



**Status:** Revised with last review  
**Doc ID:** 9075-0725

**Effective Date:** 7-14-2025  
**Last Review Date:** 5-6-2025

Pathways are independent of specific health plan medical policy coverage criteria. Health plan medical policy/clinical guidelines should be consulted to determine whether proposed services will be covered. Biosimilars or alternate formulations (along with the reference products) are considered on pathway unless otherwise specified by health plan formularies, medical policies, or preferred product rules.

## Carelon Medical Benefits Management

# Cancer Treatment Pathways

## Proprietary

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## Q2 Pathway Updates Effective 7/14/2025

### **Biliary Tract Cancer (intra and extrahepatic cholangiocarcinoma)**

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- Add pembrolizumab, gemcitabine and cisplatin to First Line of Therapy (1st line) Unresectable, Metastatic, Recurrent Disease
- Term gemcitabine and cisplatin from First Line of Therapy (1st line) Unresectable, Metastatic, Recurrent Disease

### **Hepatocellular Carcinoma**

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- Term sorafenib from First Line of Therapy (1st line) Unresectable, Metastatic, Recurrent Disease

### **Gastric, Esophageal, and Gastroesophageal Junction Adenocarcinoma**

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- Change CPS requirement for pembrolizumab + chemotherapy regimens from CPS  $\geq 10$  to CPS  $\geq 5$
- Term fluorouracil (5FU) +/- leucovorin and irinotecan (FOLFIRI) from First Line of Therapy, HER2 Negative disease

### **Kidney Cancer (Clear Cell Carcinoma)**

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- Clarify the nivolumab (Opdivo) and ipilimumab (Yervoy) regimen to indicate that it is used for Unfavorable Risk Tumors only (Previously indicated with footnote)

### **Melanoma (Cutaneous Melanoma)**

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- In Adjuvant scenario, add nivolumab to section for Stage IIB – III. Remove it from Stage III only
- Term Second and Subsequent Lines of Therapy (2nd line+) and associated regimen (encorafenib (Braftovi) and binimetinib (Mektovi))

## Carelon Cancer Treatment Pathways

The goal of the medical oncology programs administered by Carelon Medical Benefits Management on behalf of our clients is to help provide access to quality and affordable cancer care. Carelon Cancer Treatment Pathways are a key component of each program.

Carelon Pathways are developed using a rigorous process of evidence-based medicine. Pathways differ from clinical practice guidelines in that the objective of a Pathway is to identify a subset of regimens supported by clinical evidence and practice guidelines with the goal of further reducing unwarranted variation in care and cost. Pathways are selected based on clinical benefit (efficacy), safety/side effects (especially those leading to hospitalizations & impacting quality of life), strength of national guideline recommendations, and cost of regimens. Dosage and drug schedules (i.e. the interval between doses) may be considered in the selection of Pathway regimens. Carelon Pathways are intended to support the use of quality cancer care.

Pathways are not available for every medical condition but are intended to be applicable for individuals with the most common cancer types. Within each cancer type, separate Pathways are usually available for early stage and advanced cancer, sub-types of cancer (e.g., HER2 positive) and different lines of therapy. When selecting the best cancer treatment for a patient a treating oncologist should consider the type of cancer, the stage, the biomarkers or specific genetic profile of the cancer, and unique aspects the individual's medical condition. Given the complexity of cancer and all the unique individual circumstances, it would not be possible to have a Pathway option available for every specific situation. The treating oncologist will determine if, in his/her medical opinion, an Carelon Pathway treatment regimen is the best option for a patient or whether, given his or her unique circumstances, another treatment regimen will be a better choice.

It is important to note that, for some health plans, we will review requested services in accordance with client medical policies and clinical guidelines. If a request is received from a provider that is not an Carelon Pathway regimen, it may be reviewed and may be authorized if it is determined to be medically necessary pursuant to medical policies and clinical guidelines.

## Bladder Cancer (Urothelial) Pathways

### Neoadjuvant Therapy

- Clinical Stage II, III, or IV Without Evidence of Metastases (cT2, cT3, cT4a, cT4b, M0)
  - **ddMVAC\***: dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin with G-CSF<sup>1-8</sup>

### Adjuvant Therapy

- Stage 0 (Ta, Tis) or Stage I
  - Following Transurethral Resection of Bladder Tumor (TURBT) OR Resection of Recurrent/Persistent Disease, 1-2 sets of treatment
    - **BCG**: bacillus calmette-guerin, intravesical<sup>9-13</sup>
  - For low-grade histology only, Following TURBT OR Resection of Recurrent/Persistent Disease
    - Gemcitabine (Gemzar), intravesical<sup>14</sup>

### First Line of Therapy (1st Line)

- Stages IV or Recurrent
  - Enfortumab vedotin plus pembrolizumab<sup>15, 16</sup>

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\* Administration of ddMVAC is limited to 6 cycles

## Bladder Cancer (Urothelial) References

### NCCN Practice Guidelines: Bladder Cancer Version 4.2024

Referenced with permission from NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Bladder Cancer V4.2024. Available at: <http://www.nccn.org>. Accessed August 27, 2024. © National Comprehensive Cancer Network, 2024. To view the most recent complete version of the Guideline, go to [www.nccn.org](http://www.nccn.org).

These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

The NCCN Guidelines® are a statement of consensus of its authors regarding their views of currently accepted approaches to treatment. Any clinician seeking to apply or consult any NCCN Guidelines® is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care core treatment. The National Comprehensive Cancer Network makes no warranties of any kind whatsoever regarding their content, use or application and disclaims any responsibility for their application or use in any way.

1. Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. Adjuvant chemotherapy in invasive bladder cancer: a systematic review and meta-analysis of individual patient data. *Eur Urol*. 2005;48(2):189-99; discussion 99-201. PMID: 15939530
2. Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. Neoadjuvant chemotherapy in invasive bladder cancer: update of a systematic review and meta-analysis of individual patient data. *Eur Urol*. 2005;48(2):202-5; discussion 5-6. PMID: 15939524
3. 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(9):859-66. PMID: 12944571
4. Kitamura H, Tsukamoto T, Shibata T, et al. Randomised phase III study of neoadjuvant chemotherapy with methotrexate, doxorubicin, vinblastine and cisplatin followed by radical cystectomy compared with radical cystectomy alone for muscle-invasive bladder cancer: Japan Clinical Oncology Group study JCOG0209. *Ann Oncol*. 2014;25(6):1192-8. PMID: 24669010
5. Pfister C, Gravis G, Flechon A, et al. Randomized phase III trial of dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin, or gemcitabine and cisplatin as perioperative chemotherapy for patients with muscle-invasive bladder cancer. analysis of the GETUG/AFU V05 VESPER trial secondary endpoints: chemotherapy toxicity and pathological responses. *Eur Urol*. 2021;79(2):214-21. PMID: 32868138
6. Plimack ER, Hoffman-Censis 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(18):1895-901. PMID: 24821881
7. 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(1):50-4. PMID: 16330205
8. 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(10):2638-46. PMID: 11352955
9. 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(1):90-5. PMID: 12478111
10. Han RF, Pan JG. Can intravesical bacillus Calmette-Guérin reduce recurrence in patients with superficial bladder cancer? a meta-analysis of randomized trials. *Urology*. 2006;67(6):1216-23. PMID: 16765182
11. 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(4):1124-9. PMID: 10737480
12. Ojea A, Nogueira JL, Solsona E, et al. A multicentre, randomised prospective trial comparing three intravesical adjuvant therapies for intermediate-risk superficial bladder cancer: low-dose bacillus Calmette-Guerin (27 mg) versus very low-dose bacillus Calmette-Guerin (13.5 mg) versus mitomycin C. *Eur Urol*. 2007;52(5):1398-406. PMID: 17485161
13. Shelley MD, Wilt TJ, Court J, et al. Intravesical bacillus Calmette-Guérin 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(4):485-90. PMID: 15008714
14. 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(18):1880-8. PMID: 29801011
15. Powles TB, Perez Valderrama B, Gupta S, et al. EV-302/KEYNOTE-A39: open-label, randomized phase III study of enfortumab vedotin in combination with pembrolizumab (EV+P) vs chemotherapy (chemo) in previously untreated locally advanced metastatic urothelial carcinoma (la/mUC). *Ann Oncol*. 2023;34(Suppl 2):S1340. PMID: none
16. van der Heijden MS, Gupta S, Galsky MD, et al. Study EV-302: a two-arm, open-label, randomized controlled phase 3 study of enfortumab vedotin in combination with pembrolizumab versus chemotherapy in previously untreated advanced urothelial carcinoma (aUC) (trial in progress). *J Clin Oncol*. 2022;40(6 Suppl):abstract TPS589. PMID: none
17. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Bladder Cancer (Version 4.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
18. 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(7):1080-6. PMID: 12176787
19. 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(21):4602-8. PMID: 16034041
20. 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(10):1107-13. PMID: 22370319
21. 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(17):3068-77. PMID: 11001674

22. Sieker-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(3):540-7. PMID: 22914978
23. 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(5):1853-7. PMID: 9164195
24. Loriot Y, Necchi A, Park SH, et al. Erdafitinib in locally advanced or metastatic urothelial carcinoma. *N Engl J Med.* 2019;381(4):338-48. PMID: 31340094
25. Lorusso V, Pollera CF, Antimi M, et al. A phase II study of gemcitabine in patients with transitional cell carcinoma of the urinary tract previously treated with platinum. *Eur J Cancer.* 1998;34(8):1208-12. PMID: 9849481
26. 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(4):937-40. PMID: 11844814
27. Pfister C, Gravis G, Flechon A, et al. Perioperative dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin in muscle-invasive bladder cancer (VESPER): survival endpoints at 5 years in an open-label, randomised, phase 3 study. *Lancet Oncol.* 2024;25(2):255-64. PMID: 38142702
28. Pfister C, Gravis G, Flechon A, et al. Dose-dense methotrexate, vinblastine, doxorubicin, and cisplatin or gemcitabine and cisplatin as perioperative chemotherapy for patients with nonmetastatic muscle-invasive bladder cancer: results of the GETUG-AFU V05 VESPER trial. *J Clin Oncol.* 2022;40(18):2013-22. PMID: 35254888
29. 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(9):2471-7. PMID: 18823036
30. Boorjian SA, Alemozaffar M, Konety BR, et al. Intravesical nadofaragene firadenovect gene therapy for BCG-unresponsive non-muscle-invasive bladder cancer: a single-arm, open-label, repeat-dose clinical trial. *Lancet Oncol.* 2021;22(1):107-17. PMID: 33253641
31. Bosschieter 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(2):226-32. PMID: 28705539
32. Bajorin DF, Witjes JA, Gschwend JE, et al. Adjuvant nivolumab versus placebo in muscle-invasive urothelial carcinoma. *N Engl J Med.* 2021;384(22):2102-14. PMID: 34077643
33. Bergerot CD, Liu S, Bergerot P, et al. Quality of life data in CheckMate 274: does it move the needle? *Eur Urol Oncol.* 2022;5(5):564-5. PMID: 35484055
34. de Wit R, Kulkarni GS, Uchio E, et al. Health-related quality of life (HRQoL) and updated follow-up from KEYNOTE-057: phase II study of pembrolizumab (pembro) for patients (pts) with high-risk (HR) non-muscle invasive bladder cancer (NMIBC) unresponsive to bacillus Calmette-Guérin (BCG). *Ann Oncol.* 2019;30 (Suppl 5):v364-v5. PMID: none
35. U.S. Food & Drug Administration (FDA). ANKTIVA® (nogapendekin alfa inbakcept-prmln) solution, for intravesical use 2024 [revised Apr 2024]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/761336s000lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/761336s000lbl.pdf).
36. Chang S, Chamie K, Hidalgo M, et al. Final clinical results of pivotal trial of IL-15RaFc superagonist N-803 with BCG in BCG-unresponsive non-muscle invasive bladder cancer (NMIBC) cis and papillary cohorts. *J Urol.* 2022;207(Suppl 5):e1047. PMID: none
37. Powles T, Valderrama BP, Gupta S, et al. Enfortumab vedotin and pembrolizumab in untreated advanced urothelial cancer. *N Engl J Med.* 2024;390(10):875-88. PMID: 38446675
38. 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(2):191-9. PMID: 22162575
39. 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(11):3394-8. PMID: 9363871
40. Calabro F, Lorusso V, Rosati G, et al. Gemcitabine and paclitaxel every 2 weeks in patients with previously untreated urothelial carcinoma. *Cancer.* 2009;115(12):2652-9. PMID: 19396817
41. 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(11):1483-92. PMID: 28967485
42. Vuky J, Balar AV, Castellano DE, et al. Updated efficacy and safety of KEYNOTE-052: a single-arm phase 2 study investigating first-line pembrolizumab (pembro) in cisplatin ineligible advanced urothelial cancer (UC). *J Clin Oncol.* 2018;36(15 Suppl):abstract 4524. PMID: none
43. 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(10064):67-76. PMID: 27939400
44. Balar AV, Dreicer R, Loriot Y, et al. Atezolizumab (atezo) in first-line cisplatin-ineligible or platinum-treated locally advanced or metastatic urothelial cancer (mUC): long-term efficacy from phase 2 study IMvigor210. *J Clin Oncol.* 2018;36(15 Suppl):abstract 4523. PMID: none
45. Galsky MD, Arija JAA, Barnias A, et al. Atezolizumab with or without chemotherapy in metastatic urothelial cancer (IMvigor130): a multicentre, randomised, placebo-controlled phase 3 trial. *Lancet.* 2020;395(10236):1547-57. PMID: 32416780
46. Grande E, Arranz JA, De Santis M, et al. Atezolizumab plus chemotherapy versus placebo plus chemotherapy in untreated locally advanced or metastatic urothelial carcinoma (IMvigor130): final overall survival analysis results from a randomised, controlled, phase 3 study. *Lancet Oncol.* 2024;25(1):29-45. PMID: 38101433
47. Barnias A, Davis ID, Galsky MD, et al. Atezolizumab monotherapy versus chemotherapy in untreated locally advanced or metastatic urothelial carcinoma (IMvigor130): final overall survival analysis from a randomised, controlled, phase 3 study. *Lancet Oncol.* 2024;25(1):46-61. PMID: 38101431
48. Powles T, Park SH, Voog E, et al. Avelumab maintenance therapy for advanced or metastatic urothelial carcinoma. *N Engl J Med.* 2020;383(13):1218-30. PMID: 32945632
49. Powles T, Park SH, Caserta C, et al. Avelumab first-line maintenance for advanced urothelial carcinoma: results from the JAVELIN Bladder 100 trial after >=2 Years of follow-up. *J Clin Oncol.* 2023;41(19):3486-92. PMID: 37071838
50. Hoimes CJ, Flagg TW, Milowsky MI, et al. Enfortumab vedotin plus pembrolizumab in previously untreated advanced urothelial cancer. *J Clin Oncol.* 2023;41 (1):22-31. PMID: 36041086
51. O'Donnell PH, Milowsky MI, Petrylak DP, et al. Enfortumab vedotin with or without pembrolizumab in cisplatin-ineligible patients with previously untreated locally advanced or metastatic urothelial cancer. *J Clin Oncol.* 2023;41(25):4107-17. PMID: 37369081

52. Milowsky MI, O'Donnell PH, Hoimes CJ, et al. Patient-reported outcomes in patients with advanced urothelial cancer who are ineligible for cisplatin and treated with first-line enfortumab vedotin alone or with pembrolizumab. *J Clin Oncol.* 2024;42(12):1403-14. PMID: 38215355
53. van der Heijden MS, Sonpavde G, Powles T, et al. Nivolumab plus gemcitabine-cisplatin in advanced urothelial carcinoma. *N Engl J Med.* 2023;389(19):1778-89. PMID: 37870949
54. 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(29):2592-600. PMID: 31356140
55. Powles T, Rosenberg JE, Sonpavde GP, et al. Enfortumab vedotin in previously treated advanced urothelial carcinoma. *N Engl J Med.* 2021;384(12):1125-35. PMID: 33577729
56. Rosenberg JE, Powles T, Sonpavde GP, et al. Long-term outcomes in EV-301: 24-month findings from the phase 3 trial of enfortumab vedotin versus chemotherapy in patients with previously treated advanced urothelial carcinoma. *J Clin Oncol.* 2022;40(16 Suppl):abstract 4516. PMID: none
57. Rosenberg JE, Powles T, Sonpavde GP, et al. EV-301 long-term outcomes: 24-month findings from the phase III trial of enfortumab vedotin versus chemotherapy in patients with previously treated advanced urothelial carcinoma. *Ann Oncol.* 2023;34(11):1047-54. PMID: 37678672
58. 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.* 2016;4(6):1063-7. PMID: 27284445
59. Bellmunt J, de Wit R, Vaughn DJ, et al. Pembrolizumab as second-line therapy for advanced urothelial carcinoma. *N Engl J Med.* 2017;376(11):1015-26. PMID: 28212060
60. Vaughn DJ, Bellmunt J, Fradet Y, et al. Health-related quality-of-life analysis from KEYNOTE-045: a phase III study of pembrolizumab versus chemotherapy for previously treated advanced urothelial cancer. *J Clin Oncol.* 2018;36(16):1579-87. PMID: 29590008
61. 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;30(6):970-6. PMID: 31050707
62. Balar AV, Castellano DE, Grivas P, et al. Efficacy and safety of pembrolizumab in metastatic urothelial carcinoma: results from KEYNOTE-045 and KEYNOTE-052 after up to 5 years of follow-up. *Ann Oncol.* 2023;34(3):289-99. PMID: 36494006
63. 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(19):2117-24. PMID: 28375787
64. Patel MR, Ellerton JA, Infante JR, et al. Avelumab in patients with metastatic urothelial carcinoma: pooled results from two cohorts of the phase 1b JAVELIN Solid Tumor trial. *J Clin Oncol.* 2017;35(6 Suppl):abstract 330. PMID: none
65. U.S. Food & Drug Administration (FDA). BALVERSA® (erdafitinib) tablets, for oral use. 2019 [revised 2024 Jan]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/212018s007s008s009lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/212018s007s008s009lbl.pdf).
66. Sieffker-Radtke AO, Necchi A, Park SH, et al. Efficacy and safety of erdafitinib in patients with locally advanced or metastatic urothelial carcinoma: long-term follow-up of a phase 2 study. *Lancet Oncol.* 2022;23(2):248-58. PMID: 35030333
67. Loriot Y, Matsubara N, Park SH, et al. Erdafitinib or chemotherapy in advanced or metastatic urothelial carcinoma. *N Engl J Med.* 2023;389(21):1961-71. PMID: 37870920
68. 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(11):1590-8. PMID: 27733243
69. Sharma P, Retz M, Sieffker-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(3):312-22. PMID: 28131785
70. Loriot Y, Balar AV, Petrylak DP, et al. TROPHY-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). *Ann Oncol.* 2020;31(Suppl 4):S1156. PMID: none
71. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan in patients with HER2-expressing solid tumors: primary results from the DESTINY-PanTumor02 phase II trial. *J Clin Oncol.* 2024;42(1):47-58. PMID: 37870536
72. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2-expressing solid tumors: DESTINY-PanTumor02 (DP-02) interim results. *J Clin Oncol.* 2023;41(17 Suppl):abstract LBA3000. PMID: none
73. International Collaboration of Trialists, Medical Research Council Advanced Bladder Cancer Working Party, European Organisation for Research Treatment of Cancer Genito-Urinary Tract Cancer Group, 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(16):2171-7. PMID: 21502557
74. International Collaboration of Trialists on behalf of the Medical Research Council Advanced Bladder Cancer Working Party, ORTC Genito-Urinary Group, Australian Bladder Cancer Study Group, et al. Neoadjuvant cisplatin, methotrexate, and vinblastine chemotherapy for muscle-invasive bladder cancer: a randomised controlled trial. *Lancet.* 1999;354(9178):533-40. PMID: 10470696
75. Witte RS, Elson P, Bono B, et al. Eastern Cooperative Oncology Group phase II trial of ifosfamide in the treatment of previously treated advanced urothelial carcinoma. *J Clin Oncol.* 1997;15(2):589-93. PMID: 9053481
76. Sweeney CJ, Roth BJ, Kabbinavar FF, et al. Phase II study of pemetrexed for second-line treatment of transitional cell cancer of the urothelium. *J Clin Oncol.* 2006;24(21):3451-7. PMID: 16849761
77. Bambury RM, Benjamin DJ, Chaim JL, et al. The safety and efficacy of single-agent pemetrexed in platinum-resistant advanced urothelial carcinoma: a large single-institution experience. *Oncologist.* 2015;20(5):508-15. PMID: 25845990
78. 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(26):3119-25. PMID: 27269937
79. Ko YJ, Canil CM, Mukherjee SD, et al. Nanoparticle albumin-bound paclitaxel for second-line treatment of metastatic urothelial carcinoma: a single group, multicentre, phase 2 study. *Lancet Oncol.* 2013;14(8):769-76. PMID: 23706985
80. 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(10031):1909-20. PMID: 26952546
81. Sternberg CN, Loriot 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(1):73-81. PMID: 30910346
82. 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(9):e172411. PMID: 28817753

## Breast Cancer\* Pathways: Neoadjuvant and Adjuvant (Non-Hormonal)

### Neoadjuvant Therapy

- HER2 Positive
  - Stages IA<sup>†</sup> through IIIC
    - **TCH+P:** docetaxel (Taxotere), carboplatin, trastuzumab, and pertuzumab (Perjeta)<sup>1-6</sup>
- HER2 Negative, Hormone Receptor (ER or PR) Positive
  - Stage I-IIIC<sup>‡</sup>
    - **ddAC → weekly T:** dose dense doxorubicin (Adriamycin) and cyclophosphamide followed by weekly paclitaxel<sup>7-11</sup>
    - **Weekly T → ddAC:** weekly paclitaxel followed by dose dense doxorubicin (Adriamycin) and cyclophosphamide<sup>7-11</sup>
    - **TC:** docetaxel (Taxotere) and cyclophosphamide<sup>12, 13</sup>
- Triple Negative Breast Cancer (ER and PR, HER2 negative)
  - Stage II-IIIC
    - Pembrolizumab (Keytruda), carboplatin, and paclitaxel<sup>14</sup>
    - Pembrolizumab (Keytruda), doxorubicin, and cyclophosphamide<sup>14</sup>

### Adjuvant Therapy

- HER2 Positive
  - Stages IA and IB
    - **TH<sup>§</sup>:** paclitaxel and trastuzumab<sup>15-17</sup>
  - Residual Disease following Neoadjuvant Therapy
    - Ado-trastuzumab emtansine (Kadcyla)<sup>18</sup>
- HER2 negative, Hormone Receptor (ER or PR) Positive
  - Stage I-IIIC<sup>‡</sup>
    - **ddAC → weekly T:** dose dense doxorubicin (Adriamycin) and cyclophosphamide followed by weekly paclitaxel<sup>7-11</sup>
    - **Weekly T → ddAC:** weekly paclitaxel followed by dose dense doxorubicin (Adriamycin) and cyclophosphamide<sup>7-11</sup>
    - **TC:** docetaxel (Taxotere) and cyclophosphamide<sup>12, 13</sup>
- Triple Negative Breast Cancer (ER, PR, and HER2 negative)
  - Stage II-IIIC: Continuation following Neoadjuvant Therapy
    - Pembrolizumab (Keytruda), following neoadjuvant pembrolizumab-based treatment<sup>14</sup>
  - Residual Disease following Neoadjuvant Therapy
    - Capecitabine (Xeloda)<sup>19</sup>

\* Breast cancer histologies include invasive ductal, invasive filtrating lobular, inflammatory, and invasive NOS.

