06, 97-06, 99-06. J Clin Oncol 2009;27:4055-4061. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19636019>.

169. James ND, Hussain SA, Hall E, et al. Radiotherapy with or without chemotherapy in muscle-invasive bladder cancer. N Engl J Med 2012;366:1477-1488. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22512481>.

170. Coppin CM, Gospodarowicz MK, James K, et al. Improved local control of invasive bladder cancer by concurrent cisplatin and preoperative or definitive radiation. The National Cancer Institute of Canada Clinical Trials Group. J Clin Oncol 1996;14:2901-2907. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/8918486>.

171. Herr HW. Conservative management of muscle-infiltrating bladder cancer: prospective experience. J Urol 1987;138:1162-1163. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/3669160>.

172. Mak RH, Zietman AL, Heney NM, et al. Bladder preservation: optimizing radiotherapy and integrated treatment strategies. BJU Int

2008;102:1345-1353. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19035903>.

173. Haque W, Verma V, Butler EB, Teh BS. Chemotherapy versus chemoradiation for node-positive bladder cancer: Practice patterns and outcomes from the National Cancer Data Base. Bladder Cancer 2017;3:283-291. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29152552>.

174. Hermans TJ, Fransen van de Putte EE, Horenblas S, et al. Pathological downstaging and survival after induction chemotherapy and radical cystectomy for clinically node-positive bladder cancer-Results of a nationwide population-based study. Eur J Cancer 2016;69:1-8. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27814469>.

175. Picozzi S, Ricci C, Gaeta M, et al. Upper urinary tract recurrence following radical cystectomy for bladder cancer: a meta-analysis on 13,185 patients. J Urol 2012;188:2046-2054. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23083867>.

176. Raj GV, Iasonos A, Herr H, Donat SM. Formulas calculating creatinine clearance are inadequate for determining eligibility for Cisplatin-based chemotherapy in bladder cancer. J Clin Oncol 2006;24:3095-3100. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/16809735>.

177. Sweeney P, Millikan R, Donat M, et al. Is there a therapeutic role for post-chemotherapy retroperitoneal lymph node dissection in metastatic transitional cell carcinoma of the bladder? J Urol 2003;169:2113-2117. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/12771730>.

178. Otto T, Kroke S, Suhr J, Rubben H. Impact of surgical resection of bladder cancer metastases refractory to systemic therapy on performance score: a phase II trial. Urology 2001;57:55-59. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/11164143>.



179. Siefker-Radtke AO, Walsh GL, Pisters LL, et al. Is there a role for surgery in the management of metastatic urothelial cancer? The M. D. Anderson experience. *J Urol* 2004;171:145-148. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/14665863>.

180. Lehmann J, Suttman H, Albers P, et al. Surgery for metastatic urothelial carcinoma with curative intent: the German experience (AUO AB 30/05). *Eur Urol* 2009;55:1293-1299. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/19058907>.

181. Dodd PM, McCaffrey JA, Herr H, et al. Outcome of postchemotherapy surgery after treatment with methotrexate, vinblastine, doxorubicin, and cisplatin in patients with unresectable or metastatic transitional cell carcinoma. *J Clin Oncol* 1999;17:2546-2552. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/10561321>.

182. Abe T, Shinohara N, Harabayashi T, et al. Impact of multimodal treatment on survival in patients with metastatic urothelial cancer. *Eur Urol* 2007;52:1106-1113. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/17367917>.

183. Ho PL, Willis DL, Patil J, et al. Outcome of patients with clinically node-positive bladder cancer undergoing consolidative surgery after preoperative chemotherapy: The M.D. Anderson Cancer Center Experience. *Urol Oncol* 2016;34:59.e51-58. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26421586>.

184. Patel V, Collazo Lorduy A, Stern A, et al. Survival after metastasectomy for metastatic urothelial carcinoma: A systematic review and meta-analysis. *Bladder Cancer* 2017;3:121-132. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28516157>.

185. Faltas BM, Gennarelli RL, Elkin E, et al. Metastasectomy in older adults with urothelial carcinoma: Population-based analysis of use and outcomes. *Urol Oncol* 2018;36:9.e11-19.e17. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28988653>.

186. Centers for Medicare & Medicaid Services. Clinical Laboratory Improvement Amendments (CLIA). 2019. Available at:

<https://www.cms.gov/regulations-and-guidance/legislation/clia/index.html>. Accessed June 18, 2019.

187. U.S. Food & Drug Administration. FDA grants accelerated approval to erdafitinib for metastatic urothelial carcinoma. 2019. Available at: <https://www.fda.gov/drugs/resources-information-approved-drugs/fda-grants-accelerated-approval-erdafitinib-metastatic-urothelial-carcinoma>. Accessed June 18, 2019.

188. U.S. Food and Drug Administration. List of Cleared or Approved Companion Diagnostic Devices (In Vitro and Imaging Tools). 2019. Available at: <https://www.fda.gov/medical-devices/vitro-diagnostics/list-cleared-or-approved-companion-diagnostic-devices-vitro-and-imaging-tools>. Accessed July 9, 2019.

189. U. S. Food and Drug Administration. FDA Alerts Health Care Professionals and Oncology Clinical Investigators about an Efficacy Issue Identified in Clinical Trials for Some Patients Taking Keytruda (pembrolizumab) or Tecentriq (atezolizumab) as Monotherapy to Treat Urothelial Cancer with Low Expression of PD-L1. 2018. Available at: <https://www.fda.gov/Drugs/DrugSafety/ucm608075.htm>. Accessed June 20, 2019.

190. Alexandrov LB, Nik-Zainal S, Wedge DC, et al. Signatures of mutational processes in human cancer. *Nature* 2013;500:415-421. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23945592>.

191. Cancer Genome Atlas Research N. Comprehensive molecular characterization of urothelial bladder carcinoma. *Nature* 2014;507:315-322. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/24476821>.

192. Ross JS, Wang K, Khaira D, et al. Comprehensive genomic profiling of 295 cases of clinically advanced urothelial carcinoma of the urinary bladder reveals a high frequency of clinically relevant genomic alterations. *Cancer* 2016;122:702-711. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/26651075>.

193. Kaufman D, Raghavan D, Carducci M, et al. Phase II trial of gemcitabine plus cisplatin in patients with metastatic urothelial cancer. *J*



Clin Oncol 2000;18:1921-1927. Available at:
<http://www.ncbi.nlm.nih.gov/pubmed/10784633>.

194. von der Maase H, Sengelov L, Roberts JT, et al. Long-term survival results of a randomized trial comparing gemcitabine plus cisplatin, with methotrexate, vinblastine, doxorubicin, plus cisplatin in patients with bladder cancer. J Clin Oncol 2005;23:4602-4608. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16034041>.

195. De Santis M, Bellmunt J, Mead G, et al. Randomized phase II/III trial assessing gemcitabine/ carboplatin and methotrexate/carboplatin/vinblastine in patients with advanced urothelial cancer "unfit" for cisplatin-based chemotherapy: phase II--results of EORTC study 30986. J Clin Oncol 2009;27:5634-5639. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19786668>.

196. Vaughn DJ, Broome CM, Hussain M, et al. Phase II trial of weekly paclitaxel in patients with previously treated advanced urothelial cancer. J Clin Oncol 2002;20:937-940. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11844814>.

197. Sideris S, Aoun F, Zanaty M, et al. Efficacy of weekly paclitaxel treatment as a single agent chemotherapy following first-line cisplatin treatment in urothelial bladder cancer. Mol Clin Oncol 2016;4:1063-1067. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27284445>.

198. Papamichael D, Gallagher CJ, Oliver RT, et al. Phase II study of paclitaxel in pretreated patients with locally advanced/metastatic cancer of the bladder and ureter. Br J Cancer 1997;75:606-607. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9052419>.