† Stage I tumors must be at least >10 mm

‡ Therapy is indicated for T1b or larger tumors for patients under 50 years old with a 21 gene Recurrence Score that is intermediate or high (16+) or any patient with a 21 gene Recurrence Score that is high (26+)

§ Administration of trastuzumab is limited to 1 year

# Breast Cancer Adjuvant and Neoadjuvant (Non-Hormonal) References

## NCCN Clinical Practice Guidelines: *Breast Cancer*. Version 5.2024

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Cortazar P, Zhang L, Untch M, et al. Pathological complete response and long-term clinical benefit in breast cancer: the CTNeoBC pooled analysis. *Lancet*. 2014;384(9938):164-72. PMID: 24529560
2. Gianni L, Pienkowski T, Im YH, et al. Efficacy and safety of neoadjuvant pertuzumab and trastuzumab in women with locally advanced, inflammatory, or early HER2-positive breast cancer (NeoSphere): a randomised multicentre, open-label, phase 2 trial. *Lancet Oncol*. 2012;13(1):25-32. PMID: 22153890
3. Schneeweiss A, Chia S, Hickish T, et al. Pertuzumab plus trastuzumab in combination with standard neoadjuvant anthracycline-containing and anthracycline-free chemotherapy regimens in patients with HER2-positive early breast cancer: a randomized phase II cardiac safety study (TRYphaena). *Ann Oncol*. 2013;24(9):2278-84. PMID: 23704196
4. Schneeweiss A, Chia S, Hickish T, et al. Pertuzumab and trastuzumab plus standard neoadjuvant anthracycline-containing and anthracycline-free chemotherapy regimens in patients with HER2-positive early breast cancer: efficacy analysis of a phase II cardiac safety study (TRYphaena). *Cancer Res*. 2016;77(4 Suppl):abstract P4-21-02. PMID: none
5. U.S. Food & Drug Administration (FDA). FDA briefing document: Oncologic Drugs Advisory Committee meeting: sBLA 125409/51 Pertuzumab (PERJETA®). September 12, 2013. [17 p.]. Available from: <https://wayback.archive-it.org/7993/20170405223238/https://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/Drugs/OncologicDrugsAdvisoryCommittee/UCM367755.pdf>.
6. Fernandez-Martinez A, Krop IE, Hillman DW, et al. Survival, pathologic response, and genomics in CALGB 40601 (Alliance), a neoadjuvant Phase III trial of paclitaxel-trastuzumab with or without lapatinib in HER2-positive breast cancer. *J Clin Oncol*. 2020;38(35):4184-93. PMID: 33095682
7. Budd GT, Barlow WE, Moore HC, et al. SWOG S0221: a phase III trial comparing chemotherapy schedules in high-risk early-stage breast cancer. *J Clin Oncol*. 2015;33(1):58-64. PMID: 25422488
8. Budd GT, Barlow WE, Moore HCF, et al. S0221: comparison of two schedules of paclitaxel as adjuvant therapy for breast cancer. *J Clin Oncol*. 2013;31(18 Suppl ):abstract CRA1008. PMID: none
9. Citron ML, Berry DA, Cirrincione C, et al. Randomized trial of dose-dense versus conventionally scheduled and sequential versus concurrent combination chemotherapy as postoperative adjuvant treatment of node-positive primary breast cancer: first report of Intergroup Trial C9741/Cancer and Leukemia Group B Trial 9741. *J Clin Oncol*. 2003;21(8):1431-9. PMID: 12668651
10. Sparano JA, Wang M, Martino S, et al. Weekly paclitaxel in the adjuvant treatment of breast cancer. [Erratum appears in *N Engl J Med*. 2009 Apr 16;360(16):1685], [Erratum appears in *N Engl J Med*. 2008 Jul 3;359(1):106]. *N Engl J Med*. 2008;358(16):1663-71. PMID: 18420499
11. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Breast Cancer (Version 5.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
12. Jones S, Holmes FA, O'Shaughnessy J, et al. Docetaxel with cyclophosphamide is associated with an overall survival benefit compared with doxorubicin and cyclophosphamide: 7-year follow-up of US Oncology Research Trial 9735. *J Clin Oncol*. 2009;27(8):1177-83. PMID: 19204201
13. Jones SE, Savin MA, Holmes FA, et al. Phase III trial comparing doxorubicin plus cyclophosphamide with docetaxel plus cyclophosphamide as adjuvant therapy for operable breast cancer. *J Clin Oncol*. 2006;24(34):5381-7. PMID: 17135639
14. Schmid P, Cortes J, Pusztai L, et al. Pembrolizumab for early triple-negative breast cancer. *N Engl J Med*. 2020;382(9):810-21. PMID: 32101663
15. Cameron D, Piccart-Gebhart MJ, Gelber RD, et al. 11 years' follow-up of trastuzumab after adjuvant chemotherapy in HER2-positive early breast cancer: final analysis of the HERceptin Adjuvant (HERA) trial. *Lancet*. 2017;389(10075):1195-205. PMID: 28215665
16. Slamon D, Eiermann W, Robert N, et al. Adjuvant trastuzumab in HER2-positive breast cancer. *N Engl J Med*. 2011;365(14):1273-83. PMID: 21991949
17. Tolaney SM, Guo H, Pernas S, et al. Seven-year follow-up analysis of adjuvant paclitaxel and trastuzumab trial for node-negative, human epidermal growth factor receptor 2-positive breast cancer. *J Clin Oncol*. 2019;37(22):1868-75. PMID: 30939096
18. von Minckwitz G, Huang CS, Mano MS, et al. Trastuzumab emtansine for residual invasive HER2-positive breast cancer. *N Engl J Med*. 2018;380(7):617-28. PMID: 30516102
19. Masuda N, Lee SJ, Ohtani S, et al. Adjuvant capecitabine for breast cancer after preoperative chemotherapy. *N Engl J Med*. 2017;376(22):2147-59. PMID: 28564564
20. Henderson IC, Berry DA, Demetri GD, et al. Improved outcomes from adding sequential Paclitaxel but not from escalating Doxorubicin dose in an adjuvant chemotherapy regimen for patients with node-positive primary breast cancer. *J Clin Oncol*. 2003;21(6):976-83. PMID: 12637460
21. Samuel JA, Wilson JW, Hanna Bandos H, et al. NSABP B-36: a randomized phase III trial comparing six cycles of 5-fluorouracil (5-FU), epirubicin, and cyclophosphamide (FEC) to four cycles of Adriamycin and cyclophosphamide (AC) in patients (pts) with node-negative breast cancer. *Cancer Res*. 2015;75(9 Suppl):abstract S3-02. PMID: none
22. Fisher B, Brown AM, Dimitrov NV, et al. Two months of doxorubicin-cyclophosphamide with and without interval reinduction therapy compared with 6 months of cyclophosphamide, methotrexate, and fluorouracil in positive-node breast cancer patients with tamoxifen-nonresponsive tumors: results from the National Surgical Adjuvant Breast and Bowel Project B-15. *J Clin Oncol*. 1990;8(9):1483-96. PMID: 2202791

23. Levine MN, Bramwell VH, Pritchard KI, et al. Randomized trial of intensive cyclophosphamide, epirubicin, and fluorouracil chemotherapy compared with cyclophosphamide, methotrexate, and fluorouracil in premenopausal women with node-positive breast cancer. National Cancer Institute of Canada Clinical Trials Group. *J Clin Oncol.* 1998;16(8):2651-8. PMID: 9704715
24. Martin M, Villar A, Sole-Calvo A, et al. Doxorubicin in combination with fluorouracil and cyclophosphamide (i.v. FAC regimen, day 1, 21) versus methotrexate in combination with fluorouracil and cyclophosphamide (i.v. CMF regimen, day 1, 21) as adjuvant chemotherapy for operable breast cancer: a study by the GEICAM group. *Ann Oncol.* 2003;14(6):833-42. PMID: 12796019
25. Poole CJ, Earl HM, Hiller L, et al. Epirubicin and cyclophosphamide, methotrexate, and fluorouracil as adjuvant therapy for early breast cancer. *N Engl J Med.* 2006;355(18):1851-62. PMID: 17079759
26. Swain SM, Tang G, Geyer CE, Jr., et al. Definitive results of a phase III adjuvant trial comparing three chemotherapy regimens in women with operable, node-positive breast cancer: the NSABP B-38 trial. *J Clin Oncol.* 2013;31(26):3197-204. PMID: 23940225
27. Martin M, Segui MA, Anton A, et al. Adjuvant docetaxel for high-risk, node-negative breast cancer. *N Engl J Med.* 2010;363(23):2200-10. PMID: 21121833
28. Martin M, Pienkowski T, Mackey J, et al. Adjuvant docetaxel for node-positive breast cancer. *N Engl J Med.* 2005;352(22):2302-13. PMID: 15930421
29. Mackey JR, Martin M, Pienkowski T, et al. Adjuvant docetaxel, doxorubicin, and cyclophosphamide in node-positive breast cancer: 10-year follow-up of the phase 3 randomised BCIRG 001 trial. *Lancet Oncol.* 2013;14(1):72-80. PMID: 23246022
30. Tolaney SM, Barry WT, Dang CT, et al. Adjuvant paclitaxel and trastuzumab for node-negative, HER2-positive breast cancer. *N Engl J Med.* 2015;372(2):134-41. PMID: 24007746
31. Perez EA, Romond EH, Suman VJ, et al. Four-year follow-up of trastuzumab plus adjuvant chemotherapy for operable human epidermal growth factor receptor 2-positive breast cancer: joint analysis of data from NCCTG N9831 and NSABP B-31. *J Clin Oncol.* 2011;29(25):3366-73. PMID: 21768458
32. Dang C, Iyengar N, Datko F, et al. Phase II study of paclitaxel given once per week along with trastuzumab and pertuzumab in patients with human epidermal growth factor receptor 2-positive metastatic breast cancer. *J Clin Oncol.* 2015;33(5):442-7. PMID: 25547504
33. Tutt ANJ, Garber JE, Kaufman B, et al. Adjuvant olaparib for patients with BRCA1- or BRCA2-mutated breast cancer. *N Engl J Med.* 2021;384(25):2394-405. PMID: 34081848
34. Geyer CE, Jr., Garber JE, Gelber RD, et al. Overall survival in the OlympiA phase III trial of adjuvant olaparib in patients with germline pathogenic variants in BRCA1/2 and high-risk, early breast cancer. *Ann Oncol.* 2022;33(12):1250-68. PMID: 36228963
35. Ganz PA, Bandos H, Spanic T, et al. Patient-reported outcomes in OlympiA: a phase III, randomized, placebo-controlled trial of adjuvant olaparib in gBRCA1/2 mutations and high-risk human epidermal growth factor receptor 2-negative early breast cancer. *J Clin Oncol.* 2024;42(11):1288-300. PMID: 38301187
36. Schmid P, Cortes J, Dent R, et al. Event-free survival with pembrolizumab in early triple-negative breast cancer. *N Engl J Med.* 2022;386(6):556-67. PMID: 35139274
37. Pusztai L, Denkert C, O'Shaughnessy J, et al. Event-free survival by residual cancer burden with pembrolizumab in early-stage TNBC: exploratory analysis from KEYNOTE-522. *Ann Oncol.* 2024;35(5):429-36. PMID: 38369015
38. Dent R, Cortes J, Pusztai L, et al. Neoadjuvant pembrolizumab+chemotherapy/adjuvant pembrolizumab for early-stage triple-negative breast cancer: quality-of-life results from randomized KEYNOTE-522 study. *J Natl Cancer Inst.* 2024;116(10):1654-63. PMID: 38913881
39. Schmid P, Cortes J, Dent R, et al. Overall survival with pembrolizumab in early-stage triple-negative breast cancer. *N Engl J Med.* 2024;39(21):1981-91. PMID: 39282906
40. Bear HD, Anderson S, Brown A, et al. The effect on tumor response of adding sequential preoperative docetaxel to preoperative doxorubicin and cyclophosphamide: preliminary results from National Surgical Adjuvant Breast and Bowel Project Protocol B-27. *J Clin Oncol.* 2003;21(22):4165-74. PMID: 14559892
41. von Minckwitz G, Raab G, Caputo A, et al. Doxorubicin with cyclophosphamide followed by docetaxel every 21 days compared with doxorubicin and docetaxel every 14 days as preoperative treatment in operable breast cancer: the GEPARDUO study of the German Breast Group. *J Clin Oncol.* 2005;23(12):2676-85. PMID: 15837982
42. Sparano JA, Zhao F, Martino S, et al. Ten year update of E1199: phase III study of doxorubicin-cyclophosphamide followed by paclitaxel or docetaxel given every 3 weeks or weekly in patients with axillary node-positive or high-risk node-negative breast cancer. *Cancer Res.* 2015;75(9 Suppl):abstract S3-03. PMID: none
43. Piccart MJ, Di Leo A, Beauduin M, et al. Phase III trial comparing two dose levels of epirubicin combined with cyclophosphamide with cyclophosphamide, methotrexate, and fluorouracil in node-positive breast cancer. *J Clin Oncol.* 2001;19(12):3103-10. PMID: 11408507
44. Goldhirsch A, Colleoni M, Coates AS, et al. Adding adjuvant CMF chemotherapy to either radiotherapy or tamoxifen: are all CMFs alike? The International Breast Cancer Study Group (IBCSG). *Ann Oncol.* 1998;9(5):489-93. PMID: 9653488
45. Buzdar AU, Singletary SE, Theriault RL, et al. Prospective evaluation of paclitaxel versus combination chemotherapy with fluorouracil, doxorubicin, and cyclophosphamide as neoadjuvant therapy in patients with operable breast cancer. *J Clin Oncol.* 1999;17(11):3412-7. PMID: 10550135
46. Early Breast Cancer Trialists' Collaborative Group (EBCTG). Increasing the dose intensity of chemotherapy by more frequent administration or sequential scheduling: a patient-level meta-analysis of 37 298 women with early breast cancer in 26 randomised trials. *Lancet.* 2019;393(10179):1440-52. PMID: 30739743
47. von Minckwitz G, Kummel S, Vogel P, et al. Intensified neoadjuvant chemotherapy in early-responding breast cancer: phase III randomized GeparTrio study. *J Natl Cancer Inst.* 2008;100(8):552-62. PMID: 18398094
48. Yu KD, Ye FG, He M, et al. Effect of adjuvant paclitaxel and carboplatin on survival in women with triple-negative breast cancer: a phase 3 randomized clinical trial. *JAMA Oncol.* 2020;6(9):1390-6. PMID: 32789480
49. Loibl S, O'Shaughnessy J, Untch M, et al. Addition of the PARP inhibitor veliparib plus carboplatin plus carboplatin alone to standard neoadjuvant chemotherapy in triple-negative breast cancer (BrighTNess): a randomised, phase 3 trial. *Lancet Oncol.* 2018;19(4):497-509. PMID: 29501363
50. Sharma P, Lopez-Tarruella S, Garcia-Saenz JA, et al. Efficacy of neoadjuvant carboplatin plus docetaxel in triple-negative breast cancer: combined analysis of two cohorts. *Clin Cancer Res.* 2017;23(3):649-57. PMID: 27301700
51. Matikas A, Mobus V, Greil R, et al. Tailored dose-dense versus standard adjuvant chemotherapy for high-risk early breast cancer: end-of-study results of the randomized PANTHER trial. *J Clin Oncol.* 2024;42(26):3077-82. PMID: 39018515
52. Martin M, Holmes FA, Ejlertsen B, et al. Neratinib after trastuzumab-based adjuvant therapy in HER2-positive breast cancer (ExteNET): 5-year analysis of a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2017;18(12):1688-700. PMID: 29146401

53. Delaloge S, Cella D, Ye Y, et al. Effects of neratinib on health-related quality-of-life in women with HER2-positive early-stage breast cancer: longitudinal analyses from the randomized phase III ExteNET trial. *Ann Oncol.* 2019;30(4):567-74. PMID: 30689703
54. Barcenas CH, Hurvitz SA, Di Palma JA, et al. Improved tolerability of neratinib in patients with HER2-positive early-stage breast cancer: the CONTROL trial. *Ann Oncol.* 2020;31(9):1223-30. PMID: 32464281
55. Baselga J, Bradbury I, Eidtmann H, et al. Lapatinib with trastuzumab for HER2-positive early breast cancer (NeoALTTO): a randomised, open-label, multicentre, phase 3 trial. *Lancet.* 2012;379(9816):633-40. PMID: 22257673
56. Joensuu H, Kellokumpu-Lehtinen PL, Bono P, et al. Adjuvant docetaxel or vinorelbine with or without trastuzumab for breast cancer. *N Engl J Med.* 2006;354(8):809-20. PMID: 16495393
57. Romond EH, Perez EA, Bryant J, et al. Trastuzumab plus adjuvant chemotherapy for operable HER2-positive breast cancer. *N Engl J Med.* 2005;353(16):1673-84. PMID: 16236738
58. Burstein HJ, Piccart-Gebhart MJ, Perez EA, et al. Choosing the best trastuzumab-based adjuvant chemotherapy regimen: should we abandon anthracyclines? *J Clin Oncol.* 2012;30(18):2179-82. PMID: 22614986
59. Swain SM, Ewer MS, Viale G, et al. Pertuzumab, trastuzumab, and standard anthracycline- and taxane-based chemotherapy for the neoadjuvant treatment of patients with HER2-positive localized breast cancer (BERENICE): a phase II, open-label, multicenter, multinational cardiac safety study. *Ann Oncol.* 2018;29(3):646-53. PMID: 29253081
60. Dang C, Fornier M, Sugarman S, et al. The safety of dose-dense doxorubicin and cyclophosphamide followed by paclitaxel with trastuzumab in HER-2/neu overexpressed/amplified breast cancer. *J Clin Oncol.* 2008;26(8):1216-22. PMID: 18323546
61. Piccart-Gebhart MJ, Procter M, Leyland-Jones B, et al. Trastuzumab after adjuvant chemotherapy in HER2-positive breast cancer. *N Engl J Med.* 2005;353(16):1659-72. PMID: 16236737
62. Earl HM, Hiller L, Vallier AL, et al. 6 versus 12 months of adjuvant trastuzumab for HER2-positive early breast cancer (PERSEPHONE): 4-year disease-free survival results of a randomised phase 3 non-inferiority trial. *Lancet.* 2019;393(10191):2599-612. PMID: 31178152
63. Conte P, Bisagni G, Piacentini F, et al. Nine-week versus one-year trastuzumab for early human epidermal growth factor receptor 2-positive breast cancer: 10-year update of the ShortHER phase III randomized trial. *J Clin Oncol.* 2023;41(32):4976-81. PMID: 37748109
64. Jones SE, Collea R, Paul D, et al. Adjuvant docetaxel and cyclophosphamide plus trastuzumab in patients with HER2-amplified early stage breast cancer: a single-group, open-label, phase 2 study. *Lancet Oncol.* 2013;14(11):1121-8. PMID: 24007746
65. Couderc BP, Largillier R, Arnould L, et al. Multicenter phase II trial of neoadjuvant therapy with trastuzumab, docetaxel, and carboplatin for human epidermal growth factor receptor-2-overexpressing stage II or III breast cancer: results of the GETN(A)-1 trial. *J Clin Oncol.* 2007;25(19):2678-84. PMID: 17515572
66. von Minckwitz G, Procter M, de Azambuja E, et al. Adjuvant pertuzumab and trastuzumab in early HER2-positive breast cancer. [Erratum appears in N Engl J Med. 2017 Aug 17;377(7):702; PMID: 28700263]. *N Engl J Med.* 2017;377(2):122-31. PMID: 28581356
67. Piccart M, Procter M, Fumagalli D, et al. Adjuvant pertuzumab and trastuzumab in early HER2-positive breast cancer in the APHINITY trial: 6 years' follow-up. *J Clin Oncol.* 2021;39(13):1448-57. PMID: 33539215
68. Del Mastro L, De Placido S, Bruzzi P, et al. Fluorouracil and dose-dense chemotherapy in adjuvant treatment of patients with early-stage breast cancer: an open-label, 2 x 2 factorial, randomised phase 3 trial. *Lancet.* 2015;385(9980):1863-72. PMID: 25740286
69. Cognetti F, P. B., De Placido S, et al. Abstract S5-06: epirubicin and cyclophosphamide (EC) followed by paclitaxel (T) versus fluorouracil, epirubicin and cyclophosphamide (FEC) followed by T, all given every 3 weeks or 2 weeks, in node-positive early breast cancer (BC) patients (pts): final results of the Gruppo Italiano Mammella (GIM)-2 randomized phase III study. *Cancer Res.* 2013;73(24 Suppl):abstract S5-06. PMID: none
70. Martin M, Ruiz A, Ruiz Borrego M, et al. Fluorouracil, doxorubicin, and cyclophosphamide (FAC) versus FAC followed by weekly paclitaxel as adjuvant therapy for high-risk, node-negative breast cancer: results from the GEICAM/2003-02 study. *J Clin Oncol.* 2013;31(20):2593-9. PMID: 23733779
71. Roche H, Fumoleau P, Spielmann M, et al. Sequential adjuvant epirubicin-based and docetaxel chemotherapy for node-positive breast cancer patients: the FNCLCC PACS 01 trial. *J Clin Oncol.* 2006;24(36):5664-71. PMID: 17116941
72. Martin M, Rodriguez-Lescure A, Ruiz A, et al. Randomized phase 3 trial of fluorouracil, epirubicin, and cyclophosphamide alone or followed by paclitaxel for early breast cancer. *J Natl Cancer Inst.* 2008;100(11):805-14. PMID: 18505968
73. Mittendorf EA, Zhang H, Barrios CH, et al. Neoadjuvant atezolizumab in combination with sequential nab-paclitaxel and anthracycline-based chemotherapy versus placebo and chemotherapy in patients with early-stage triple-negative breast cancer (IMpassion031): a randomised, double-blind, phase 3 trial. *Lancet.* 2020;396(10257):1090-100. PMID: 32966830
74. Johnston SRD, Harbeck N, Hegg R, et al. Abemaciclib combined with endocrine therapy for the adjuvant treatment of HR+, HER2-, node-positive, high-risk, early breast cancer (monarchE). *J Clin Oncol.* 2020;38(34):3987-98. PMID: 32954927
75. Gianni L, Pienkowski T, Im YH, et al. 5-year analysis of neoadjuvant pertuzumab and trastuzumab in patients with locally advanced, inflammatory, or early-stage HER2-positive breast cancer (NeoSphere): a multicentre, open-label, phase 2 randomised trial. *Lancet Oncol.* 2016;17(6):791-800. PMID: 27179402
76. Blackwell KL, Burstein HJ, Storniolo AM, et al. Randomized study of lapatinib alone or in combination with trastuzumab in women with ErbB2-positive, trastuzumab-refractory metastatic breast cancer. *J Clin Oncol.* 2010;28(7):1124-30. PMID: 20124187
77. Buzdar AU, Ibrahim NK, Francis D, et al. Significantly higher pathologic complete remission rate after neoadjuvant therapy with trastuzumab, paclitaxel, and epirubicin chemotherapy: results of a randomized trial in human epidermal growth factor receptor 2-positive operable breast cancer. *J Clin Oncol.* 2005;23(16):3676-85. PMID: 15738535
78. Piccart-Gebhart MJ, Holmes AP, Jose Baselga J, et al. First results from the phase III ALTTO trial (BIG 2-06; NCCTG [Alliance] N063D) comparing one year of anti-HER2 therapy with lapatinib alone (L), trastuzumab alone (T), their sequence (T→L), or their combination (T+L) in the adjuvant treatment of HER2-positive early breast cancer (EBC). *J Clin Oncol.* 2014;32(18 Suppl):abstract LBA4. PMID: none
79. Jackisch C, Stroyakovskiy D, Pivot X, et al. Subcutaneous vs intravenous trastuzumab for patients with ERBB2-positive early breast cancer: final analysis of the HannaH phase 3 randomized clinical trial. *JAMA Oncol.* 2019;e190339. PMID: 30998824
80. Tan AR, Im SA, Mattar A, et al. Fixed-dose combination of pertuzumab and trastuzumab for subcutaneous injection plus chemotherapy in HER2-positive early breast cancer (FeDeriCa): a randomised, open-label, multicentre, non-inferiority, phase 3 study. *Lancet Oncol.* 2021;22(1):85-97. PMID: 33357420

## Breast Cancer\* Pathways: Advanced/Metastatic Disease

### First Line of Therapy (1st Line)

- Stage IV and Recurrent, HER2 Positive
  - Pertuzumab (Perjeta), trastuzumab, and docetaxel (Taxotere)<sup>1-6</sup>
  - Pertuzumab (Perjeta), trastuzumab, and paclitaxel<sup>7-10</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Stage IV and Recurrent
  - HER2 Positive
    - Fam-trastuzumab deruxtecan-nxki (Enhertu)<sup>11-13</sup>
  - HER2 Low
    - Fam-trastuzumab deruxtecan-nxki (Enhertu)<sup>14</sup>

### First Line of Therapy (1st Line)

- Stage IV and Recurrent
  - Triple Negative Breast Cancer (ER, PR, and HER2 negative), CPS ≥ 10
    - Pembrolizumab (Keytruda) and nab-paclitaxel (Abraxane)<sup>15</sup>
    - Pembrolizumab (Keytruda) and paclitaxel<sup>15</sup>
    - Pembrolizumab (Keytruda), gemcitabine (Gemzar), and carboplatin<sup>15</sup>

### First, Second, and Third Lines of Therapy (1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> Line)

- Stage IV and Recurrent
  - Triple Negative Breast Cancer (ER, PR, and HER2 negative)
    - Capecitabine (Xeloda)<sup>16-21</sup>
    - Doxorubicin (Adriamycin)<sup>21-28</sup>
    - Gemcitabine (Gemzar)<sup>29, 30</sup>
    - Paclitaxel<sup>21, 31-35</sup>
    - Vinorelbine (Navelbine)<sup>36-38</sup>
    - Sacituzumab govitecan-hziy (Trodelvy)<sup>39-41</sup> (**third line only**)
  - Hormone Receptor (ER or PR) Positive and HER2 Negative
    - Capecitabine (Xeloda)<sup>16-21</sup>
    - Doxorubicin (Adriamycin)<sup>21-28</sup>
    - Gemcitabine (Gemzar)<sup>29, 30</sup>
    - Paclitaxel<sup>21, 31-35</sup>
    - Vinorelbine (Navelbine)<sup>36-38</sup>
    - Sacituzumab govitecan-hziy (Trodelvy) (**third line only**)<sup>42, 43</sup>

\* Breast cancer histologies include invasive ductal, invasive lobular, inflammatory, and invasive NOS.

## Breast Cancer Advanced/Metastatic References

### NCCN Clinical Practice Guidelines: Breast Cancer. Version 5.2024

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Baselga J, Cortes J, Kim SB, et al. Pertuzumab plus trastuzumab plus docetaxel for metastatic breast cancer. *N Engl J Med.* 2012;366(2):109-19. PMID: 22149875
2. Durkee BY, Qian Y, Pollom EL, et al. Cost-effectiveness of pertuzumab in human epidermal growth factor receptor 2-positive metastatic breast cancer. *J Clin Oncol.* 2016;34(9):902-9. PMID: 26351332
3. Robert N, Leyland-Jones B, Asmar L, et al. Randomized phase III study of trastuzumab, paclitaxel, and carboplatin compared with trastuzumab and paclitaxel in women with HER-2-overexpressing metastatic breast cancer. *J Clin Oncol.* 2006;24(18):2786-92. PMID: 16782917
4. Swain SM, Baselga J, Kim SB, et al. Pertuzumab, trastuzumab, and docetaxel in HER2-positive metastatic breast cancer. *N Engl J Med.* 2015;372(8):724-34. PMID: 25693012
5. Swain SM, Kim SB, Cortes J, et al. Pertuzumab, trastuzumab, and docetaxel for HER2-positive metastatic breast cancer (CLEOPATRA study): overall survival results from a randomised, double-blind, placebo-controlled, phase 3 study. *Lancet Oncol.* 2013;14(6):461-71. PMID: 23602601
6. Swain SM, Miles D, Kim SB, et al. Pertuzumab, trastuzumab, and docetaxel for HER2-positive metastatic breast cancer (CLEOPATRA): end-of-study results from a double-blind, randomised, placebo-controlled, phase 3 study. *Lancet Oncol.* 2020;21(4):519-30. PMID: 32171426
7. Bachet T, Ciruelos E, Schneeweiss A, et al. Preliminary safety and efficacy of first-line pertuzumab combined with trastuzumab and taxane therapy for HER2-positive locally recurrent or metastatic breast cancer (PERUSE). *Ann Oncol.* 2019;30(5):766-73. PMID: 30796821
8. Wang R, Smyth LM, Iyengar N, et al. Phase II Study of Weekly Paclitaxel with Trastuzumab and Pertuzumab in Patients with Human Epidermal Growth Receptor 2 Overexpressing Metastatic Breast Cancer: 5-Year Follow-up. *Oncologist.* 2019;24(8):e646-e652. PMID: 30602614
9. Datko FM, D'Andrea G, Dickler MN, et al. Phase II study of pertuzumab, trastuzumab, and weekly paclitaxel in patients with HER2-overexpressing metastatic breast cancer (MBC). *J Clin Oncol.* 2013;31(15 Suppl):abstract 606. PMID: none
10. Miles D, Ciruelos E, Schneeweiss A, et al. Final results from the PERUSE study of first-line pertuzumab plus trastuzumab plus a taxane for HER2-positive locally recurrent or metastatic breast cancer, with a multivariable approach to guide prognostication. *Ann Oncol.* 2021;32(10):1245-55. PMID: 34224826
11. Modi S, Saura C, Yamashita T, et al. Trastuzumab deruxtecan in previously treated HER2-positive breast cancer. *N Engl J Med.* 2020;382(7):610-21. PMID: 31825192
12. Cortes J, Kim S, Chung W, et al. Trastuzumab deruxtecan (T-DXd) vs trastuzumab emtansine (T-DM1) in patients (Pts) with HER2+ metastatic breast cancer (mBC): results of the randomized phase III DESTINY-Breast03 study. *Ann Oncol.* 2021;32(Suppl 5):S1287-S8. PMID: none
13. Curigliano G, Dunton K, Rosenlund M, et al. Patient-reported outcomes and hospitalization data in patients with HER2-positive metastatic breast cancer receiving trastuzumab deruxtecan or trastuzumab emtansine in the phase III DESTINY-Breast03 study. *Ann Oncol.* 2023;34(7):569-77. PMID: 37179020
14. Modi S, Jacot W, Yamashita T, et al. Trastuzumab deruxtecan in previously treated HER2-low advanced breast cancer. *N Engl J Med.* 2022;387(1):9-20. PMID: 35665782
15. Cortes J, Cescon DW, Rugo HS, et al. Pembrolizumab plus chemotherapy versus placebo plus chemotherapy for previously untreated locally recurrent inoperable or metastatic triple-negative breast cancer (KEYNOTE-355): a randomised, placebo-controlled, double-blind, phase 3 clinical trial. *Lancet.* 2020;396(10265):1817-28. PMID: 33278935
16. Bajetta E, Procopio G, Celio L, et al. Safety and efficacy of two different doses of capecitabine in the treatment of advanced breast cancer in older women. *J Clin Oncol.* 2005;23(10):2155-61. PMID: 15710946
17. Cortes J, O'Shaughnessy J, Loesch D, et al. Eribulin monotherapy versus treatment of physician's choice in patients with metastatic breast cancer (EMBRACE): a phase 3 open-label randomised study. *Lancet.* 2011;377(9769):914-23. PMID: 21376385
18. Crown JP, Dieras V, Staroslawska E, et al. Phase III trial of sunitinib in combination with capecitabine versus capecitabine monotherapy for the treatment of patients with pretreated metastatic breast cancer. *J Clin Oncol.* 2013;31(23):2870-8. PMID: 23857972
19. O'Shaughnessy JA, Kaufmann M, Siedentopf F, et al. Capecitabine monotherapy: review of studies in first-line HER-2-negative metastatic breast cancer. *Oncologist.* 2012;17(4):476-84. PMID: 22418569
20. Smorenburg CH, de Groot SM, van Leeuwen-Stok AE, et al. A randomized phase III study comparing pegylated liposomal doxorubicin with capecitabine as first-line chemotherapy in elderly patients with metastatic breast cancer: results of the OMEGA study of the Dutch Breast Cancer Research Group BOOG. *Ann Oncol.* 2014;25(3):599-605. PMID: 24504445
21. Cortazar P, Justice R, Johnson J, et al. US Food and Drug Administration approval overview in metastatic breast cancer. *J Clin Oncol.* 2012;30(14):1705-11. PMID: 22430273
22. Chan S, Friedrichs K, Noel D, et al. Prospective randomized trial of docetaxel versus doxorubicin in patients with metastatic breast cancer. *J Clin Oncol.* 1999;17(8):2341-54. PMID: 10561296
23. Gasparini G, Dal Fior S, Panizzi GA, et al. Weekly epirubicin versus doxorubicin as second line therapy in advanced breast cancer. A randomized clinical trial. *Am J Clin Oncol.* 1991;14(1):38-44. PMID: 1987737
24. Gundersen S, Kvinnslund S, Klepp O, et al. Weekly adriamycin versus VAC in advanced breast cancer. A randomized trial. *Eur J Cancer Clin Oncol.* 1986;22(12):1431-4. PMID: 3595668
25. Gundersen S, Kvinnslund S, Klepp O, et al. Weekly adriamycin® vs. 4-epidoxorubicin every second week in advanced breast cancer. A randomized trial. *Eur J Cancer.* 1990;26(1):45-8. PMID: 2138477

26. Norris B, Pritchard KI, James K, et al. Phase III comparative study of vinorelbine combined with doxorubicin versus doxorubicin alone in disseminated metastatic/recurrent breast cancer: National Cancer Institute of Canada Clinical Trials Group Study MA8. *J Clin Oncol.* 2000;18(12):2385-94. PMID: 10856098
27. O'Brien ME, Wigler N, Inbar M, et al. Reduced cardiotoxicity and comparable efficacy in a phase III trial of pegylated liposomal doxorubicin HCl (CAELYX/Doxil) versus conventional doxorubicin for first-line treatment of metastatic breast cancer. *Ann Oncol.* 2004;15(3):440-9. PMID: 14998846
28. Reyno L, Seymour L, Tu D, et al. Phase III study of N,N-diethyl-2-[4-(phenylmethyl) phenoxy]ethanamine (BMS-217380-01) combined with doxorubicin versus doxorubicin alone in metastatic/recurrent breast cancer: National Cancer Institute of Canada Clinical Trials Group study MA.19. *J Clin Oncol.* 2004;22(2):269-76. PMID: 14722035
29. Rha SY, Moon YH, Jeung HC, et al. Gemcitabine monotherapy as salvage chemotherapy in heavily pretreated metastatic breast cancer. *Breast Cancer Res Treat.* 2005;90(3):215-21. PMID: 15830134
30. Seidman AD. Gemcitabine as single-agent therapy in the management of advanced breast cancer. *Oncology.* 2001;15(2 Suppl 3):11-4. PMID: 11252882
31. Nabholz JM, Gelmon K, Bontenbal M, et al. Multicenter, randomized comparative study of two doses of paclitaxel in patients with metastatic breast cancer. *J Clin Oncol.* 1996;14(6):1858-67. PMID: 8656254
32. Perez EA, Vogel CL, Irwin DH, et al. Multicenter phase II trial of weekly paclitaxel in women with metastatic breast cancer. *J Clin Oncol.* 2001;19(22):4216-23. PMID: 11709565
33. Seidman AD, Berry D, Cirrincione C, et al. Randomized phase III trial of weekly compared with every-3-weeks paclitaxel for metastatic breast cancer, with trastuzumab for all HER-2 overexpressors and random assignment to trastuzumab or not in HER-2 nonoverexpressors: final results of Cancer and Leukemia Group B protocol 9840. *J Clin Oncol.* 2008;26(10):1642-9. PMID: 18375893
34. Seidman AD, Tiersten A, Hudis C, et al. Phase II trial of paclitaxel by 3-hour infusion as initial and salvage chemotherapy for metastatic breast cancer. *J Clin Oncol.* 1995;13(10):2575-81. PMID: 7595709
35. Winer EP, Berry DA, Woolf S, et al. Failure of higher-dose paclitaxel to improve outcome in patients with metastatic breast cancer: cancer and leukemia group B trial 9342. *J Clin Oncol.* 2004;22(11):2061-8. PMID: 15169793
36. Fumoleau P, Delgado FM, Delozier T, et al. Phase II trial of weekly intravenous vinorelbine in first-line advanced breast cancer chemotherapy. *J Clin Oncol.* 1993;11(7):1245-52. PMID: 8315421
37. Weber BL, Vogel C, Jones S, et al. Intravenous vinorelbine as first-line and second-line therapy in advanced breast cancer. *J Clin Oncol.* 1995;13(11):2722-30. PMID: 7595730
38. Zelek L, Barthier S, Riofrio M, et al. Weekly vinorelbine is an effective palliative regimen after failure with anthracyclines and taxanes in metastatic breast carcinoma. *Cancer.* 2001;92(9):2267-72. PMID: 11745280
39. Bardia A, Tolaney SM, Loirat D, et al. ASCENT: a randomized phase III study of sacituzumab govitecan (SG) vs treatment of physician's choice (TPC) in patients (pts) with previously treated metastatic triple-negative breast cancer (mTNBC). *Ann Oncol.* 2020;31 (Suppl 4):S1149-S50. PMID: none
40. Bardia A, Mayer IA, Vahdat LT, et al. Sacituzumab govitecan-hziy in refractory metastatic triple-negative breast cancer. *N Engl J Med.* 2019;38(18):741-51. PMID: 30786188
41. Bardia A, Hurvitz SA, Tolaney SM, et al. Sacituzumab govitecan in metastatic triple-negative breast cancer. *N Engl J Med.* 2021;384(16):1529-41. PMID: 33882206
42. Rugo HS, Bardia A, Marme F, et al. Sacituzumab govitecan in hormone receptor-positive/human epidermal growth factor receptor 2-negative metastatic breast cancer. *J Clin Oncol.* 2022;40(29):3365-76. PMID: 36027558
43. Rugo HS, Bardia A, Marme F, et al. Overall survival (OS) results from the phase III TROPiCS-02 study of sacituzumab govitecan (SG) vs treatment of physician's choice (TPC) in patients (pts) with HR+/HER2- metastatic breast cancer (mBC). *Ann Oncol.* 2022;33(Suppl 7):S1386. PMID: none
44. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Breast Cancer (Version 5.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
45. Martin M, Diaz-Rubio E, Casado A, et al. Carboplatin: an active drug in metastatic breast cancer. *J Clin Oncol.* 1992;10(3):433-7. PMID: 1740682
46. O'Brien ME, Talbot DC, Smith IE. Carboplatin in the treatment of advanced breast cancer: a phase II study using a pharmacokinetically guided dose schedule. *J Clin Oncol.* 1993;11(11):2112-7. PMID: 8229125
47. Gradishar WJ, Krasnojon D, Cheporov S, et al. Phase II trial of nab-paclitaxel compared with docetaxel as first-line chemotherapy in patients with metastatic breast cancer: final analysis of overall survival. *Clin Breast Cancer.* 2012;12(5):313-21. PMID: 22728026
48. Tabernero J, Climent MA, Lluch A, et al. A multicentre, randomised phase II study of weekly or 3-weekly docetaxel in patients with metastatic breast cancer. *Ann Oncol.* 2004;15(9):1358-65. PMID: 15319242
49. Nabholz JM, Senn HJ, Bezwoda WR, et al. Prospective randomized trial of docetaxel versus mitomycin plus vinblastine in patients with metastatic breast cancer progressing despite previous anthracycline-containing chemotherapy. *J Clin Oncol.* 1999;17(5):1413-24. PMID: 10334526
50. Gradishar WJ, Krasnojon D, Cheporov S, et al. Significantly longer progression-free survival with nab-paclitaxel compared with docetaxel as first-line therapy for metastatic breast cancer. *J Clin Oncol.* 2009;27(22):3611-9. PMID: 19470941
51. Ejlersen B, Mouridsen HT, Langkjer ST, et al. Phase III study of intravenous vinorelbine in combination with epirubicin versus epirubicin alone in patients with advanced breast cancer: a Scandinavian Breast Group Trial (SBG9403). *J Clin Oncol.* 2004;22(12):2313-20. PMID: 15197192
52. Awada A, Kaufman PA, Yelle L, et al. A phase III, open-label, randomized study of eribulin versus capecitabine in patients (pts) with metastatic breast cancer (MBC): effect of post-progression anti-cancer treatments (PPT) and metastatic progression events on overall survival. *Cancer Res.* 2013;73(24 Suppl):abstract P3-13-03. PMID: none
53. Perez EA, Lerzo G, Pivot X, et al. Efficacy and safety of ixabepilone (BMS-247550) in a phase II study of patients with advanced breast cancer resistant to an anthracycline, a taxane, and capecitabine. *J Clin Oncol.* 2007;25(23):3407-14. PMID: 17606974
54. O'Shaughnessy J, Gradishar WJ, Bhar P, et al. Nab-paclitaxel for first-line treatment of patients with metastatic breast cancer and poor prognostic factors: a retrospective analysis. *Breast Cancer Res Treat.* 2013;138(3):829-37. PMID: 23563958
55. Marabelle A, Le DT, Ascierto PA, et al. Efficacy of pembrolizumab in patients with noncolorectal high microsatellite instability/mismatch repair-deficient cancer: results from the phase II KEYNOTE-158 study. *J Clin Oncol.* 2020;38(1):1-10. PMID: 31682550
56. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255
57. Partridge AH, Rumble RB, Carey LA, et al. Chemotherapy and targeted therapy for women with human epidermal growth factor receptor 2-negative (or unknown) advanced breast cancer: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol.* 2014;32(29):3307-29. PMID: 25185096