199. McCaffrey JA, Hilton S, Mazumdar M, et al. Phase II trial of docetaxel in patients with advanced or metastatic transitional-cell carcinoma. J Clin Oncol 1997;15:1853-1857. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9164195>.

200. Bellmunt J, von der Maase H, Mead GM, et al. Randomized phase III study comparing paclitaxel/cisplatin/gemcitabine and gemcitabine/cisplatin in patients with locally advanced or metastatic

urothelial cancer without prior systemic therapy: EORTC Intergroup Study 30987. J Clin Oncol 2012;30:1107-1113. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22370319>.

201. Burch PA, Richardson RL, Cha SS, et al. Phase II study of paclitaxel and cisplatin for advanced urothelial cancer. J Urol 2000;164:1538-1542. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11025699>.

202. Meluch AA, Greco FA, Burris HA, 3rd, et al. Paclitaxel and gemcitabine chemotherapy for advanced transitional-cell carcinoma of the urothelial tract: a phase II trial of the Minnie pearl cancer research network. J Clin Oncol 2001;19:3018-3024. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11408496>.

203. Bellmunt J, Guillem V, Paz-Ares L, et al. Phase I-II study of paclitaxel, cisplatin, and gemcitabine in advanced transitional-cell carcinoma of the urothelium. Spanish Oncology Genitourinary Group. J Clin Oncol 2000;18:3247-3255. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10986057>.

204. Hussain M, Vaishampayan U, Du W, et al. Combination paclitaxel, carboplatin, and gemcitabine is an active treatment for advanced urothelial cancer. J Clin Oncol 2001;19:2527-2533. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11331332>.

205. Pectasides D, Glotsos J, Bountouroglou N, et al. Weekly chemotherapy with docetaxel, gemcitabine and cisplatin in advanced transitional cell urothelial cancer: a phase II trial. Ann Oncol 2002;13:243-250. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/11886001>.

206. Powles T, Park SH, Voog E, et al. Maintenance avelumab + best supportive care (BSC) versus BSC alone after platinum-based first-line (1L) chemotherapy in advanced urothelial carcinoma (UC): JAVELIN Bladder 100 phase III interim analysis [abstract]. Journal of Clinical Oncology 2020;38:LBA1-LBA1. Available at: https://ascopubs.org/doi/abs/10.1200/JCO.2020.38.18_suppl.LBA1.



207. De Santis M, Bellmunt J, Mead G, et al. Randomized phase II/III trial assessing gemcitabine/carboplatin and methotrexate/carboplatin/vinblastine in patients with advanced urothelial cancer who are unfit for cisplatin-based chemotherapy: EORTC study 30986. *J Clin Oncol* 2012;30:191-199. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22162575>.

208. Bellmunt J, Theodore C, Demkov T, et al. Phase III trial of vinflunine plus best supportive care compared with best supportive care alone after a platinum-containing regimen in patients with advanced transitional cell carcinoma of the urothelial tract. *J Clin Oncol* 2009;27:4454-4461. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19687335>.

209. Garon EB, Rizvi NA, Hui R, et al. Pembrolizumab for the treatment of non-small-cell lung cancer. *N Engl J Med* 2015;372:2018-2028. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/25891174>.

210. Brahmer J, Reckamp KL, Baas P, et al. Nivolumab versus docetaxel in advanced squamous-cell non-small-cell lung cancer. *N Engl J Med* 2015;373:123-135. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26028407>.

211. Postow MA, Chesney J, Pavlick AC, et al. Nivolumab and ipilimumab versus ipilimumab in untreated melanoma. *N Engl J Med* 2015;372:2006-2017. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/25891304>.

212. Larkin J, Chiarion-Sileni V, Gonzalez R, et al. Combined nivolumab and ipilimumab or monotherapy in untreated melanoma. *N Engl J Med* 2015;373:23-34. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26027431>.

213. Wolchok JD, Kluger H, Callahan MK, et al. Nivolumab plus ipilimumab in advanced melanoma. *N Engl J Med* 2013;369:122-133. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23724867>.

214. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med* 2015;372:2509-2520. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26028255>.

215. Kamat AM, Bellmunt J, Galsky MD, et al. Society for Immunotherapy of Cancer consensus statement on immunotherapy for the treatment of bladder carcinoma. *J Immunother Cancer* 2017;5:68. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28807024>.

216. Plimack ER, Bellmunt J, Gupta S, et al. Safety and activity of pembrolizumab in patients with locally advanced or metastatic urothelial cancer (KEYNOTE-012): a non-randomised, open-label, phase 1b study. *Lancet Oncol* 2017;18:212-220. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28081914>.

217. Bellmunt J, de Wit R, Vaughn DJ, et al. Pembrolizumab as second-line therapy for advanced urothelial carcinoma. *N Engl J Med* 2017;376:1015-1026. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28212060>.

218. Fradet Y, Bellmunt J, Vaughn DJ, et al. Randomized phase III KEYNOTE-045 trial of pembrolizumab versus paclitaxel, docetaxel, or vinflunine in recurrent advanced urothelial cancer: results of > 2 years of follow-up. *Ann Oncol* 2019. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31050707>.

219. Balar AV, Castellano D, O'Donnell PH, et al. First-line pembrolizumab in cisplatin-ineligible patients with locally advanced and unresectable or metastatic urothelial cancer (KEYNOTE-052): a multicentre, single-arm, phase 2 study. *Lancet Oncol* 2017;18:1483-1492. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28967485>.

220. Balar AV, Galsky MD, Rosenberg JE, et al. Atezolizumab as first-line treatment in cisplatin-ineligible patients with locally advanced and metastatic urothelial carcinoma: a single-arm, multicentre, phase 2 trial. *Lancet* 2017;389:67-76. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27939400>.



221. U. S. Food and Drug Administration. Prescribing Information. TECENTRIQ® (atezolizumab) injection, for intravenous use. 2019. Available at:

https://www.accessdata.fda.gov/drugsatfda_docs/label/2019/761034s014lbl.pdf. Accessed June 20, 2019.

222. Rosenberg JE, Hoffman-Censits J, Powles T, et al. Atezolizumab in patients with locally advanced and metastatic urothelial carcinoma who have progressed following treatment with platinum-based chemotherapy: a single-arm, multicentre, phase 2 trial. *Lancet* 2016;387:1909-1920. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/26952546>.

223. Necchi A, Joseph RW, Loria Y, et al. Atezolizumab in platinum-treated locally advanced or metastatic urothelial carcinoma: post-progression outcomes from the phase II IMvigor210 study. *Ann Oncol* 2017;28:3044-3050. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28950298>.

224. Powles T, Duran I, van der Heijden MS, et al. Atezolizumab versus chemotherapy in patients with platinum-treated locally advanced or metastatic urothelial carcinoma (IMvigor211): a multicentre, open-label, phase 3 randomised controlled trial. *Lancet* 2018;391:748-757. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29268948>.

225. Sternberg CN, Loria Y, James N, et al. Primary Results from SAUL, a Multinational Single-arm Safety Study of Atezolizumab Therapy for Locally Advanced or Metastatic Urothelial or Nonurothelial Carcinoma of the Urinary Tract. *Eur Urol* 2019;76:73-81. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30910346>.

226. Pal SK, Hoffman-Censits J, Zheng H, et al. Atezolizumab in Platinum-treated Locally Advanced or Metastatic Urothelial Carcinoma: Clinical Experience from an Expanded Access Study in the United States. *Eur Urol* 2018;73:800-806. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29478735>.

227. Roche. Roche provides update on Tecentriq US indication in prior-platinum treated metastatic bladder cancer. 2021. Available at:

<https://www.roche.com/investors/updates/inv-update-2021-03-08b.htm>. Accessed March 16, 2021.