58. Swain SM, Tang G, Geyer CE, Jr., et al. Definitive results of a phase III adjuvant trial comparing three chemotherapy regimens in women with operable, node-positive breast cancer: the NSABP B-38 trial. *J Clin Oncol.* 2013;31(26):3197-204. PMID: 23940225
59. von Minckwitz G, du Bois A, Schmidt M, et al. Trastuzumab beyond progression in human epidermal growth factor receptor 2-positive advanced breast cancer: a German Breast Group 26/Breast International Group 03-05 study. *J Clin Oncol.* 2009;27(12):1999-2006. PMID: 19289619
60. Bartsch R, Wenzel C, Altorki G, et al. Capecitabine and trastuzumab in heavily pretreated metastatic breast cancer. *J Clin Oncol.* 2007;25(25):3853-8. PMID: 17679724
61. Schaller G, Fuchs I, Gonsch T, et al. Phase II study of capecitabine plus trastuzumab in human epidermal growth factor receptor 2 overexpressing metastatic breast cancer pretreated with anthracyclines or taxanes. *J Clin Oncol.* 2007;25(22):3246-50. PMID: 17577021
62. Yardley DA, Burris HA, 3rd, Hanson S, et al. Weekly gemcitabine and trastuzumab in the treatment of patients with HER2-overexpressing metastatic breast cancer. *Clin Breast Cancer.* 2009;9(3):178-83. PMID: 19661042
63. O'Shaughnessy JA, Vukelja S, Marsland T, et al. Phase II study of trastuzumab plus gemcitabine in chemotherapy-pretreated patients with metastatic breast cancer. *Clin Breast Cancer.* 2004;5(2):142-7. PMID: 15245619
64. Hamberg P, Bos MM, Braun HJ, et al. Randomized phase II study comparing efficacy and safety of combination-therapy trastuzumab and docetaxel vs. sequential therapy of trastuzumab followed by docetaxel alone at progression as first-line chemotherapy in patients with HER2+ metastatic breast cancer: HERTAX trial. *Clin Breast Cancer.* 2011;11(2):103-13. PMID: 21569996
65. Marty M, Cognetti F, Maraninchi D, et al. Randomized phase II trial of the efficacy and safety of trastuzumab combined with docetaxel in patients with human epidermal growth factor receptor 2-positive metastatic breast cancer administered as first-line treatment: the M77001 study group. *J Clin Oncol.* 2005;23(19):4265-74. PMID: 15911866
66. Hurvitz SA, Dirix L, Kocsis J, et al. Phase II randomized study of trastuzumab emtansine versus trastuzumab plus docetaxel in patients with human epidermal growth factor receptor 2-positive metastatic breast cancer. *J Clin Oncol.* 2013;31(9):1157-63. PMID: 23382472
67. Vogel CL, Cobleigh MA, Tripathy D, et al. Efficacy and safety of trastuzumab as a single agent in first-line treatment of HER2-overexpressing metastatic breast cancer. *J Clin Oncol.* 2002;20(3):719-26. PMID: 11821453
68. Blackwell KL, Burstein HJ, Storniolo AM, et al. Overall survival benefit with lapatinib in combination with trastuzumab for patients with human epidermal growth factor receptor 2-positive metastatic breast cancer: final results from the EGF104900 Study. *J Clin Oncol.* 2012;30(21):2585-92. PMID: 22689807
69. Chan A, Martin M, Untch M, et al. Vinorelbine plus trastuzumab combination as first-line therapy for HER 2-positive metastatic breast cancer patients: an international phase II trial. *British Journal of Cancer.* 2006;95(7):788-93. PMID: 16969343
70. Papaldo P, Fabi A, Ferretti G, et al. A phase II study on metastatic breast cancer patients treated with weekly vinorelbine with or without trastuzumab according to HER2 expression: changing the natural history of HER2-positive disease. *Ann Oncol.* 2006;17(4):630-6. PMID: 16410363
71. Leyland-Jones B, Gelmon K, Ayoub JP, et al. Pharmacokinetics, safety, and efficacy of trastuzumab administered every three weeks in combination with paclitaxel. *J Clin Oncol.* 2003;21(21):3965-71. PMID: 14507946
72. Cortes J, Cescon DW, Rugo HS, et al. KEYNOTE-355: final results from a randomized, double-blind phase III study of first-line pembrolizumab + chemotherapy vs placebo + chemotherapy for metastatic TNBC. *Ann Oncol.* 2021;32(Suppl 5):S1289-S90. PMID: none
73. Bardia A, Rugo HS, Tolaney SM, et al. Final results from the randomized phase III ASCENT clinical trial in metastatic triple-negative breast cancer and association of outcomes by human epidermal growth factor receptor 2 and trophoblast cell surface antigen 2 expression. *J Clin Oncol.* 2024;42(15):1738-44. PMID: 38422473
74. Rugo HS, Bardia A, Marme F, et al. Overall survival with sacituzumab govitecan in hormone receptor-positive and human epidermal growth factor receptor 2-negative metastatic breast cancer (TROPiCS-02): a randomised, open-label, multicentre, phase 3 trial. *Lancet.* 2023;402(10411):1423-33. PMID: 37633306
75. Rugo HS, Schmid P, Tolaney SM, et al. Health-related quality of life with sacituzumab govitecan in HR+/HER2- metastatic breast cancer in the phase III TROPiCS-02 trial. *Oncologist.* 2024;29(9):768-79. PMID: 38748596
76. Dear RF, McGeechan K, Jenkins MC, et al. Combination versus sequential single agent chemotherapy for metastatic breast cancer. *Cochrane Database Syst Rev.* 2013(12):article no. CD008792. PMID: 24347031
77. Nabholz JM, Falkson C, Campos D, et al. Docetaxel and doxorubicin compared with doxorubicin and cyclophosphamide as first-line chemotherapy for metastatic breast cancer: results of a randomized, multicenter, phase III trial. *J Clin Oncol.* 2003;1(6):968-75. PMID: 12637459
78. Decatris MP, Sundar S, O'Byrne KJ. Platinum-based chemotherapy in metastatic breast cancer: current status. *Cancer Treat Rev.* 2004;30(1):53-81. PMID: 14766126
79. Isakoff SJ, Mayer EL, He L, et al. TBCRC009: a multicenter phase II clinical trial of platinum monotherapy with biomarker assessment in metastatic triple-negative breast cancer. *J Clin Oncol.* 2015;33(17):1902-9. PMID: 25847936
80. Silver DP, Richardson AL, Eklund AC, et al. Efficacy of neoadjuvant cisplatin in triple-negative breast cancer. *J Clin Oncol.* 2010;28(7):1145-53. PMID: 20100965
81. Bonadonna G, Brusamolino E, Valagussa P, et al. Combination chemotherapy as an adjuvant treatment in operable breast cancer. *N Engl J Med.* 1976;294(8):405-10. PMID: 1246307
82. Licchetta A, Correale P, Migali C, et al. Oral metronomic chemo-hormonal-therapy of metastatic breast cancer with cyclophosphamide and megestrol acetate. *J Chemother.* 2010;22(3):201-4. PMID: 20566427
83. U.S. Food & Drug Administration (FDA). TAXOTERE (docetaxel) injection, for intravenous use. 1996 [revised 2023 Jan]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2023/020449s086lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/020449s086lbl.pdf).
84. Harvey V, Mouridsen H, Semiglavov V, et al. Phase III trial comparing three doses of docetaxel for second-line treatment of advanced breast cancer. *J Clin Oncol.* 2006;24(31):4963-70. PMID: 17033039
85. Qi WX, Shen Z, Lin F, et al. Paclitaxel-based versus docetaxel-based regimens in metastatic breast cancer: a systematic review and meta-analysis of randomized controlled trials. *Curr Med Res Opin.* 2013;29(2):117-25. PMID: 23216340
86. Belfiglio M, Fanizza C, Tinari N, et al. Meta-analysis of phase III trials of docetaxel alone or in combination with chemotherapy in metastatic breast cancer. *J Cancer Res Clin Oncol.* 2012;138(2):221-9. PMID: 22095437
87. Sparano JA, Wang M, Martino S, et al. Weekly paclitaxel in the adjuvant treatment of breast cancer. *N Engl J Med.* 2008;358(16):1663-71. PMID: 18420499
88. Burris HA, 3rd. Single-agent docetaxel (Taxotere) in randomized phase III trials. *Semin Oncol.* 1999;26(3 Suppl 9):1-6. PMID: 10426452
89. Rivera E, Mejia JA, Arun BK, et al. Phase 3 study comparing the use of docetaxel on an every-3-week versus weekly schedule in the treatment of metastatic breast cancer. *Cancer.* 2008;112(7):1455-61. PMID: 18300256

90. Mavroudis D, Papakotoulas P, Aravanis A, et al. Randomized phase III trial comparing docetaxel plus epirubicin versus docetaxel plus capecitabine as first-line treatment in women with advanced breast cancer. *Ann Oncol.* 2010;21(1):48-54. PMID: 19906761
91. Roche H, Fumoleau P, Spielmann M, et al. Sequential adjuvant epirubicin-based and docetaxel chemotherapy for node-positive breast cancer patients: the FNCLCC PACS 01 trial. *J Clin Oncol.* 2006;24(36):5664-71. PMID: 17116941
92. Bastholt L, Dalmark M, Gjedde SB, et al. Dose-response relationship of epirubicin in the treatment of postmenopausal patients with metastatic breast cancer: a randomized study of epirubicin at four different dose levels performed by the Danish Breast Cancer Cooperative Group. *J Clin Oncol.* 1996;14(4):1146-55. PMID: 8648369
93. Kaufman PA, Awada A, Twelves C, et al. Phase III open-label randomized study of eribulin mesylate versus capecitabine in patients with locally advanced or metastatic breast cancer previously treated with an anthracycline and a taxane. *J Clin Oncol.* 2015;33(6):594-601. PMID: 25605862
94. Langley RE, Carmichael J, Jones AL, et al. Phase III trial of epirubicin plus paclitaxel compared with epirubicin plus cyclophosphamide as first-line chemotherapy for metastatic breast cancer: United Kingdom National Cancer Research Institute trial AB01. *J Clin Oncol.* 2005;23(33):8322-30. PMID: 16293863
95. O'Shaughnessy J, Schwartzberg L, Danso MA, et al. Phase III study of iniparib plus gemcitabine and carboplatin versus gemcitabine and carboplatin in patients with metastatic triple-negative breast cancer. *J Clin Oncol.* 2014;32(34):3840-7. PMID: 25349301
96. O'Shaughnessy J, Schwartzberg LS, Danso MA, et al. A randomized phase III study of iniparib (BSI-201) in combination with gemcitabine/carboplatin (G/C) in metastatic triple-negative breast cancer (TNBC). *J Clin Oncol.* 2011;29(15 Suppl):abstract 1007. PMID: none
97. Albain KS, Nag SM, Calderillo-Ruiz G, et al. Gemcitabine plus paclitaxel versus paclitaxel monotherapy in patients with metastatic breast cancer and prior anthracycline treatment. *J Clin Oncol.* 2008;26(24):3950-7. PMID: 18711184
98. Sparano JA, Vrdoljak E, Rixe O, et al. Randomized phase III trial of ixabepilone plus capecitabine versus capecitabine in patients with metastatic breast cancer previously treated with an anthracycline and a taxane. *J Clin Oncol.* 2010;28(20):3256-63. PMID: 20530276
99. U.S. Food & Drug Administration (FDA). ABRAXANE® for injectable suspension (paclitaxel protein-bound particles for injectable suspension)(albumin-bound). 2005 [revised 2020 Aug]. Available from: [http://www.accessdata.fda.gov/drugsatfda\\_docs/label/2020/021660s047lbl.pdf](http://www.accessdata.fda.gov/drugsatfda_docs/label/2020/021660s047lbl.pdf).
100. Gradishar WJ, Tjulandin S, Davidson N, et al. Phase III trial of nanoparticle albumin-bound paclitaxel compared with polyethylated castor oil-based paclitaxel in women with breast cancer. *J Clin Oncol.* 2005;23(31):7794-803. PMID: 16172456
101. Robson M, Im SA, Senkus E, et al. Olaparib for metastatic breast cancer in patients with a germline BRCA mutation. *N Engl J Med.* 2017;377(6):523-33. PMID: 28578601
102. Robson ME, Tung N, Conte P, et al. OlympiAD final overall survival and tolerability results: olaparib versus chemotherapy treatment of physician's choice in patients with a germline BRCA mutation and HER2-negative metastatic breast cancer. *Ann Oncol.* 2019;30(4):558-66. PMID: 30689707
103. Litton JK, Rugo HS, Ettl J, et al. Talazoparib in patients with advanced breast cancer and a germline BRCA mutation. *N Engl J Med.* 2018;379(8):753-63. PMID: 30110579
104. Hurvitz SA, Goncalves A, Rugo HS, et al. Talazoparib in patients with a germline brca-mutated advanced breast cancer: detailed safety analyses from the phase III EMBRACA trial. *Oncologist.* 2020;25(3):e439-e50. PMID: 32162822
105. Schnipper LE, Smith TJ, Raghavan D, et al. American Society of Clinical Oncology identifies five key opportunities to improve care and reduce costs: the top five list for oncology. *J Clin Oncol.* 2012;30(14):1715-24. PMID: 22493340
106. Perez EA, Hillman DW, Stella PJ, et al. A phase II study of paclitaxel plus carboplatin as first-line chemotherapy for women with metastatic breast carcinoma. *Cancer.* 2000;88(1):124-31. PMID: 10618614
107. Loesch D, Robert N, Asmar L, et al. Phase II multicenter trial of a weekly paclitaxel and carboplatin regimen in patients with advanced breast cancer. *J Clin Oncol.* 2002;20(18):3857-64. PMID: 12228205
108. Yardley DA, Coleman R, Conte P, et al. Nab-paclitaxel plus carboplatin or gemcitabine versus gemcitabine plus carboplatin as first-line treatment of patients with triple-negative metastatic breast cancer: results from the tnAcity trial. *Ann Oncol.* 2018;29(8):1763-70. PMID: 29878040
109. Drilon A, Siena S, Ou SI, et al. Safety and antitumor activity of the multitargeted pan-TRK, ROS1, and ALK inhibitor entrectinib: combined results from two phase I trials (ALK-A-372-001 and STARTRK-1). *Cancer Discov.* 2017;7(4):400-9. PMID: 28183697
110. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
111. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
112. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science.* 2017;357(6349):409-13. PMID: 28596308
113. Lala M, Li TR, de Alwis DP, et al. A six-weekly dosing schedule for pembrolizumab in patients with cancer based on evaluation using modelling and simulation. *Eur J Cancer.* 2020;131:68-75. PMID: 32305010
114. Andre F, Hee Park Y, Kim SB, et al. Trastuzumab deruxtecan versus treatment of physician's choice in patients with HER2-positive metastatic breast cancer (DESTINY-Breast02): a randomised, open-label, multicentre, phase 3 trial. *Lancet.* 2023;401(10390):1773-85. PMID: 37086745
115. Fehm T, Cottone F, Dunton K, et al. Trastuzumab deruxtecan versus treatment of physician's choice in patients with HER2-positive metastatic breast cancer (DESTINY-Breast02): patient-reported outcomes from a randomised, open-label, multicentre, phase 3 trial. *Lancet Oncol.* 2024;25(5):614-25. PMID: 38697155
116. Cobleigh MA, Vogel CL, Tripathy D, et al. Multinational study of the efficacy and safety of humanized anti-HER2 monoclonal antibody in women who have HER2-overexpressing metastatic breast cancer that has progressed after chemotherapy for metastatic disease. *J Clin Oncol.* 1999;17(9):2639-48. PMID: 10561337
117. Slamon DJ, Leyland-Jones B, Shak S, et al. Use of chemotherapy plus a monoclonal antibody against HER2 for metastatic breast cancer that overexpresses HER2. *N Engl J Med.* 2001;344(11):783-92. PMID: 11248153
118. Gelmon KA, Boyle FM, Kaufman B, et al. Lapatinib or trastuzumab plus taxane therapy for human epidermal growth factor receptor 2-positive advanced breast cancer: final results of NCIC CTG MA.31. *J Clin Oncol.* 2015;33(14):1574-83. PMID: 25779558
119. Verma S, Miles D, Gianni L, et al. Trastuzumab emtansine for HER2-positive advanced breast cancer. *N Engl J Med.* 2012;367(19):1783-91. PMID: 23020162
120. Dieras V, Harbeck N, Budd GT, et al. Trastuzumab emtansine in human epidermal growth factor receptor 2-positive metastatic breast cancer: an integrated safety analysis. *J Clin Oncol.* 2014;32(25):2750-7. PMID: 25024070

121. Krop IE, Lin NU, Blackwell K, et al. Trastuzumab emtansine (T-DM1) versus lapatinib plus capecitabine in patients with HER2-positive metastatic breast cancer and central nervous system metastases: a retrospective, exploratory analysis in EMILIA. *Ann Oncol.* 2015;26(1):113-9. PMID: 25355722
122. Dieras V, Miles D, Verma S, et al. Trastuzumab emtansine versus capecitabine plus lapatinib in patients with previously treated HER2-positive advanced breast cancer (EMILIA): a descriptive analysis of final overall survival results from a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2017;18(6):732-42. PMID: 28526536
123. Krop IE, Kim SB, Martin AG, et al. Trastuzumab emtansine versus treatment of physician's choice in patients with previously treated HER2-positive metastatic breast cancer (TH3RESA): final overall survival results from a randomised open-label phase 3 trial. *Lancet Oncol.* 2017;18(6):743-54. PMID: 28526538
124. Geyer CE, Forster J, Lindquist D, et al. Lapatinib plus capecitabine for HER2-positive advanced breast cancer. *N Engl J Med.* 2006;355(26):2733-43. PMID: 17192538
125. Cameron D, Casey M, Press M, et al. A phase III randomized comparison of lapatinib plus capecitabine versus capecitabine alone in women with advanced breast cancer that has progressed on trastuzumab: updated efficacy and biomarker analyses. *Breast Cancer Res Treat.* 2008;112(3):533-43. PMID: 18188694
126. Tolaney SM, Najita J, Sperinde J, et al. A phase II study of ixabepilone and trastuzumab for metastatic HER2-positive breast cancer. *Ann Oncol.* 2013;24(7):1841-7. PMID: 23559151
127. Saura C, Oliveira M, Feng YH, et al. Neratinib + capecitabine versus lapatinib + capecitabine in patients with HER2+ metastatic breast cancer previously treated with ≥ 2 HER2-directed regimens: findings from the multinational, randomized, phase III NALA trial. *J Clin Oncol.* 2019;37(Suppl 15):abstract 1002. PMID: none
128. Saura C, Oliveira M, Feng YH, et al. Neratinib plus capecitabine versus lapatinib plus capecitabine in HER2-positive metastatic breast cancer previously treated with >= 2 HER2-directed regimens: phase III NALA trial. *J Clin Oncol.* 2020;38(27):3138-49. PMID: 32678716
129. Rugo HS, Im SA, Cardoso F, et al. Efficacy of margetuximab vs trastuzumab in patients with pretreated ERBB2-positive advanced breast cancer: a phase 3 randomized clinical trial. *JAMA Oncol.* 2021;7(4):573-84. PMID: 33480963
130. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. *N Engl J Med.* 2010;363(8):733-42. PMID: 20818875
131. Perez EA, Suman VJ, Rowland KM, et al. Two concurrent phase II trials of paclitaxel/carboplatin/trastuzumab (weekly or every-3-week schedule) as first-line therapy in women with HER2-overexpressing metastatic breast cancer: NCCTG study 983252. *Clin Breast Cancer.* 2005;6(5):425-32. PMID: 16381626
132. Extra JM, Cognetti F, Maraninchi D, et al. Long-term survival demonstrated with trastuzumab plus docetaxel: 24-month data from a randomised trial (M77001) in HER2-positive metastatic breast cancer. *J Clin Oncol.* 2005;23(16 Suppl):abstract 555. PMID: none
133. Esteva FJ, Valero V, Booser D, et al. Phase II study of weekly docetaxel and trastuzumab for patients with HER-2-overexpressing metastatic breast cancer. *J Clin Oncol.* 2002;20(7):1800-8. PMID: 11919237
134. Blackwell KL, Burstein HJ, Storniolo AM, et al. Randomized study of lapatinib alone or in combination with trastuzumab in women with ErbB2-positive, trastuzumab-refractory metastatic breast cancer. *J Clin Oncol.* 2010;28(7):1124-30. PMID: 20124187
135. Murthy RK, Loi S, Okines A, et al. Tucatinib, trastuzumab, and capecitabine for HER2-positive metastatic breast cancer. *N Engl J Med.* 2020;382(7):597-609. PMID: 31825569
136. Lin NU, Borges V, Anders C, et al. Intracranial efficacy and survival with tucatinib plus trastuzumab and capecitabine for previously treated HER2-positive breast cancer with brain metastases in the HER2CLIMB trial. *J Clin Oncol.* 2020;38(23):2610-9. PMID: 32468955
137. Curigliano G, Mueller V, Borges V, et al. Tucatinib versus placebo added to trastuzumab and capecitabine for patients with pretreated HER2+ metastatic breast cancer with and without brain metastases (HER2CLIMB): final overall survival analysis. *Ann Oncol.* 2022;33(3):321-9. PMID: 34954044
138. Burstein HJ, Keshaviah A, Baron AD, et al. Trastuzumab plus vinorelbine or taxane chemotherapy for HER2-overexpressing metastatic breast cancer: the trastuzumab and vinorelbine or taxane study. *Cancer.* 2007;110(5):965-72. PMID: 17614302
139. Andersson M, Lidbrink E, Bjerre K, et al. Phase III randomized study comparing docetaxel plus trastuzumab with vinorelbine plus trastuzumab as first-line therapy of metastatic or locally advanced human epidermal growth factor receptor 2-positive breast cancer: the HERNATA study. *J Clin Oncol.* 2011;29(3):264-71. PMID: 21149659
140. Esfahani K, Ferrario C, Le P, et al. The trastuzumab and vinorelbine combination: an alternative to taxane-based chemotherapy for early-stage and locally advanced her2-positive breast cancer. *Current Oncology.* 2014;21(5):e723-7. PMID: 25301539
141. Bardia A, Hu X, Dent R, et al. Trastuzumab deruxtecan after endocrine therapy in metastatic breast cancer. *N Engl J Med.* 2024:[Epub ahead of print]. PMID: 39282896
142. Ackland SP, Anton A, Breitbach GP, et al. Dose-intensive epirubicin-based chemotherapy is superior to an intensive intravenous cyclophosphamide, methotrexate, and fluorouracil regimen in metastatic breast cancer: a randomized multinational study. *J Clin Oncol.* 2001;19(4):943-53. PMID: 11181656
143. Dieras V, Han HS, Kaufman B, et al. Veliparib with carboplatin and paclitaxel in BRCA-mutated advanced breast cancer (BROCADE3): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2020;21(10):1269-82. PMID: 32861273
144. Miles D, Gligorov J, Andre F, et al. Primary results from IMpassion131, a double-blind, placebo-controlled, randomised phase III trial of first-line paclitaxel with or without atezolizumab for unresectable locally advanced/metastatic triple-negative breast cancer. *Ann Oncol.* 2021;32(8):994-1004. PMID: 34219000
145. Schmid P, Adams S, Rugo HS, et al. Atezolizumab and nab-paclitaxel in advanced triple-negative breast cancer. *N Engl J Med.* 2018;379(22):2108-21. PMID: 30345906
146. Adams S, Dieras V, Barrios CH, et al. Patient-reported outcomes from the phase III IMpassion130 trial of atezolizumab plus nab-paclitaxel in metastatic triple-negative breast cancer. *Ann Oncol.* 2020;31(5):582-9. PMID: 32178964
147. Schmid P, Rugo HS, Adams S, et al. Atezolizumab plus nab-paclitaxel as first-line treatment for unresectable, locally advanced or metastatic triple-negative breast cancer (IMpassion130): updated efficacy results from a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2020;21(1):44-59. PMID: 31786121
148. Emens LA, Molinero L, Loi S, et al. Atezolizumab and nab-paclitaxel in advanced triple-negative breast cancer: biomarker evaluation of the IMpassion130 study. *J Natl Cancer Inst.* 2021;113(8):1005-16. PMID: 33523233

149. Emens LA, Adams S, Barrios CH, et al. First-line atezolizumab plus nab-paclitaxel for unresectable, locally advanced, or metastatic triple-negative breast cancer: IMpassion130 final overall survival analysis. *Ann Oncol.* 2021;32(8):983-93. PMID: 34272041
150. Miller K, Wang M, Gralow J, et al. Paclitaxel plus bevacizumab versus paclitaxel alone for metastatic breast cancer. *N Engl J Med.* 2007;357(26):2666-76. PMID: 18160686
151. Perez EA, Barrios C, Eiermann W, et al. Trastuzumab emtansine with or without pertuzumab versus trastuzumab plus taxane for human epidermal growth factor receptor 2-positive, advanced breast cancer: primary results from the phase III MARIANNE study. *J Clin Oncol.* 2017;35(2):141-8. PMID: 28056202
152. De Gregorio N, Schochter F, Melcher C, et al. DETECT III-a multicenter, randomized, phase III trial to compare standard therapy alone versus standard therapy plus lapatinib in patients with initially HER2-negative metastatic breast cancer and HER2-positive circulating tumor cells. *Cancer Res.* 2013;73(24 Suppl):abstract OT1--11. PMID: none

## Breast Cancer\* Pathways: Endocrine Therapy for Hormone Receptor Positive Advanced/Metastatic Disease

### First Line of Therapy (1<sup>st</sup> Line)

- Stages IV and Recurrent
  - HER2 Negative
    - Anastrozole (Arimidex) and ribociclib (Kisqali)<sup>1, 2</sup>
    - Letrozole (Femara) and ribociclib (Kisqali)<sup>1-4</sup>
    - Anastrozole (Arimidex)<sup>5-13</sup>
    - Fulvestrant (Faslodex) high dose<sup>7-10, 12-17</sup>
    - Fulvestrant (Faslodex) and ribociclib (Kisqali)<sup>18, 19</sup>
    - Letrozole (Femara)<sup>20-25</sup>
    - Tamoxifen<sup>†15, 24, 26, 27</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Stages IV and Recurrent
  - HER2 Negative
    - Anastrozole (Arimidex)<sup>5-13</sup>
    - Fulvestrant (Faslodex) high dose<sup>7-10, 12-17</sup>
    - Fulvestrant (Faslodex) and ribociclib (Kisqali)<sup>‡18, 19</sup>
    - Letrozole (Femara)<sup>20-25</sup>
    - Tamoxifen<sup>†15, 24, 26, 27</sup>
    - Exemestane (Aromasin)<sup>16, 28-30</sup>

### Second or Third Line of Therapy (2<sup>nd</sup> or 3<sup>rd</sup> Line)

- Stages IV and Recurrent
  - PIK3CA/AKT1/PTEN Mutated and HER2 Negative
    - Fulvestrant (Faslodex) and alpelisib (PIQRAY)<sup>§||31-33</sup>
    - Fulvestrant (Faslodex) and capivasertib (TRUQAP)<sup>||34</sup>

\* Breast cancer histologies include invasive ductal, invasive lobular, inflammatory and invasive NOS

† Tamoxifen is considered pathway for premenopausal individuals with or without ovarian suppression

‡ Ribociclib regimens are not considered pathway when continued in the second line setting if the patient has received an available CDK4/6 inhibitor regimen in the first line setting

§ Regimen applies only to the subset of PIK3CA mutations

|| After progression on prior therapy with a CDK 4/6 inhibitor

# Breast Cancer Endocrine Therapy for Advanced/Metastatic Disease References

## NCCN Clinical Practice Guidelines: *Breast Cancer*. Version 1.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Im SA, Lu YS, Bardia A, et al. Overall survival with ribociclib plus endocrine therapy in breast cancer. *N Engl J Med.* 2019;381(4):307-16. PMID: 31166679
2. Tripathy D, Im SA, Colleoni M, et al. Ribociclib plus endocrine therapy for premenopausal women with hormone-receptor-positive, advanced breast cancer (MONALEESA-7): a randomised phase 3 trial. *Lancet Oncol.* 2018;19(7):904-15. PMID: 29804902
3. Hortobagyi GN, Stemmer SM, Burris HA, et al. Ribociclib as first-line therapy for hr-positive, advanced breast cancer. *N Engl J Med.* 2016;375(18):1738-48. PMID: 27717303
4. Hortobagyi GN, Stemmer SM, Burris HA, et al. Overall survival (OS) results from the phase III MONALEESA-2 (ML-2) trial of postmenopausal patients (pts) with hormone receptor positive/human epidermal growth factor receptor 2 negative (HR+/HER2-) advanced breast cancer (ABC) treated with endocrine therapy (ET) ± ribociclib (RIB). *Ann Oncol.* 2021;32(Suppl 5):S1290-S1. PMID: none
5. Bergh J, Jonsson PE, Lidbrink EK, et al. FACT: an open-label randomized phase III study of fulvestrant and anastrozole in combination compared with anastrozole alone as first-line therapy for patients with receptor-positive postmenopausal breast cancer. *J Clin Oncol.* 2012;30(16):1919-25. PMID: 22370325
6. Carlson RW, Theriault R, Schurman CM, et al. Phase II trial of anastrozole plus goserelin in the treatment of hormone receptor-positive, metastatic carcinoma of the breast in premenopausal women. *J Clin Oncol.* 2010;28(25):3917-21. PMID: 20679610
7. Ellis MJ, Llombart-Cussac A, Feltl D, et al. Fulvestrant 500 mg versus anastrozole 1 mg for the first-line treatment of advanced breast cancer: overall survival analysis from the phase II FIRST study. *J Clin Oncol.* 2015;33(32):3781-7. PMID: 26371134
8. Howell A, Robertson JF, Quaresma Albano J, et al. Fulvestrant, formerly ICI 182,780, is as effective as anastrozole in postmenopausal women with advanced breast cancer progressing after prior endocrine treatment. *J Clin Oncol.* 2002;20(16):3396-403. PMID: 12177099
9. Mehta RS, Barlow WE, Albain KS, et al. Overall survival with fulvestrant plus anastrozole in metastatic breast cancer. *N Engl J Med.* 2019;380(13):1226-34. PMID: 30917258
10. Mehta RS, Barlow WE, Albain KS, et al. Combination anastrozole and fulvestrant in metastatic breast cancer. *N Engl J Med.* 2012;367(5):435-44. PMID: 22853014
11. Nabholz JM, Buzdar A, Pollak M, et al. Anastrozole is superior to tamoxifen as first-line therapy for advanced breast cancer in postmenopausal women: results of a North American multicenter randomized trial. *J Clin Oncol.* 2000;18(22):3758-67. PMID: 11078488
12. Robertson JF, Llombart-Cussac A, Rolski J, et al. Activity of fulvestrant 500 mg versus anastrozole 1 mg as first-line treatment for advanced breast cancer: results from the FIRST study. *J Clin Oncol.* 2009;27(27):4530-5. PMID: 19704066
13. Robertson JFR, Bondarenko IM, Trishkina E, et al. Fulvestrant 500 mg versus anastrozole 1 mg for hormone receptor-positive advanced breast cancer (FALCON): an international, randomised, double-blind, phase 3 trial. *Lancet.* 2016;388(10063):2997-3005. PMID: 27908454
14. Di Leo A, Jerusalem G, Petruzelka L, et al. Final overall survival: fulvestrant 500 mg vs 250 mg in the randomized CONFIRM trial. *J Natl Cancer Inst.* 2014;106(1):djt337. PMID: 24317176
15. Howell A, Robertson JF, Abram P, et al. Comparison of fulvestrant versus tamoxifen for the treatment of advanced breast cancer in postmenopausal women previously untreated with endocrine therapy: a multinational, double-blind, randomized trial. *J Clin Oncol.* 2004;22(9):1605-13. PMID: 15117982
16. Johnston SR, Kilburn LS, Ellis P, et al. Fulvestrant plus anastrozole or placebo versus exemestane alone after progression on non-steroidal aromatase inhibitors in postmenopausal patients with hormone-receptor-positive locally advanced or metastatic breast cancer (SoFEA): a composite, multicentre, phase 3 randomised trial. *Lancet Oncol.* 2013;14(10):989-98. PMID: 23902874
17. Kaufmann M, Jonat W, Schachner-Wunschmann E, et al. The depot GnRH analogue goserelin in the treatment of premenopausal patients with metastatic breast cancer--a 5-year experience and further endocrine therapies. Cooperative German Zoladex Study Group. *Onkologie.* 1991;14(1):22-4, 6-8, 30. PMID: 1829149
18. Slamon DJ, Neven P, Chia S, et al. Phase III randomized study of ribociclib and fulvestrant in hormone receptor-positive, human epidermal growth factor receptor 2-negative advanced breast cancer: MONALEESA-3. *J Clin Oncol.* 2018;36(24):2465-72. PMID: 29860922

19. Slamon DJ, Neven P, Chia S, et al. Overall survival with ribociclib plus fulvestrant in advanced breast cancer. *N Engl J Med.* 2020;382(6):514-524.(6):514-24. PMID: 31826360
20. Breast International Group 1-98 Collaborative Group, Thurlimann B, Keshaviah A, et al. A comparison of letrozole and tamoxifen in postmenopausal women with early breast cancer. *N Engl J Med.* 2005;353(26):2747-57. PMID: 16382061
21. Buzdar A, Douma J, Davidson N, et al. Phase III, multicenter, double-blind, randomized study of letrozole, an aromatase inhibitor, for advanced breast cancer versus megestrol acetate. *J Clin Oncol.* 2001;19(14):3357-66. PMID: 11454883
22. Dombernowsky P, Smith I, Falkson G, et al. Letrozole, a new oral aromatase inhibitor for advanced breast cancer: double-blind randomized trial showing a dose effect and improved efficacy and tolerability compared with megestrol acetate. *J Clin Oncol.* 1998;16(2):453-61. PMID: 9469328
23. Johnston S, Pippen J, Jr., Pivot X, et al. Lapatinib combined with letrozole versus letrozole and placebo as first-line therapy for postmenopausal hormone receptor-positive metastatic breast cancer. *J Clin Oncol.* 2009;27(33):5538-46. PMID: 19786658
24. Mouridsen H, Gershovitch M, Sun Y, et al. Phase III study of letrozole versus tamoxifen as first-line therapy of advanced breast cancer in postmenopausal women: analysis of survival and update of efficacy from the International Letrozole Breast Cancer Group. *J Clin Oncol.* 2003;21(11):2101-9. PMID: 12775735
25. Park IH, Ro J, Lee KS, et al. Phase II parallel group study showing comparable efficacy between premenopausal metastatic breast cancer patients treated with letrozole plus goserelin and postmenopausal patients treated with letrozole alone as first-line hormone therapy. *J Clin Oncol.* 2010;28(16):2705-11. PMID: 20421538
26. Klijn JG, Beex LV, Mauriac L, et al. Combined treatment with buserelin and tamoxifen in premenopausal metastatic breast cancer: a randomized study. *J Natl Cancer Inst.* 2000;92(11):903-11. PMID: 10841825
27. Santen RJ, Manni A, Harvey H, et al. Endocrine treatment of breast cancer in women. *Endocr Rev.* 1990;11(2):221-65. PMID: 2194783
28. Chia S, Gradishar W, Mauriac L, et al. Double-blind, randomized placebo controlled trial of fulvestrant compared with exemestane after prior nonsteroidal aromatase inhibitor therapy in postmenopausal women with hormone receptor-positive, advanced breast cancer: results from EFACT. *J Clin Oncol.* 2008;26(10):1664-70. PMID: 18316794
29. Pagani O, Regan MM, Walley B, et al. Randomized comparison of adjuvant aromatase inhibitor (AI) exemestane (E) plus ovarian function suppression (OFS) vs tamoxifen (T) plus OFS in premenopausal women with hormone receptor-positive (HR+) early breast cancer (BC): joint analysis of IBCSG TEXT and SOFT trials. *J Clin Oncol.* 2014;32(18 Suppl):abstract LBA1. PMID: none
30. Yardley DA, Ismail-Khan RR, Melichar B, et al. Randomized phase II, double-blind, placebo-controlled study of exemestane with or without entinostat in postmenopausal women with locally recurrent or metastatic estrogen receptor-positive breast cancer progressing on treatment with a nonsteroidal aromatase inhibitor. *J Clin Oncol.* 2013;31(17):2128-35. PMID: 23650416
31. Andre F, Ciruelos E, Rubovszky G, et al. Alpelisib for PIK3CA-mutated, hormone receptor-positive advanced breast cancer. *N Engl J Med.* 2019;380(20):1929-40. PMID: 31091374
32. Rugo HS, Andre F, Yamashita T, et al. Time course and management of key adverse events during the randomized phase III SOLAR-1 study of PI3K inhibitor alpelisib plus fulvestrant in patients with HR-positive advanced breast cancer. *Ann Oncol.* 2020;31(8):1001-10. PMID: 32416251
33. Ciruelos EM, Rugo HS, Mayer IA, et al. Patient-reported outcomes in patients with PIK3CA-mutated hormone receptor-positive, human epidermal growth factor receptor 2-negative advanced breast cancer from SOLAR-1. *J Clin Oncol.* 2021;39(18):2005-15. PMID: 33780274
34. Turner NC, Oliveira M, Howell SJ, et al. Capivasertib in hormone receptor-positive advanced breast cancer. *N Engl J Med.* 2023;388(22):2058-70. PMID: 37256976
35. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Breast Cancer (Version 1.2025. Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
36. Iwata H, Im SA, Masuda N, et al. PALOMA-3: phase III trial of fulvestrant with or without palbociclib in premenopausal and postmenopausal women with hormone receptor-positive, human epidermal growth factor receptor 2-negative metastatic breast cancer that progressed on prior endocrine therapy-safety and efficacy in Asian patients. *J Glob Oncol.* 2017;3(4):289-303. PMID: 28831437
37. Cristofanilli M, Turner NC, Bondarenko I, et al. Fulvestrant plus palbociclib versus fulvestrant plus placebo for treatment of hormone-receptor-positive, HER2-negative metastatic breast cancer that progressed on previous endocrine therapy (PALOMA-3): final analysis of the multicentre, double-blind, phase 3 randomised controlled trial. *Lancet Oncol.* 2016;17(4):425-39. PMID: 26947331
38. Finn RS, Crown JP, Lang I, et al. The cyclin-dependent kinase 4/6 inhibitor palbociclib in combination with letrozole versus letrozole alone as first-line treatment of oestrogen receptor-positive, HER2-negative, advanced breast cancer (PALOMA-1/TRIO-18): a randomised phase 2 study. *Lancet Oncol.* 2015;16(1):25-35. PMID: 25524798
39. Piccart M, Hortobagyi GN, Campone M, et al. Everolimus plus exemestane for hormone-receptor-positive, human epidermal growth factor receptor-2-negative advanced breast cancer: overall survival results from BOLERO-2. *Ann Oncol.* 2014;25(12):2357-62. PMID: 25231953
40. Yardley DA, Noguchi S, Pritchard KI, et al. Everolimus plus exemestane in postmenopausal patients with HR(+) breast cancer: BOLERO-2 final progression-free survival analysis. *Adv Ther.* 2013;30(10):870-84. PMID: 24158787
41. U.S. Food & Drug Administration (FDA). FARESTON® (toremifene citrate) 60 mg tablets oral administration 1997 [revised 2017 May] Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2017/020497s009lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/020497s009lbl.pdf).