228. Sharma P, Retz M, Siefker-Radtke A, et al. Nivolumab in metastatic urothelial carcinoma after platinum therapy (CheckMate 275): a multicentre, single-arm, phase 2 trial. *Lancet Oncol* 2017;18:312-322. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28131785>.

229. Sharma P, Callahan MK, Bono P, et al. Nivolumab monotherapy in recurrent metastatic urothelial carcinoma (CheckMate 032): a multicentre, open-label, two-stage, multi-arm, phase 1/2 trial. *Lancet Oncol* 2016;17:1590-1598. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27733243>.

230. Sharma P, Siefker-Radtke A, de Braud F, et al. Nivolumab Alone and With Ipilimumab in Previously Treated Metastatic Urothelial Carcinoma: CheckMate 032 Nivolumab 1 mg/kg Plus Ipilimumab 3 mg/kg Expansion Cohort Results. *J Clin Oncol* 2019;37:1608-1616. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31100038>.

231. Apolo AB, Infante JR, Balmanoukian A, et al. Avelumab, an anti-programmed death-ligand 1 antibody, in patients with refractory metastatic urothelial carcinoma: Results from a multicenter, phase Ib study. *J Clin Oncol* 2017;35:2117-2124. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28375787>.

232. Patel MR, Ellerton J, Infante JR, et al. Avelumab in metastatic urothelial carcinoma after platinum failure (JAVELIN Solid Tumor): pooled results from two expansion cohorts of an open-label, phase 1 trial. *Lancet Oncol* 2017. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29217288>.

233. Loria Y, Necchi A, Park SH, et al. Erdafitinib in Locally Advanced or Metastatic Urothelial Carcinoma. *N Engl J Med* 2019;381:338-348. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31340094>.

234. U. S. Food and Drug Administration. Prescribing Information. BALVERSA (erdafitinib) tablets, for oral use. 2019. Available at:



https://www.accessdata.fda.gov/drugsatfda_docs/label/2019/212018s000lbl.pdf. Accessed January 7, 2020.

235. Rosenberg JE, O'Donnell PH, Balar AV, et al. Pivotal Trial of Enfortumab Vedotin in Urothelial Carcinoma After Platinum and Anti-Programmed Death 1/Programmed Death Ligand 1 Therapy. *J Clin Oncol* 2019;37:2592-2600. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/31356140>.

236. Massard C, Gordon MS, Sharma S, et al. Safety and efficacy of durvalumab (MEDI4736), an anti-programmed cell death ligand-1 immune checkpoint inhibitor, in patients with advanced urothelial bladder cancer. *J Clin Oncol* 2016;34:3119-3125. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/27269937>.

237. Powles T, O'Donnell PH, Massard C, et al. Efficacy and safety of durvalumab in locally advanced or metastatic urothelial carcinoma: Updated results from a phase 1/2 open-label study. *JAMA Oncol* 2017;3:e172411. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28817753>.

238. U.S. Food & Drug Administration. Durvalumab (Imfinzi). 2017. Available at: <https://www.fda.gov/drugs/resources-information-approved-drugs/durvalumab-imfinzi>. Accessed February 25, 2021.

239. AstraZeneca. Voluntary withdrawal of Imfinzi indication in advanced bladder cancer in the US. 2021. Available at: <https://www.astrazeneca.com/media-centre/press-releases/2021/voluntary-withdrawal-imfinzi-us-bladder-indication.html>. Accessed February 25, 2021.

240. Powles T, van der Heijden MS, Castellano D, et al. Durvalumab alone and durvalumab plus tremelimumab versus chemotherapy in previously untreated patients with unresectable, locally advanced or metastatic urothelial carcinoma (DANUBE): a randomised, open-label, multicentre, phase 3 trial. *Lancet Oncol* 2020;21:1574-1588. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/32971005>.

241. Ismaili N. A rare bladder cancer--small cell carcinoma: review and update. *Orphanet J Rare Dis* 2011;6:75. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22078012>.