42. Slamon DJ, Neven P, Chia S, et al. Ribociclib plus fulvestrant for postmenopausal women with hormone receptor-positive, human epidermal growth factor receptor 2-negative advanced breast cancer in the phase 3 randomized MONALEESA-3 trial: updated overall survival. *Ann Oncol.* 2021;32(8):1015-24. PMID: 34102253
43. Kalinsky K, Accordino MK, Chiuzan C, et al. Randomized phase II trial of endocrine therapy with or without ribociclib after progression on cyclin-dependent kinase 4/6 inhibition in hormone receptor-positive, human epidermal growth factor receptor 2-negative metastatic breast cancer: MAINTAIN trial. *J Clin Oncol.* 2023;41(24):4004-13. PMID: 37207300
44. Hortobagyi GN, Stemmer SM, Burris HA, et al. Overall survival with ribociclib plus letrozole in advanced breast cancer. *N Engl J Med.* 2022;386(10):942-50. PMID: 35263519
45. Sonke GS, van Ommen-Nijhof A, Wortelboer N, et al. Early versus deferred use of CDK4/6 inhibitors in advanced breast cancer. *Nature.* 2024;636(8042):474-80. PMID: 39604725
46. Rugo HS, Dieras V, Gelmon KA, et al. Impact of palbociclib plus letrozole on patient-reported health-related quality of life: results from the PALOMA-2 trial. *Ann Oncol.* 2018;29(4):888-94. PMID: 29360932
47. U.S. Food & Drug Administration (FDA). IBRANCE® (palbociclib) capsules, for oral use. 2015 [revised 2023 Sept]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2023/207103s017s018lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/207103s017s018lbl.pdf).
48. Sonke GS, Van Ommen-Nijhof A, Wortelboer N, et al. Primary outcome analysis of the phase 3 SONIA trial (BOOG 2017-03) on selecting the optimal position of cyclin-dependent kinases 4 and 6 (CDK4/6) inhibitors for patients with hormone receptor-positive (HR+), HER2-negative (HER2-) advanced breast cancer (ABC). *J Clin Oncol.* 2023;41(17 Suppl):abstract LBA1000. PMID: none
49. Dickler MN, Tolaney SM, Rugo HS, et al. MONARCH 1, a phase II study of abemaciclib, a CDK4 and CDK6 inhibitor, as a single agent, in patients with refractory HR+/HER- metastatic breast cancer. *Clin Cancer Res.* 2017;23(17):5218-24. PMID: 28533223
50. Goetz MP, Toi M, Campone M, et al. MONARCH 3: abemaciclib as initial therapy for advanced breast cancer. *J Clin Oncol.* 2017;35(32):3638-46. PMID: 28968163
51. Goetz MP, Martin M, Tokunaga E, et al. Health-related quality of life in MONARCH 3: abemaciclib plus an aromatase inhibitor as initial therapy in HR+, HER2- advanced breast cancer. *Oncologist.* 2020;25(9):e1346-e54. PMID: 32536013
52. Goetz MP, Toi M, Huober J, et al. Abemaciclib plus a nonsteroidal aromatase inhibitor as initial therapy for HR+, HER2- advanced breast cancer: final overall survival results of MONARCH 3. *Ann Oncol.* 2024;35(8):718-27. PMID: 38729566
53. Forward DP, Cheung KL, Jackson L, et al. Clinical and endocrine data for goserelin plus anastrozole as second-line endocrine therapy for premenopausal advanced breast cancer. *British Journal of Cancer.* 2004;90(3):590-4. PMID: 14760369
54. Martin M, Zielinski C, Ruiz-Borrego M, et al. Palbociclib in combination with endocrine therapy versus capecitabine in hormonal receptor-positive, human epidermal growth factor 2-negative, aromatase inhibitor-resistant metastatic breast cancer: a phase III randomised controlled trial-PEARL. *Ann Oncol.* 2020;32(4):488-99. PMID: 33385521
55. Martin M, Zielinski C, Ruiz-Borrego M, et al. Overall survival with palbociclib plus endocrine therapy versus capecitabine in postmenopausal patients with hormone receptor-positive, HER2-negative metastatic breast cancer in the PEARL study. *Eur J Cancer.* 2022;168:12-24. PMID: 35429901
56. Sledge GW, Jr., Toi M, Neven P, et al. MONARCH 2: abemaciclib in combination with fulvestrant in women with HR+/HER2- advanced breast cancer who had progressed while receiving endocrine therapy. *J Clin Oncol.* 2017;35(25):2875-84. PMID: 28580882
57. Sledge GW, Jr., Toi M, Neven P, et al. The effect of abemaciclib plus fulvestrant on overall survival in hormone receptor-positive, ERBB2-negative breast cancer that progressed on endocrine therapy-MONARCH 2: a randomized clinical trial. *JAMA Oncol.* 2020;6(1):116-24. PMID: 31563959
58. Kaufman PA, Toi M, Neven P, et al. Health-related quality of life in MONARCH 2: abemaciclib plus fulvestrant in hormone receptor-positive, HER2-negative advanced breast cancer after endocrine therapy. *Oncologist.* 2020;25(2):e243-e51. PMID: 31649135
59. Kalinsky K, Bianchini G, Hamilton E, et al. Abemaciclib plus fulvestrant in advanced breast cancer following progression on CDK4/6 inhibition: results from the phase III postMONARCH trial. *J Clin Oncol.* 2024:[Epub ahead of print]. PMID: 39693591
60. Turner NC, Ro J, Andre F, et al. Palbociclib in hormone-receptor-positive advanced breast cancer. *N Engl J Med.* 2015;373(3):209-19. PMID: 26030518
61. Harbeck N, Iyer S, Turner N, et al. Quality of life with palbociclib plus fulvestrant in previously treated hormone receptor-positive, HER2-negative metastatic breast cancer: patient-reported outcomes from the PALOMA-3 trial. *Ann Oncol.* 2016;27(6):1047-54. PMID: 27029704
62. Llombart-Cussac A, Perez-Garcia JM, Bellet M, et al. Fulvestrant-palbociclib vs letrozole-palbociclib as initial therapy for endocrine-sensitive, hormone receptor-positive, ERBB2-negative advanced breast cancer: a randomized clinical trial. *JAMA Oncol.* 2021;7(12):1791-9. PMID: 34617955
63. Finn RS, Martin M, Rugo HS, et al. Palbociclib and letrozole in advanced breast cancer. *N Engl J Med.* 2016;375(20):1925-36. PMID: 27959613
64. Giuliano M, Schettini F, Rognoni C, et al. Endocrine treatment versus chemotherapy in postmenopausal women with hormone receptor-positive, HER2-negative, metastatic breast cancer: a systematic review and network meta-analysis. *Lancet Oncol.* 2019;20(10):1360-9. PMID: 31494037
65. Slamon DJ, Dieras V, Rugo HS, et al. Overall survival with palbociclib plus letrozole in advanced breast cancer. *J Clin Oncol.* 2024;42(9):994-1000. PMID: 38252901
66. Turner NC, Im SA, Saura C, et al. Inavolisib-based therapy in PIK3CA-mutated advanced breast cancer. *N Engl J Med.* 2024;391(17):1584-96. PMID: 39476340
67. Juric D, Kalinsky K, Turner NC, et al. First-line inavolisib/placebo + palbociclib + fulvestrant (Inavo/Pbo+Palbo+Fulv) in patients (pts) with PIK3CA-mutated, hormone receptor-positive, HER2-negative locally advanced/metastatic breast cancer who relapsed

- during/within 12 months (mo) of adjuvant endocrine therapy completion: INAVO120 phase III randomized trial additional analyses. *J Clin Oncol.* 2024;42(16 Suppl):abstract 1003. PMID: none
68. Kummel S, Jhaveri K, Im SA, et al. Inavolisib or placebo in combination with palbociclib and fulvestrant in patients with PIK3CA-mutated, hormone receptor-positive, HER2-negative locally advanced or metastatic breast cancer: phase III INAVO120 primary analysis. *Oncol Res Treat.* 2024;47(Suppl 1):227. PMID: none
  69. Kaufman B, Mackey JR, Clemens MR, et al. Trastuzumab plus anastrozole versus anastrozole alone for the treatment of postmenopausal women with human epidermal growth factor receptor 2-positive, hormone receptor-positive metastatic breast cancer: results from the randomized phase III TANDEM study. *J Clin Oncol.* 2009;27(33):5529-37. PMID: 19786670
  70. Johnston SRD, Hegg R, Im SA, et al. Phase III, randomized study of dual human epidermal growth factor receptor 2 (HER2) blockade with lapatinib plus trastuzumab in combination with an aromatase inhibitor in postmenopausal women with HER2-positive, hormone receptor-positive metastatic breast cancer: ALTERNATIVE. *J Clin Oncol.* 2018;36(8):741-8. PMID: 29244528
  71. Johnston SRD, Hegg R, Im SA, et al. Phase III, randomized study of dual human epidermal growth factor receptor 2 (HER2) blockade with lapatinib plus trastuzumab in combination with an aromatase inhibitor in postmenopausal women with HER2-positive, hormone receptor-positive metastatic breast cancer: updated results of ALTERNATIVE. *J Clin Oncol.* 2021;39(1):79-89. PMID: 32822287
  72. Tolane SM, Wardley AM, Zambelli S, et al. Abemaciclib plus trastuzumab with or without fulvestrant versus trastuzumab plus standard-of-care chemotherapy in women with hormone receptor-positive, HER2-positive advanced breast cancer (monarchHER): a randomised, open-label, phase 2 trial. *Lancet Oncol.* 2020;21(6):763-75. PMID: 32353342
  73. Burstein HJ, DeMichele A, Fallowfield L, et al. Endocrine and targeted therapy for hormone receptor-positive, human epidermal growth factor receptor 2-negative metastatic breast cancer-capivasertib-fulvestrant: ASCO rapid recommendation update. *J Clin Oncol.* 2024;42(12):1450-3. PMID: 38478799
  74. Dilawari A, Buturla J, Osgood C, et al. US Food and Drug Administration approval summary: capivasertib with fulvestrant for hormone receptor-positive, human epidermal growth factor receptor 2-negative locally advanced or metastatic breast cancer with PIK3CA/AKT1/PTEN alterations. *J Clin Oncol.* 2024;42(34):4103-13. PMID: 39159418
  75. Oliveira M, Rugo HS, Howell SJ, et al. Capivasertib and fulvestrant for patients with hormone receptor-positive, HER2-negative advanced breast cancer (CAPItello-291): patient-reported outcomes from a phase 3, randomised, double-blind, placebo-controlled trial. *Lancet Oncol.* 2024;25(9):1231-44. PMID: 39214106
  76. Shah M, Lingam H, Gao X, et al. US Food and Drug Administration approval summary: elacestrant for estrogen receptor-positive, human epidermal growth factor receptor 2-negative, ESR1-mutated advanced or metastatic breast cancer. *J Clin Oncol.* 2024;42(10):1193-201. PMID: 38381994
  77. Bidard FC, Kaklamani VG, Neven P, et al. Elacestrant (oral selective estrogen receptor degrader) versus standard endocrine therapy for estrogen receptor-positive, human epidermal growth factor receptor 2-negative advanced breast cancer: results from the randomized phase III EMERALD trial. *J Clin Oncol.* 2022;40(28):3246-56. PMID: 35584336
  78. Baselga J, Campone M, Piccart M, et al. Everolimus in postmenopausal hormone-receptor-positive advanced breast cancer. *N Engl J Med.* 2012;366(6):520-9. PMID: 22149876
  79. Wolff AC, Lazar AA, Bondarenko I, et al. Randomized phase III placebo-controlled trial of letrozole plus oral temsirolimus as first-line endocrine therapy in postmenopausal women with locally advanced or metastatic breast cancer. *J Clin Oncol.* 2013;31(2):195-202. PMID: 23233719
  80. Cristofanilli M, Rugo HS, Im SA, et al. Overall survival with palbociclib and fulvestrant in women with HR+/HER2- ABC: updated exploratory analyses of PALOMA-3, a double-blind, phase III randomized study. *Clin Cancer Res.* 2022;28(16):3433-42. PMID: 35552673
  81. Bachelot T, Bourgier C, Crochet C, et al. Randomized phase II trial of everolimus in combination with tamoxifen in patients with hormone receptor-positive, human epidermal growth factor receptor 2-negative metastatic breast cancer with prior exposure to aromatase inhibitors: a GINECO study. *J Clin Oncol.* 2012;30(22):2718-24. PMID: 22565002
  82. Leyland-Jones B, Regan MM, Bouzyk M, et al. Outcome according to CYP2D6 genotype among postmenopausal women with endocrine-responsive early invasive breast cancer randomized in the BIG 1-98 trial. *Cancer Res.* 2010;70(24 Suppl):abstract S1-8. PMID: none
  83. Kornblum N, Zhao F, Manola J, et al. Randomized phase II trial of fulvestrant plus everolimus or placebo in postmenopausal women with hormone receptor-positive, human epidermal growth factor receptor 2-negative metastatic breast cancer resistant to aromatase inhibitor therapy: results of PrE0102. *J Clin Oncol.* 2018;36(16):1556-63. PMID: 29664714
  84. Schmid P, Zaiss M, Harper-Wynne C, et al. MANTA - A randomized phase II study of fulvestrant in combination with the dual mTOR inhibitor AZD2014 or everolimus or fulvestrant alone in estrogen receptor-positive advanced or metastatic breast cancer. *Cancer Res.* 2018;78(4 Suppl):abstract GS2-07. PMID: none
  85. Damodaran S, O'Sullivan CC, Elkhany A, et al. Open-label, phase II, multicenter study of lasofoxifene plus abemaciclib for treating women with metastatic ER+/HER2- breast cancer and an ESR1 mutation after disease progression on prior therapies: ELAINE 2. *Ann Oncol.* 2023;34(12):1131-40. PMID: 38072513
  86. Jhaveri KL, Neven P, Casalnuovo ML, et al. Imlunestrant with or without abemaciclib in advanced breast cancer. *N Engl J Med.* 2024;[Epub ahead of print]. PMID: 39660834
  87. Beex L, Pieters G, Smals A, et al. Tamoxifen versus ethinyl estradiol in the treatment of postmenopausal women with advanced breast cancer. *Cancer Treat Rep.* 1981;65(3-4):179-85. PMID: 7237448

88. Westerberg H. Tamoxifen and fluoxymesterone in advanced breast cancer: a controlled clinical trial. *Cancer Treat Rep.* 1980;64(1):117-21. PMID: 6991101

## Biliary Tract Cancer (intra and extrahepatic cholangiocarcinoma) Pathway

### First Line of Therapy (1<sup>st</sup> Line)

- Unresectable, Metastatic, Recurrent Disease
    - Durvalumab (Imfinzi), gemcitabine (Gemzar), and cisplatin<sup>1</sup>
    - Pembrolizumab (Keytruda), gemcitabine (Gemzar), and cisplatin<sup>2,3</sup> – **Added 7/14/2025**
    - Gemcitabine (Gemzar) and cisplatin – **Termed 7/14/2025**
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# Biliary Tract Cancer (intra and extrahepatic cholangiocarcinoma) References

## NCCN Practice Guidelines: Biliary Tract Cancers Version 1.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Oh DY, He AR, Qin S, et al. Updated overall survival (OS) from the phase III TOPAZ-1 study of durvalumab (D) or placebo (PBO) plus gemcitabine and cisplatin (+ GC) in patients (pts) with advanced biliary tract cancer (BTC). Ann Oncol. 2022;33(Supp 7):S565-S6. PMID: none
2. Kelley RK, Ueno M, Yoo C, et al. Pembrolizumab in combination with gemcitabine and cisplatin compared with gemcitabine and cisplatin alone for patients with advanced biliary tract cancer (KEYNOTE-966): a randomised, double-blind, placebo-controlled, phase 3 trial. Lancet. 2023;401(10391):1853-65. PMID: 37075781
3. Finn RS, Ueno M, Yoo C, et al. Three-year follow-up data from KEYNOTE-966: pembrolizumab (pembro) plus gemcitabine and cisplatin (gem/cis) compared with gem/cis alone for patients (pts) with advanced biliary tract cancer (BTC). J Clin Oncol. 2024;42(16 Suppl):abstract 4093. PMID: none
4. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Biliary Tract Cancers (Version 1.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
5. Burris HA, 3rd, Okusaka T, Vogel A, et al. Durvalumab plus gemcitabine and cisplatin in advanced biliary tract cancer (TOPAZ-1): patient-reported outcomes from a randomised, double-blind, placebo-controlled, phase 3 trial. Lancet Oncol. 2024;25(5):626-35. PMID: 38697156
6. Oh DY, He AR, Bouattour M, et al. Durvalumab or placebo plus gemcitabine and cisplatin in participants with advanced biliary tract cancer (TOPAZ-1): updated overall survival from a randomised phase 3 study. Lancet Gastroenterol Hepatol. 2024;9(8):694-704. PMID: 38823398
7. Valle J, Wasan H, Palmer DH, et al. Cisplatin plus gemcitabine versus gemcitabine for biliary tract cancer. N Engl J Med. 2010;362(14):1273-81. PMID: 20375404
8. Okusaka T, Nakachi K, Fukutomi A, et al. Gemcitabine alone or in combination with cisplatin in patients with biliary tract cancer: a comparative multicentre study in Japan. British Journal of Cancer. 2010;103(4):469-74. PMID: 20628385
9. Doval DC, Sekhon JS, Gupta SK, et al. A phase II study of gemcitabine and cisplatin in chemotherapy-naïve, unresectable gall bladder cancer. British Journal of Cancer. 2004;90(8):1516-20. PMID: 15083178
10. Giuliani F, Gebbia V, Maiello E, et al. Gemcitabine and cisplatin for inoperable and/or metastatic biliary tree carcinomas: a multicenter phase II study of the Gruppo Oncologico dell'Italia Meridionale (GOIM). Ann Oncol. 2006;17 (Suppl 7):vii73-7. PMID: 16760299
11. Thongprasert S, Napapan S, Charoentum C, et al. Phase II study of gemcitabine and cisplatin as first-line chemotherapy in inoperable biliary tract carcinoma. Ann Oncol. 2005;16(2):279-81. PMID: 15668284
12. Meyerhardt JA, Zhu AX, Stuart K, et al. Phase-II study of gemcitabine and cisplatin in patients with metastatic biliary and gallbladder cancer. Dig Dis Sci. 2008;53(2):564-70. PMID: 17597402
13. Lee J, Kim TY, Lee MA, et al. Phase II trial of gemcitabine combined with cisplatin in patients with inoperable biliary tract carcinomas. Cancer Chemother Pharmacol. 2008;61(1):47-52. PMID: 17364190
14. Eckel F, Schmid RM. Chemotherapy in advanced biliary tract carcinoma: a pooled analysis of clinical trials. British Journal of Cancer. 2007;96(6):896-902. PMID: 17325704
15. Nehls O, Klump B, Arkenau HT, et al. Oxaliplatin, fluorouracil and leucovorin for advanced biliary system adenocarcinomas: a prospective phase II trial. British Journal of Cancer. 2002;87(7):702-4. PMID: 12232749
16. Nehls O, Oettle H, Hartmann JT, et al. Capecitabine plus oxaliplatin as first-line treatment in patients with advanced biliary system adenocarcinoma: a prospective multicentre phase II trial. British Journal of Cancer. 2008;98(2):309-15. PMID: 18182984
17. Kim ST, Kang JH, Lee J, et al. Capecitabine plus oxaliplatin versus gemcitabine plus oxaliplatin as first-line therapy for advanced biliary tract cancers: a multicenter, open-label, randomized, phase III, noninferiority trial. Ann Oncol. 2019;30(5):788-95. PMID: 30785198
18. Sahai V, Catalano PJ, Zalupski MM, et al. Nab-paclitaxel and gemcitabine as first-line treatment of advanced or metastatic cholangiocarcinoma: a phase 2 clinical trial. JAMA Oncol. 2018;4(12):1707-12. PMID: 30178032
19. Knox JJ, Hedley D, Ozs A, et al. Combining gemcitabine and capecitabine in patients with advanced biliary cancer: a phase II trial. J Clin Oncol. 2005;23(10):2332-8. PMID: 15800324
20. Riechelmann RP, Townsley CA, Chin SN, et al. Expanded phase II trial of gemcitabine and capecitabine for advanced biliary cancer. Cancer. 2007;110(6):1307-12. PMID: 17628484
21. Iqbal S, Rankin C, Lenz HJ, et al. A phase II trial of gemcitabine and capecitabine in patients with unresectable or metastatic gallbladder cancer or cholangiocarcinoma: Southwest Oncology Group study S0202. Cancer Chemother Pharmacol. 2011;68(6):1595-602. PMID: 21556747
22. Koeberle D, Saletti P, Borner M, et al. Patient-reported outcomes of patients with advanced biliary tract cancers receiving gemcitabine plus capecitabine: a multicenter, phase II trial of the Swiss Group for Clinical Cancer Research. J Clin Oncol. 2008;26(22):3702-8. PMID: 18669455
23. Sharma A, Dwary AD, Mohanti BK, et al. Best supportive care compared with chemotherapy for unresectable gall bladder cancer: a randomized controlled study. J Clin Oncol. 2010;28(30):4581-6. PMID: 20855823
24. Andre T, Tournigand C, Rosmorduc O, et al. Gemcitabine combined with oxaliplatin (GEMOX) in advanced biliary tract adenocarcinoma: a GERCOR study. Ann Oncol. 2004;15(9):1339-43. PMID: 15319238
25. Andre T, Reyes-Vidal JM, Fartoux L, et al. Gemcitabine and oxaliplatin in advanced biliary tract carcinoma: a phase II study. British Journal of Cancer. 2008;99(6):862-7. PMID: 19238628