242. Siefker-Radtke AO, Dinney CP, Abrahams NA, et al. Evidence supporting preoperative chemotherapy for small cell carcinoma of the bladder: a retrospective review of the M. D. Anderson cancer experience. *J Urol* 2004;172:481-484. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15247709>.

243. Siefker-Radtke AO, Kamat AM, Grossman HB, et al. Phase II clinical trial of neoadjuvant alternating doublet chemotherapy with ifosfamide/doxorubicin and etoposide/cisplatin in small-cell urothelial cancer. *J Clin Oncol* 2009;27:2592-2597. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/19414678>.

244. Kaushik D, Frank I, Boorjian SA, et al. Long-term results of radical cystectomy and role of adjuvant chemotherapy for small cell carcinoma of the bladder. *Int J Urol* 2015;22:549-554. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/25761779>.

245. Lynch SP, Shen Y, Kamat A, et al. Neoadjuvant chemotherapy in small cell urothelial cancer improves pathologic downstaging and long-term outcomes: results from a retrospective study at the MD Anderson Cancer Center. *Eur Urol* 2013;64:307-313. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22564397>.

246. Vetterlein MW, Wankowicz SAM, Seisen T, et al. Neoadjuvant chemotherapy prior to radical cystectomy for muscle-invasive bladder cancer with variant histology. *Cancer* 2017;123:4346-4355. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28743155>.

247. Bryant CM, Dang LH, Stechmiller BK, et al. Treatment of Small Cell Carcinoma of the Bladder With Chemotherapy and Radiation after Transurethral Resection of a Bladder Tumor. *Am J Clin Oncol* 2016;39:69-75. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/24517956>.



248. Roupert M, Babjuk M, Comperat E, et al. European Association of Urology Guidelines on Upper Urinary Tract Urothelial Carcinoma: 2017 Update. *Eur Urol* 2018;73:111-122. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28867446>.

249. Metcalfe MJ, Petros FG, Rao P, et al. Universal point of care testing for Lynch syndrome in patients with upper tract urothelial carcinoma. *J Urol* 2018;199:60-65. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28797715>.

250. O'Brien T, Ray E, Singh R, et al. Prevention of bladder tumours after nephroureterectomy for primary upper urinary tract urothelial carcinoma: a prospective, multicentre, randomised clinical trial of a single postoperative intravesical dose of mitomycin C (the ODMIT-C Trial). *Eur Urol* 2011;60:703-710. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/21684068>.

251. Ito A, Shintaku I, Satoh M, et al. Prospective randomized phase II trial of a single early intravesical instillation of pirarubicin (THP) in the prevention of bladder recurrence after nephroureterectomy for upper urinary tract urothelial carcinoma: the THP Monotherapy Study Group Trial. *J Clin Oncol* 2013;31:1422-1427. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/23460707>.

252. Miyamoto K, Ito A, Wakabayashi M, et al. A Phase III trial of a single early intravesical instillation of pirarubicin to prevent bladder recurrence after radical nephroureterectomy for upper tract urothelial carcinoma (JCOG1403, UTUC THP Phase III). *Jpn J Clin Oncol* 2018;48:94-97. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/29136187>.

253. Kim DK, Lee JY, Kim JW, et al. Effect of neoadjuvant chemotherapy on locally advanced upper tract urothelial carcinoma: A systematic review and meta-analysis. *Crit Rev Oncol Hematol* 2019;135:59-65. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30819447>.

254. Mandalapu RS, Remzi M, de Reijke TM, et al. Update of the ICUD-SIU consultation on upper tract urothelial carcinoma 2016: treatment of

low-risk upper tract urothelial carcinoma. *World J Urol* 2017;35:355-365. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27233780>.

255. Seisen T, Peyronnet B, Dominguez-Escrig JL, et al. Oncologic outcomes of kidney-sparing surgery versus radical nephroureterectomy for upper tract urothelial carcinoma: A systematic review by the EAU Non-muscle Invasive Bladder Cancer Guidelines Panel. *Eur Urol* 2016;70:1052-1068. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27477528>.