26. Harder J, Riecken B, Kummer O, et al. Outpatient chemotherapy with gemcitabine and oxaliplatin in patients with biliary tract cancer. *British Journal of Cancer*. 2006;95(7):848-52. PMID: 16969352
27. Jang JS, Lim HY, Hwang IG, et al. Gemcitabine and oxaliplatin in patients with unresectable biliary cancer including gall bladder cancer: a Korean Cancer Study Group phase II trial. *Cancer Chemother Pharmacol*. 2010;65(4):641-7. PMID: 19652971
28. Kim HJ, Lee NS, Lee SC, et al. A phase II study of gemcitabine in combination with oxaliplatin as first-line chemotherapy in patients with inoperable biliary tract cancer. *Cancer Chemother Pharmacol*. 2009;64(2):371-7. PMID: 19142638
29. Ducreux M, Van Cutsem E, Van Laethem JL, et al. A randomised phase II trial of weekly high-dose 5-fluorouracil with and without folinic acid and cisplatin in patients with advanced biliary tract carcinoma: results of the 40955 EORTC trial. *Eur J Cancer*. 2005;41(3):398-403. PMID: 15691639
30. Patt YZ, Hassan MM, Aguayo A, et al. Oral capecitabine for the treatment of hepatocellular carcinoma, cholangiocarcinoma, and gallbladder carcinoma. *Cancer*. 2004;101(3):578-86. PMID: 15274071
31. Yonemoto N, Furuse J, Okusaka T, et al. A multi-center retrospective analysis of survival benefits of chemotherapy for unresectable biliary tract cancer. *Jpn J Clin Oncol*. 2007;37(11):843-51. PMID: 17942578
32. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med*. 2018;378(8):731-9. PMID: 29466156
33. Shroff RT, King G, Colby S, et al. SWOG S1815: a phase III randomized trial of gemcitabine, cisplatin, and nab-paclitaxel versus gemcitabine and cisplatin in newly diagnosed, advanced biliary tract cancers. *J Clin Oncol*. 2024;43(5):43(5):536-44. PMID: 39671534
34. Lamarca A, Palmer DH, Wasan HS, et al. ABC-06 , a randomised phase III, multi-centre, open-label study of active symptom control (ASC) alone or ASC with oxaliplatin / 5-FU chemotherapy (ASC+mFOLFOX) for patients (pts) with locally advanced / metastatic biliary tract cancers (ABC) previously-treated with cisplatin/gemcitabine (CisGem) chemotherapy. *J Clin Oncol*. 2019;37(15 Suppl):abstract 4003. PMID: none
35. He S, Shen J, Sun X, et al. A phase II FOLFOX-4 regimen as second-line treatment in advanced biliary tract cancer refractory to gemcitabine/cisplatin. *J Chemother*. 2014;26(4):243-7. PMID: 24070164
36. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science*. 2017;357(6349):409-13. PMID: 28596308
37. Marabelle A, Le DT, Ascierto PA, et al. Efficacy of pembrolizumab in patients with noncolorectal high microsatellite instability/mismatch repair-deficient cancer: results from the phase II KEYNOTE-158 study. *J Clin Oncol*. 2020;38(1):1-10. PMID: 31682550
38. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol*. 2020;21(2):271-82. PMID: 31838007
39. Abou-Alfa GK, Sahai V, Hollebecque A, et al. Pemigatinib for previously treated, locally advanced or metastatic cholangiocarcinoma: a multicentre, open-label, phase 2 study. *Lancet Oncol*. 2020;21(5):671-84. PMID: 32203698
40. Abou-Alfa GK, Macarulla T, Javle MM, et al. Ivosidenib in IDH1-mutant, chemotherapy-refractory cholangiocarcinoma (ClarIDHy): a multicentre, randomised, double-blind, placebo-controlled, phase 3 study. *Lancet Oncol*. 2020;21(6):796-807. PMID: 32416072
41. Subbiah V, Lassen U, Elez E, et al. Dabrafenib plus trametinib in patients with BRAFV600E-mutated biliary tract cancer (ROAR): a phase 2, open-label, single-arm, multicentre basket trial. *Lancet Oncol*. 2020;21(9):1234-43. PMID: 32818466
42. Salama AKS, Li S, Macrae ER, et al. Dabrafenib and trametinib in patients with tumors with BRAFV600E mutations: results of the NCI-MATCH trial subprotocol H. *J Clin Oncol*. 2020;38(33):3895-904. PMID: 32758030
43. Goyal L, Meric-Bernstam F, Hollebecque A, et al. Updated results of the FOENIX-CCA2 trial: efficacy and safety of futibatinib in intrahepatic cholangiocarcinoma (iCCA) harboring FGFR2 fusions/rearrangements. *J Clin Oncol*. 2022;40(16 Suppl):abstract 4009. PMID: none
44. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan in patients with HER2-expressing solid tumors: primary results from the DESTINY-PanTumor02 phase II trial. *J Clin Oncol*. 2024;42(1):47-58. PMID: 37870536
45. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2- expressing solid tumors: DESTINY-PanTumor02 (DP-02) interim results. *J Clin Oncol*. 2023;41(17 Suppl):abstract LBA3000. PMID: none
46. Harding JJ, Fan J, Oh DY, et al. Zanidatamab for HER2-amplified, unresectable, locally advanced or metastatic biliary tract cancer (HERIZON-BTC-01): a multicentre, single-arm, phase 2b study. *Lancet Oncol*. 2023;24(7):772-82. PMID: 37276871
47. Abdel-Rahman O, Elsayed Z, Elhalawani H. Gemcitabine-based chemotherapy for advanced biliary tract carcinomas. *Cochrane Database Syst Rev*. 2018(4):article no. CD011746. PMID: 29624208
48. Kobayashi K, Tsuji A, Morita S, et al. A phase II study of LFP therapy (5-FU (5-fluorourasyl) continuous infusion (CVI) and low-dose consecutive (Cisplatin) CDDP) in advanced biliary tract carcinoma. *BMC Cancer*. 2006;6(121):[10 p.]. PMID: 16677397
49. Kim TW, Chang HM, Kang HJ, et al. Phase II study of capecitabine plus cisplatin as first-line chemotherapy in advanced biliary cancer. *Ann Oncol*. 2003;14(7):1115-20. PMID: 12853355
50. Javle M, Roychowdhury S, Kelley RK, et al. Infigratinib (BGJ398) in previously treated patients with advanced or metastatic cholangiocarcinoma with FGFR2 fusions or rearrangements: mature results from a multicentre, open-label, single-arm, phase 2 study. *Lancet Gastroenterol Hepatol*. 2021;6(10):803-15. PMID: 34358484

## Chronic Lymphocytic Leukemia (CLL)/ Small Lymphocytic Lymphoma (SLL) Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- Requiring Initial Therapy
  - Any 17p/TP53 status
    - Acalabrutinib (Calquence)<sup>1-5</sup>
    - Ibrutinib (Imbruvica)<sup>6-12</sup>
    - Zanubrutinib (Brukinsa)<sup>13, 14</sup>
  - Without 17p Deletion AND Without TP53 Mutation
    - Venetoclax (Venclexta) and obinutuzumab (Gazyva)<sup>15, 16</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Recurrent / Relapsed Disease
  - Any 17p/TP53 status
    - Acalabrutinib (Calquence)<sup>1-5</sup>
    - Venetoclax (Venclexta) and rituximab<sup>17-22</sup>
    - Zanubrutinib (Brukinsa)<sup>23-25</sup>

# Chronic Lymphocytic Leukemia (CLL) / Small Lymphocytic Lymphoma (SLL) References

## NCCN Practice Guidelines: Chronic Lymphocytic Leukemia / Small Lymphocytic Lymphoma V3.2024

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1. Awan FT, Schuh A, Brown JR, et al. Acalabrutinib monotherapy in patients with chronic lymphocytic leukemia who are intolerant to ibrutinib. *Blood Adv.* 2019;3(9):1553-62. PMID: 31088809
2. Byrd JC, Harrington B, O'Brien S, et al. Acalabrutinib (ACP-196) in Relapsed Chronic Lymphocytic Leukemia. *N Engl J Med.* 2016;374(4):323-32. PMID: 26641137
3. Byrd JC, Wierda WG, Schuh A, et al. Acalabrutinib monotherapy in patients with relapsed/refractory chronic lymphocytic leukemia: updated phase 2 results. *Blood.* 2020;135(15):1204-13. PMID: 31876911
4. Byrd JC, Wierda WG, Schuh A, et al. Acalabrutinib monotherapy in patients with relapsed/refractory chronic lymphocytic leukemia: updated results from the phase 1/2 ACE-CL-001 study. *Blood.* 2017;130(1):498. PMID: none
5. Ghia P, Pluta A, Wach M, et al. ASCEND: phase III, randomized trial of acalabrutinib versus idelalisib plus rituximab or bendamustine plus rituximab in relapsed or refractory chronic lymphocytic leukemia. *J Clin Oncol.* 2020;38(25):2849-61. PMID: 32459600
6. Barr PM, Robak T, Owen C, et al. Sustained efficacy and detailed clinical follow-up of first-line ibrutinib treatment in older patients with chronic lymphocytic leukemia: extended phase 3 results from RESONATE-2. *Haematologica.* 2018;103(9):1502-10. PMID: 29880603
7. Burger JA, Barr PM, Robak T, et al. Long-term efficacy and safety of first-line ibrutinib treatment for patients with CLL/SLL: 5 years of follow-up from the phase 3 RESONATE-2 study. *Leukemia.* 2020;34(3):787-98. PMID: 31628428
8. Burger JA, Tedeschi A, Barr PM, et al. Ibrutinib as initial therapy for patients with chronic lymphocytic leukemia. *N Engl J Med.* 2015;373(25):2425-37. PMID: 26639149
9. Byrd JC, Brown JR, O'Brien S, et al. Ibrutinib versus ofatumumab in previously treated chronic lymphoid leukemia. *N Engl J Med.* 2014;371(3):213-23. PMID: 24881631
10. Byrd JC, Furman RR, Coutre SE, et al. Three-year follow-up of treatment-naïve and previously treated patients with CLL and SLL receiving single-agent ibrutinib. *Blood.* 2015;125(16):2497-506. PMID: 25700432
11. Woyach JA, Ruppert AS, Heerema NA, et al. Ibrutinib regimens versus chemoimmunotherapy in older patients with untreated CLL. *N Engl J Med.* 2018;379(26):2517-28. PMID: 30501481
12. Sivina M, Kim E, Wierda WG, et al. Ibrutinib induces durable remissions in treatment-naïve patients with CLL and 17p deletion and/or TP53 mutations. *Blood.* 2021;138(24):2589-92. PMID: 34521099
13. Tam CS, Robak T, Ghia P, et al. Zanubrutinib monotherapy for patients with treatment naïve chronic lymphocytic leukemia and 17p deletion. *Haematologica.* 2020;106(9):2354-63. PMID: 33054121
14. Tam CS, Brown JR, Kahl BS, et al. Zanubrutinib versus bendamustine and rituximab in untreated chronic lymphocytic leukaemia and small lymphocytic lymphoma (SEQUOIA): a randomised, controlled, phase 3 trial. *Lancet Oncol.* 2022;23(8):1031-43. PMID: 35810754
15. Fischer K, Al-Sawaf O, Bahlo J, et al. Venetoclax and obinutuzumab in patients with CLL and coexisting conditions. *N Engl J Med.* 2019;380(23):2225-36. PMID: 31166681
16. Al-Sawaf O, Zhang C, Tandon M, et al. Venetoclax plus obinutuzumab versus chlorambucil plus obinutuzumab for previously untreated chronic lymphocytic leukaemia (CLL14): follow-up results from a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2020;21(9):1188-200. PMID: 32888452
17. Hallek M, Cheson BD, Catovsky D, et al. iwCLL guidelines for diagnosis, indications for treatment, response assessment, and supportive management of CLL. *Blood.* 2018;131(25):2745-60. PMID: 29540348
18. Kater AP, Kipps TJ, Eichhorst B, et al. Five-year analysis of murano study demonstrates enduring undetectable minimal residual disease (UMRD) in a subset of relapsed/refractory chronic lymphocytic leukemia (r/r CLL) patients (PTS) following fixed-duration venetoclax-rituximab (VENR) therapy (TX). *Blood.* 2020;136 (Suppl 1):19-21. PMID: none
19. Kater AP, Seymour JF, Hillmen P, et al. Fixed duration of venetoclax-rituximab in relapsed/refractory chronic lymphocytic leukemia eradicates minimal residual disease and prolongs survival: post-treatment follow-up of the MURANO phase III study. *J Clin Oncol.* 2019;37(4):269-77. PMID: 30523712
20. Kater AP, Wu JQ, Kipps T, et al. Venetoclax plus rituximab in relapsed chronic lymphocytic leukemia: 4-year results and evaluation of impact of genomic complexity and gene mutations from the MURANO phase III study. *J Clin Oncol.* 2020;38(34):4042-54. PMID: 32986498
21. Seymour JF, Kipps TJ, Eichhorst B, et al. Venetoclax-rituximab in relapsed or refractory chronic lymphocytic leukemia. *N Engl J Med.* 2018;378(12):1107-20. PMID: 29562156
22. Seymour JF, Ma S, Brander DM, et al. Venetoclax plus rituximab in relapsed or refractory chronic lymphocytic leukaemia: a phase 1b study. *Lancet Oncol.* 2017;18(2):230-40. PMID: 28089635
23. Xu W, Yang S, Zhou K, et al. Treatment of relapsed/refractory chronic lymphocytic leukemia/small lymphocytic lymphoma with the BTK inhibitor zanubrutinib: phase 2, single-arm, multicenter study. *J Hematol Oncol.* 2020;13(1):48. PMID: 32393328
24. Brown JR, Eichhorst B, Hillmen P, et al. Zanubrutinib or ibrutinib in relapsed or refractory chronic lymphocytic leukemia. *N Engl J Med.* 2023;388(4):319-32. PMID: 36511784
25. Hillmen P, Eichhorst B, Brown JR, et al. Zanubrutinib versus ibrutinib in relapsed/refractory chronic lymphocytic leukemia and small lymphocytic lymphoma: interim analysis of a randomized phase III trial. *J Clin Oncol.* 2023;41(5):1035-45. PMID: 36395435

26. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma (Version 3.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
27. Eichhorst B, Fink AM, Busch R, et al. Frontline chemoimmunotherapy with fludarabine (F), cyclophosphamide (C), and rituximab (R) (FCR) shows superior efficacy in comparison to bendamustine (B) and rituximab (BR) in previously untreated and physically fit patients (pts) with advanced chronic lymphocytic leukemia (CLL): Final analysis of an international, randomized study of the german cll study group (GCLLSG) (CLL10 Study). *Blood*. 2014;124(21):19. PMID: none
28. Eichhorst B, Fink AM, Bahlo J, et al. First-line chemoimmunotherapy with bendamustine and rituximab versus fludarabine, cyclophosphamide, and rituximab in patients with advanced chronic lymphocytic leukaemia (CLL10): an international, open-label, randomised, phase 3, non-inferiority trial. *Lancet Oncol*. 2016;17(7):928-42. PMID: 27216274
29. Fischer K, Cramer P, Busch R, et al. Bendamustine in combination with rituximab for previously untreated patients with chronic lymphocytic leukemia: a multicenter phase II trial of the German Chronic Lymphocytic Leukemia Study Group. *J Clin Oncol*. 2012;30(26):3209-16. PMID: 22869884
30. Hallek M, Fischer K, Fingerle-Rowson G, et al. Addition of rituximab to fludarabine and cyclophosphamide in patients with chronic lymphocytic leukaemia: a randomised, open-label, phase 3 trial. *Lancet*. 2010;376(9747):1164-74. PMID: 20888994
31. Fischer K, Bahlo J, Fink AM, et al. Long-term remissions after FCR chemoimmunotherapy in previously untreated patients with CLL: updated results of the CLL8 trial. *Blood*. 2016;127(2):208-15. PMID: 26486789
32. Faderl S, Thomas DA, O'Brien S, et al. Experience with alemtuzumab plus rituximab in patients with relapsed and refractory lymphoid malignancies. *Blood*. 2003;101(9):3413-5. PMID: 12522009
33. Bowen DA, Call TG, Jenkins GD, et al. Methylprednisolone-rituximab is an effective salvage therapy for patients with relapsed chronic lymphocytic leukemia including those with unfavorable cytogenetic features. *Leuk Lymphoma*. 2007;48(12):2412-7. PMID: 18067017
34. Gopal AK, Kahl BS, de Vos S, et al. PI3Kdelta inhibition by idelalisib in patients with relapsed indolent lymphoma. *N Engl J Med*. 2014;370(11):1008-18. PMID: 24450858
35. Badoux XC, Keating MJ, Wen S, et al. Phase II study of lenalidomide and rituximab as salvage therapy for patients with relapsed or refractory chronic lymphocytic leukemia. *J Clin Oncol*. 2013;31(5):584-91. PMID: 23270003
36. Stilgenbauer S, Eichhorst B, Schetelig J, et al. Venetoclax in relapsed or refractory chronic lymphocytic leukaemia with 17p deletion: a multicentre, open-label, phase 2 study. *Lancet Oncol*. 2016;17(6):768-78. PMID: 27178240
37. Michallet AS, Aktan M, Hiddemann W, et al. Rituximab plus bendamustine or chlorambucil for chronic lymphocytic leukemia: primary analysis of the randomized, open-label MABLE study. *Haematologica*. 2018;103(4):698-706. PMID: 29419437
38. Robinson KS, Williams ME, van der Jagt RH, et al. Phase II multicenter study of bendamustine plus rituximab in patients with relapsed indolent B-cell and mantle cell non-Hodgkin's lymphoma. *J Clin Oncol*. 2008;26(27):4473-9. PMID: 18626004
39. Byrd JC, Furman RR, Coutre SE, et al. Targeting BTK with ibrutinib in relapsed chronic lymphocytic leukemia. *N Engl J Med*. 2013;369(1):32-42. PMID: 23782158
40. Carton G, de Guibert S, Dilhuyd MS, et al. Obinutuzumab (GA101) in relapsed/refractory chronic lymphocytic leukemia: final data from the phase 1/2 GAUGUIN study. *Blood*. 2014;124(14):2196-202. PMID: 25143487
41. Sharman JP, Egedy M, Jurczak W, et al. Acalabrutinib with or without obinutuzumab versus chlorambucil and obinutuzumab for treatment-naïve chronic lymphocytic leukaemia (ELEVATE TN): a randomised, controlled, phase 3 trial. *Lancet*. 2020;395(10232):1278-91. PMID: 32305093
42. Castro JE, James DF, Sandoval-Sus JD, et al. Rituximab in combination with high-dose methylprednisolone for the treatment of chronic lymphocytic leukemia. *Leukemia*. 2009;23(10):1779-89. PMID: 19693094
43. Goede V, Fischer K, Busch R, et al. Obinutuzumab plus chlorambucil in patients with CLL and coexisting conditions. *N Engl J Med*. 2014;370(12):1101-10. PMID: 24401022
44. Byrd JC, Flynn JM, Kipps TJ, et al. Randomized phase 2 study of obinutuzumab monotherapy in symptomatic, previously untreated chronic lymphocytic leukemia. *Blood*. 2016;127(1):79-86. PMID: 26472752
45. Al-Sawaf O, Zhang C, Lu T, et al. Minimal residual disease dynamics after venetoclax-obinutuzumab treatment: extended off-treatment follow-up from the randomized CLL14 study. *J Clin Oncol*. 2021;39(36):4049-60. PMID: 34709929
46. Sharman JP, Burke JM, Yimer HA, et al. Final results from the multicenter, open-label, phase II GIBB study of obinutuzumab+bendamustine in previously untreated patients with chronic lymphocytic leukemia. *Blood*. 2019;134(Suppl 1):4317. PMID: none
47. Stilgenbauer S, Leblond V, Foa R, et al. Obinutuzumab plus bendamustine in previously untreated patients with CLL: a subgroup analysis of the GREEN study. *Leukemia*. 2018;32(8):1778-86. PMID: 29749403
48. Knauf WU, Lissitchkov T, Aldaoud A, et al. Bendamustine compared with chlorambucil in previously untreated patients with chronic lymphocytic leukaemia: updated results of a randomized phase III trial. *Br J Haematol*. 2012;159(1):67-77. PMID: 22861163
49. Keating MJ, O'Brien S, Albitar M, et al. Early results of a chemoimmunotherapy regimen of fludarabine, cyclophosphamide, and rituximab as initial therapy for chronic lymphocytic leukemia. *J Clin Oncol*. 2005;23(18):4079-88. PMID: 15767648
50. Thompson PA, Tam CS, O'Brien SM, et al. Fludarabine, cyclophosphamide, and rituximab treatment achieves long-term disease-free survival in IGHV-mutated chronic lymphocytic leukemia. *Blood*. 2016;127(3):303-9. PMID: 26492934
51. Shanafelt TD, Wang XV, Kay NE, et al. Ibrutinib-rituximab or chemoimmunotherapy for chronic lymphocytic leukemia. *N Engl J Med*. 2019;381(5):432-43. PMID: 31365801
52. Goede V, Fischer K, Engelke A, et al. Obinutuzumab as frontline treatment of chronic lymphocytic leukemia: updated results of the CLL11 study. *Leukemia*. 2015;29(7):1602-4. PMID: 25634683
53. Stilgenbauer S, Zenz T, Winkler D, et al. Subcutaneous alemtuzumab in fludarabine-refractory chronic lymphocytic leukemia: clinical results and prognostic marker analyses from the CLL2H study of the German Chronic Lymphocytic Leukemia Study Group. *J Clin Oncol*. 2009;27(24):3994-4001. PMID: 19597025
54. Lozanski G, Heerema NA, Flinn IW, et al. Alemtuzumab is an effective therapy for chronic lymphocytic leukemia with p53 mutations and deletions. *Blood*. 2004;103(9):3278-81. PMID: 14726385
55. Faderl S, Ferrajoli A, Wierda W, et al. Alemtuzumab by continuous intravenous infusion followed by subcutaneous injection plus rituximab in the treatment of patients with chronic lymphocytic leukemia recurrence. *Cancer*. 2010;116(10):2360-5. PMID: 20225334
56. Flinn IW, Hillmen P, Montillo M, et al. The phase 3 DUO trial: duvelisib versus ofatumumab in relapsed and refractory CLL/SLL. *Blood*. 2018;132(23):2446-55. PMID: 30287523
57. Davids MS, Kuss BJ, Hillmen P, et al. The efficacy and safety of duvelisib following disease progression on ofatumumab in patients with relapsed/refractory CLL or SLL: updated results from the DUO crossover extension study. *Blood*. 2018;132(Suppl 1):3140. PMID: none
58. Davids MS, Kuss BJ, Hillmen P, et al. Efficacy and safety of duvelisib following disease progression on ofatumumab in patients with relapsed/refractory CLL or SLL in the DUO crossover extension study. *Clin Cancer Res*. 2020;26(9):2096-103. PMID: 31964785