256. Yakoubi R, Colin P, Seisen T, et al. Radical nephroureterectomy versus endoscopic procedures for the treatment of localised upper tract urothelial carcinoma: a meta-analysis and a systematic review of current evidence from comparative studies. *Eur J Surg Oncol* 2014;40:1629-1634. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/25108813>.

257. Gakis G, Schubert T, Alemozaffar M, et al. Update of the ICUD-SIU consultation on upper tract urothelial carcinoma 2016: treatment of localized high-risk disease. *World J Urol* 2017;35:327-335. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/27043218>.

258. U.S. Food and Drug Administration. Prescribing information. JELMYTO™ (mitomycin) for pyelocalyceal solution. 2020. Available at: https://www.accessdata.fda.gov/drugsatfda_docs/label/2020/211728s001bl.pdf. Accessed May 1, 2020.

259. Kleinmann N, Matin SF, Pierorazio PM, et al. Primary chemoablation of low-grade upper tract urothelial carcinoma using UGN-101, a mitomycin-containing reverse thermal gel (OLYMPUS): an open-label, single-arm, phase 3 trial. *The Lancet Oncology* 2020. Available at: [https://doi.org/10.1016/S1470-2045\(20\)30147-9](https://doi.org/10.1016/S1470-2045(20)30147-9).

260. Kleinmann N, Matin S, Pierorazio P, et al. Primary chemoablation for the treatment of low grade upper tract urothelial carcinoma: the OLYMPUS trial [abstract]. *Journal of Urology* 2020;203:e378-e378. Available at: <https://www.auajournals.org/doi/abs/10.1097/JU.0000000000000861.07>.



261. Necchi A, Lo Vullo S, Mariani L, et al. Adjuvant chemotherapy after radical nephroureterectomy does not improve survival in patients with upper tract urothelial carcinoma: a joint study by the European Association of Urology-Young Academic Urologists and the Upper Tract Urothelial Carcinoma Collaboration. *BJU Int* 2018;121:252-259. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28940605>.

262. Birtle AJ, Chester JD, Jones RJ, et al. Results of POUT: A phase III randomised trial of perioperative chemotherapy versus surveillance in upper tract urothelial cancer (UTUC) [abstract]. *J Clin Oncol* 2018;36:407-407. Available at: https://ascopubs.org/doi/abs/10.1200/JCO.2018.36.6_suppl.407.

263. Audenet F, Yates DR, Cussenot O, Roupret M. The role of chemotherapy in the treatment of urothelial cell carcinoma of the upper urinary tract (UUT-UCC). *Urol Oncol* 2013;31:407-413. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/20884249>.

264. Dayyani F, Hoffman K, Eifel P, et al. Management of advanced primary urethral carcinomas. *BJU Int* 2014;114:25-31. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/24447439>.

265. Dalbagni G, Zhang ZF, Lacombe L, Herr HW. Male urethral carcinoma: analysis of treatment outcome. *Urology* 1999;53:1126-1132. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10367840>.

266. Grigsby PW. Carcinoma of the urethra in women. *Int J Radiat Oncol Biol Phys* 1998;41:535-541. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9635699>.

267. Dimarco DS, Dimarco CS, Zincke H, et al. Surgical treatment for local control of female urethral carcinoma. *Urol Oncol* 2004;22:404-409. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15464921>.

268. Dayyani F, Pettaway CA, Kamat AM, et al. Retrospective analysis of survival outcomes and the role of cisplatin-based chemotherapy in patients with urethral carcinomas referred to medical oncologists. *Urol Oncol* 2013;31:1171-1177. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/22534087>.

269. Cohen MS, Triaca V, Billmeyer B, et al. Coordinated chemoradiation therapy with genital preservation for the treatment of primary invasive carcinoma of the male urethra. *J Urol* 2008;179:536-541; discussion 541. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/18076921>.