59. Flinn IW, Miller CB, Ardeshta KM, et al. DYNAMO: a phase II study of duvelisib (IPI-145) in patients with refractory indolent non-Hodgkin lymphoma. *J Clin Oncol.* 2019;37(11):912-22. PMID: 30742566
60. Benjamin DJ, Prasad V. PI3K inhibitors in haematological malignancies. *Lancet Oncol.* 2022;23(8):e362-e3. PMID: 35901824
61. Richardson NC, Kasamon Y, Pazdur R, et al. The saga of PI3K inhibitors in haematological malignancies: survival is the ultimate safety endpoint. *Lancet Oncol.* 2022;23(5):563-6. PMID: 35429996
62. Thornton PD, Matutes E, Bosanquet AG, et al. High dose methylprednisolone can induce remissions in CLL patients with p53 abnormalities. *Ann Hematol.* 2003;82(12):759-65. PMID: 14551737
63. Byrd JC, Hillmen P, Ghia P, et al. Acalabrutinib versus ibrutinib in previously treated chronic lymphocytic leukemia: results of the first randomized phase III trial. *J Clin Oncol.* 2021;39(31):3441-52. PMID: 34310172
64. O'Brien S, Jones JA, Coutre SE, et al. Ibrutinib for patients with relapsed or refractory chronic lymphocytic leukaemia with 17p deletion (RESONATE-17): a phase 2, open-label, multicentre study. *Lancet Oncol.* 2016;17(10):1409-18. PMID: 27637985
65. Brown JR, Hillmen P, O'Brien S, et al. Extended follow-up and impact of high-risk prognostic factors from the phase 3 RESONATE study in patients with previously treated CLL/SLL. *Leukemia.* 2018;32(1):83-91. PMID: 28592889
66. Byrd JC, Hillmen P, O'Brien S, et al. Long-term follow-up of the RESONATE phase 3 trial of ibrutinib vs ofatumumab. *Blood.* 2019;133(19):2031-42. PMID: 30842083
67. Munir T, Brown JR, O'Brien S, et al. Final analysis from RESONATE: Up to six years of follow-up on ibrutinib in patients with previously treated chronic lymphocytic leukemia or small lymphocytic lymphoma. *Am J Hematol.* 2019;94(12):1353-63. PMID: 31512258
68. Furman RR, Sharman JP, Coutre SE, et al. Idelalisib and rituximab in relapsed chronic lymphocytic leukemia. *N Engl J Med.* 2014;370(11):997-1007. PMID: 24450857
69. Sharman JP, Coutre SE, Furman RR, et al. Final results of a randomized, phase III study of rituximab with or without idelalisib followed by open-label idelalisib in patients with relapsed chronic lymphocytic leukemia. *J Clin Oncol.* 2019;37(16):1391-402. PMID: 30995176
70. Ferrajoli A, Lee BN, Schlette EJ, et al. Lenalidomide induces complete and partial remissions in patients with relapsed and refractory chronic lymphocytic leukemia. *Blood.* 2008;111(11):5291-7. PMID: 18334676
71. Chanan-Khan A, Miller KC, Musial L, et al. Clinical efficacy of lenalidomide in patients with relapsed or refractory chronic lymphocytic leukemia: results of a phase II study. *J Clin Oncol.* 2006;24(34):5343-9. PMID: 17088571
72. Roberts AW, Davids MS, Pagel JM, et al. Targeting BCL2 with Venetoclax in Relapsed Chronic Lymphocytic Leukemia. *N Engl J Med.* 2016;374(4):311-22. PMID: 26639348
73. Stilgenbauer S, Eichhorst B, Schetelig J, et al. Venetoclax for patients with chronic lymphocytic leukemia with 17p deletion: results from the full population of a phase II pivotal trial. *J Clin Oncol.* 2018;36(19):1973-80. PMID: 29715056
74. Coutre S, Choi M, Furman RR, et al. Venetoclax for patients with chronic lymphocytic leukemia who progressed during or after idelalisib therapy. *Blood.* 2018;131(15):1704-11. PMID: 29305552
75. Jones JA, Mato AR, Wierda WG, et al. Venetoclax for chronic lymphocytic leukaemia progressing after ibrutinib: an interim analysis of a multicentre, open-label, phase 2 trial. *Lancet Oncol.* 2018;19(1):65-75. PMID: 29246803
76. Fraser G, Cramer P, Demirkiran F, et al. Updated results from the phase 3 HELIOS study of ibrutinib, bendamustine, and rituximab in relapsed chronic lymphocytic leukemia/small lymphocytic lymphoma. *Leukemia.* 2019;33(4):969-80. PMID: 30315239
77. Fischer K, Cramer P, Busch R, et al. Bendamustine combined with rituximab in patients with relapsed and/or refractory chronic lymphocytic leukemia: a multicenter phase II trial of the German Chronic Lymphocytic Leukemia Study Group. *J Clin Oncol.* 2011;29(26):3559-66. PMID: 21844497
78. Robak T, Dmoszynska A, Solal-Celigny P, et al. Rituximab plus fludarabine and cyclophosphamide prolongs progression-free survival compared with fludarabine and cyclophosphamide alone in previously treated chronic lymphocytic leukemia. *J Clin Oncol.* 2010;28(10):1756-65. PMID: 20194844
79. Wierda W, O'Brien S, Wen S, et al. Chemoimmunotherapy with fludarabine, cyclophosphamide, and rituximab for relapsed and refractory chronic lymphocytic leukemia. *J Clin Oncol.* 2005;23(18):4070-8. PMID: 15767647
80. Badoux XC, Keating MJ, Wang X, et al. Fludarabine, cyclophosphamide, and rituximab chemoimmunotherapy is highly effective treatment for relapsed patients with CLL. *Blood.* 2011;117(11):3016-24. PMID: 21245487
81. Burger JA, Sivina M, Jain N, et al. Randomized trial of ibrutinib vs ibrutinib plus rituximab in patients with chronic lymphocytic leukemia. *Blood.* 2019;133(10):1011-9. PMID: 30530801
82. Fink AM, Bahlo J, Robrecht S, et al. Lenalidomide maintenance after first-line therapy for high-risk chronic lymphocytic leukaemia (CLLM1): final results from a randomised, double-blind, phase 3 study. *Lancet Haematol.* 2017;4(10):e475-e86. PMID: 28916311
83. Chanan-Khan AA, Zaritsky A, Egyed M, et al. Lenalidomide maintenance therapy in previously treated chronic lymphocytic leukaemia (CONTINUUM): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Haematol.* 2017;4(11):e534-e43. PMID: 28958469
84. Foon KA, Boyiadzis M, Land SR, et al. Chemoimmunotherapy with low-dose fludarabine and cyclophosphamide and high dose rituximab in previously untreated patients with chronic lymphocytic leukemia. *J Clin Oncol.* 2009;27(4):498-503. PMID: 19075274
85. Mato AR, Woyach JA, Brown JR, et al. Pirtobrutinib after a covalent BTK inhibitor in chronic lymphocytic leukemia. *N Engl J Med.* 2023;389(1):33-44. PMID: 37407001
86. Czuczzman MS, Koryzna A, Mohr A, et al. Rituximab in combination with fludarabine chemotherapy in low-grade or follicular lymphoma. *J Clin Oncol.* 2005;23(4):694-704. PMID: 15681517
87. Greil R, Obritlikova P, Smolej L, et al. Rituximab maintenance versus observation alone in patients with chronic lymphocytic leukaemia who respond to first-line or second-line rituximab-containing chemoimmunotherapy: final results of the AGMT CLL-8a Maintenance randomised trial. *Lancet Haematol.* 2016;3(7):e317-29. PMID: 27374465
88. Munir T, Howard DR, McParland L, et al. Results of the randomized phase IIB ADMIRE trial of FCR with or without mitoxantrone in previously untreated CLL. *Leukemia.* 2017;31(10):2085-93. PMID: 28216660
89. Jain N, Keating M, Thompson P, et al. Ibrutinib and venetoclax for first-line treatment of CLL. *N Engl J Med.* 2019;380(22):2095-103. PMID: 31141631
90. Jain N, Keating M, Thompson P, et al. Ibrutinib plus venetoclax for first-line treatment of chronic lymphocytic leukemia: a nonrandomized phase 2 trial. *JAMA Oncol.* 2021;7(8):1213-9. PMID: 34110383
91. Hillmen P, Skotnicki AB, Robak T, et al. Alemtuzumab compared with chlorambucil as first-line therapy for chronic lymphocytic leukemia. *J Clin Oncol.* 2007;25(35):5616-23. PMID: 17984186
92. Keating MJ, Flinn I, Jain V, et al. Therapeutic role of alemtuzumab (Campath-1H) in patients who have failed fludarabine: results of a large international study. *Blood.* 2002;99(10):3554-61. PMID: 11986207
93. Friedberg JW, Cohen P, Chen L, et al. Bendamustine in patients with rituximab-refractory indolent and transformed non-Hodgkin's lymphoma: results from a phase II multicenter, single-agent study. *J Clin Oncol.* 2008;26(2):204-10. PMID: 18182663

94. Eichhorst BF, Busch R, Stilgenbauer S, et al. First-line therapy with fludarabine compared with chlorambucil does not result in a major benefit for elderly patients with advanced chronic lymphocytic leukemia. *Blood*. 2009;114(16):3382-91. PMID: 19605849
95. Lamanna N, Kalaycio M, Maslak P, et al. Pentostatin, cyclophosphamide, and rituximab is an active, well-tolerated regimen for patients with previously treated chronic lymphocytic leukemia. *J Clin Oncol*. 2006;24(10):1575-81. PMID: 16520464
96. Raphael B, Andersen JW, Silber R, et al. Comparison of chlorambucil and prednisone versus cyclophosphamide, vincristine, and prednisone as initial treatment for chronic lymphocytic leukemia: long-term follow-up of an Eastern Cooperative Oncology Group randomized clinical trial. *J Clin Oncol*. 1991;9(5):770-6. PMID: 2016618
97. U.S. Food & Drug Administration (FDA). ARZERRA® (ofatumumab) injection, for intravenous use 2009 [revised 2016 Aug]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2016/125326s063lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2016/125326s063lbl.pdf).
98. Hillmen P, Robak T, Janssens A, et al. Chlorambucil plus ofatumumab versus chlorambucil alone in previously untreated patients with chronic lymphocytic leukaemia (COMPLEMENT 1): a randomised, multicentre, open-label phase 3 trial. *Lancet*. 2015;385(9980):1873-83. PMID: 25882396
99. Hillmen P, Gribben JG, Follows GA, et al. Rituximab plus chlorambucil as first-line treatment for chronic lymphocytic leukemia: Final analysis of an open-label phase II study. *J Clin Oncol*. 2014;32(12):1236-41. PMID: 24638012
100. Foa R, Del Giudice I, Cuneo A, et al. Chlorambucil plus rituximab with or without maintenance rituximab as first-line treatment for elderly chronic lymphocytic leukemia patients. *Am J Hematol*. 2014;89(5):480-6. PMID: 24415640
101. Flinn IW, Panayiotidis P, Afanasyev B, et al. A phase 2, multicenter study investigating ofatumumab and bendamustine combination in patients with untreated or relapsed CLL. *Am J Hematol*. 2016;91(9):900-6. PMID: 27222473
102. Byrd JC, Peterson BL, Morrison VA, et al. Randomized phase 2 study of fludarabine with concurrent versus sequential treatment with rituximab in symptomatic, untreated patients with B-cell chronic lymphocytic leukemia: results from Cancer and Leukemia Group B 9712 (CALGB 9712). *Blood*. 2003;101(1):6-14. PMID: 12393429
103. Woyach JA, Ruppert AS, Heerema NA, et al. Chemoimmunotherapy with fludarabine and rituximab produces extended overall survival and progression-free survival in chronic lymphocytic leukemia: long-term follow-up of CALGB study 9712. *J Clin Oncol*. 2011;29(10):1349-55. PMID: 21321292
104. Wierda WG, Kipps TJ, Mayer J, et al. Ofatumumab as single-agent CD20 immunotherapy in fludarabine-refractory chronic lymphocytic leukemia. *J Clin Oncol*. 2010;28(10):1749-55. PMID: 20194866
105. Jones JA, Robak T, Brown JR, et al. Efficacy and safety of idelalisib in combination with ofatumumab for previously treated chronic lymphocytic leukaemia: an open-label, randomised phase 3 trial. *Lancet Haematol*. 2017;4(3):e114-e26. PMID: 28257752
106. Robak T, Warzocha K, Govind Babu K, et al. Ofatumumab plus fludarabine and cyclophosphamide in relapsed chronic lymphocytic leukemia: results from the COMPLEMENT 2 trial. *Leuk Lymphoma*. 2017;58(5):1084-93. PMID: 27731748
107. Tsimerman AM, Wierda WG, Plunkett W, et al. Phase I-II study of oxaliplatin, fludarabine, cytarabine, and rituximab combination therapy in patients with Richter's syndrome or fludarabine-refractory chronic lymphocytic leukemia. *J Clin Oncol*. 2008;26(2):196-203. PMID: 18182662
108. Coiffier B, Lepretre S, Pedersen LM, et al. Safety and efficacy of ofatumumab, a fully human monoclonal anti-CD20 antibody, in patients with relapsed or refractory B-cell chronic lymphocytic leukemia: a phase 1-2 study. *Blood*. 2008;111(3):1094-100. PMID: 18003886
109. van Oers MH, Kuliczkowski K, Smolej L, et al. Ofatumumab maintenance versus observation in relapsed chronic lymphocytic leukaemia (PROLONG): an open-label, multicentre, randomised phase 3 study. *Lancet Oncol*. 2015;16(13):1370-9. PMID: 26377300
110. Elter T, Borchmann P, Schulz H, et al. Fludarabine in combination with alemtuzumab is effective and feasible in patients with relapsed or refractory B-cell chronic lymphocytic leukemia: results of a phase II trial. *J Clin Oncol*. 2005;23(28):7024-31. PMID: 16145065
111. Kay NE, Geyer SM, Call TG, et al. Combination chemoimmunotherapy with pentostatin, cyclophosphamide, and rituximab shows significant clinical activity with low accompanying toxicity in previously untreated B chronic lymphocytic leukemia. *Blood*. 2007;109(2):405-11. PMID: 17008537
112. Knauf WU, Lissichkov T, Alaaoud A, et al. Phase III randomized study of bendamustine compared with chlorambucil in previously untreated patients with chronic lymphocytic leukemia. *J Clin Oncol*. 2009;27(26):4378-84. PMID: 19652068

## Chronic Phase Chronic Myelogenous Leukemia (CP-CML) Pathways

### New Diagnosis of CML

- Low, Intermediate, or High-Risk Disease\*
  - Imatinib (Gleevec)<sup>1-13</sup>
- Intermediate or High-Risk Disease\*
  - Dasatinib (Sprycel)<sup>8, 9, 12, 14-16</sup>
  - Nilotinib (Tasigna)<sup>10, 11, 13, 17-19</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Resistant disease to primary treatment, Suboptimal Response<sup>†</sup>, or Intolerance to 1<sup>st</sup> Line
  - Bosutinib (Bosulif)<sup>6, 20, 21</sup>
  - Dasatinib (Sprycel)<sup>9, 22-26</sup>
  - Nilotinib (Tasigna)<sup>18, 19, 27-30</sup>
- Presence of T315I mutation
  - Ponatinib (Iclusig)<sup>31, 32</sup>

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\* For patients with intermediate or high-risk disease based on Sokal or Hasford score:

**Sokal:** Intermediate Risk=0.8-1.2; High Risk>1.2

**Hasford:** Intermediate Risk=781-1480; High Risk>1480

† Defined as lack of complete hematologic response or BCR-ABL1 transcripts > 10% (IS) or lack of partial cytogenetic response on bone marrow cytogenetics.

# Chronic Myelogenous Leukemia- Chronic Phase References

## NCCN Clinical Practice Guidelines: Chronic Myeloid Leukemia. Version 3.2025

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1. Brummendorf TH, Cortes JE, de Souza CA, et al. Bosutinib versus imatinib in newly diagnosed chronic-phase chronic myeloid leukaemia: results from the 24-month follow-up of the BELA trial. *Br J Haematol.* 2015;168(1):69-81. PMID: 25196702
2. Cortes J, Hochhaus A, Hughes T, et al. Front-line and salvage therapies with tyrosine kinase inhibitors and other treatments in chronic myeloid leukemia. *J Clin Oncol.* 2011;29(5):524-31. PMID: 21220597
3. Deininger M, O'Brien SG, Guilhot F, et al. International randomized study of interferon vs ST1571 (IRIS) 8-year follow up: sustained survival and low risk for progression or events in patients with newly diagnosed chronic myeloid leukemia in chronic phase (CML-CP) treated with imatinib. *Blood.* 2009;114(22):abstract 1126. PMID: 70248424
4. Deininger MW, Kopecky KJ, Radich JP, et al. Imatinib 800 mg daily induces deeper molecular responses than imatinib 400 mg daily: results of SWOG S0325, an intergroup randomized PHASE II trial in newly diagnosed chronic phase chronic myeloid leukaemia. *Br J Haematol.* 2014;164(2):223-32. PMID: 24383843
5. Druker BJ, Guilhot F, O'Brien SG, et al. Five-year follow-up of patients receiving imatinib for chronic myeloid leukemia. *N Engl J Med.* 2006;355(23):2408-17. PMID: 17151364
6. Gambacorti-Passerini C, Cortes JE, Lipton JH, et al. Safety of bosutinib versus imatinib in the phase 3 BELA trial in newly diagnosed chronic phase chronic myeloid leukemia. *Am J Hematol.* 2014;89(10):947-53. PMID: 24944159
7. Hochhaus A, Larson RA, Guilhot F, et al. Long-term outcomes of imatinib treatment for chronic myeloid leukemia. *N Engl J Med.* 2017;376(10):917-27. PMID: 28273028
8. Jabbour E, Kantarjian HM, Saglio G, et al. Early response with dasatinib or imatinib in chronic myeloid leukemia: 3-year follow-up from a randomized phase 3 trial (DASISION). *Blood.* 2014;123(4):494-500. PMID: 24311723
9. Kantarjian H, Shah NP, Hochhaus A, et al. Dasatinib versus imatinib in newly diagnosed chronic-phase chronic myeloid leukemia. *N Engl J Med.* 2010;362(24):2260-70. PMID: 20525995
10. Kantarjian HM, Hochhaus A, Saglio G, et al. Nilotinib versus imatinib for the treatment of patients with newly diagnosed chronic phase, Philadelphia chromosome-positive, chronic myeloid leukaemia: 24-month minimum follow-up of the phase 3 randomised ENESTnd trial. *Lancet Oncol.* 2011;12(9):841-51. PMID: 21856226
11. Larson RA, Hochhaus A, Saglio G, et al. Nilotinib versus imatinib in patients (pts) with newly diagnosed chronic myeloid leukemia in chronic phase (CML-CP): ENESTnd 4-year (y) update. *J Clin Oncol.* 2013;31(15 Suppl):abstract 7052. PMID: 71099453
12. Radich JP, Kopecky KJ, Appelbaum FR, et al. A randomized trial of dasatinib 100 mg versus imatinib 400 mg in newly diagnosed chronic-phase chronic myeloid leukemia. *Blood.* 2012;120(19):3898-905. PMID: 22915637
13. Saglio G, Kim DW, Issaragrisil S, et al. Nilotinib versus imatinib for newly diagnosed chronic myeloid leukemia. *N Engl J Med.* 2010;362(24):2251-9. PMID: 20525993
14. Cortes JE, Saglio G, Baccarani M, et al. Final study results of the phase 3 dasatinib versus imatinib in newly diagnosed chronic myeloid leukemia in chronic phase (CML-CP) trial (DASISION, CA180-056). *Blood.* 2014;124(21):152. PMID: none
15. Cortes JE, Saglio G, Kantarjian HM, et al. Final 5-year study results of DASISION: the dasatinib versus imatinib study in treatment-naïve chronic myeloid leukemia patients trial. *J Clin Oncol.* 2016;34(20):2333-40. PMID: 27217448
16. O'Brien SG, Hedgley C, Adams S, et al. Spirit 2: an NCRI randomised study comparing dasatinib with imatinib in patients with newly diagnosed CML. *Blood.* 2014;124(21):517. PMID: none
17. Hochhaus A, Saglio G, Hughes TP, et al. Long-term benefits and risks of frontline nilotinib vs imatinib for chronic myeloid leukemia in chronic phase: 5-year update of the randomized ENESTnd trial. *Leukemia.* 2016;30(5):1044-54. PMID: 26837842
18. Kim TD, Rea D, Schwarz M, et al. Peripheral artery occlusive disease in chronic phase chronic myeloid leukemia patients treated with nilotinib or imatinib. *Leukemia.* 2013;27(6):1316-21. PMID: 23459449
19. Rea D, Mirault T, Cluzeau T, et al. Early onset hypercholesterolemia induced by the 2nd-generation tyrosine kinase inhibitor nilotinib in patients with chronic phase-chronic myeloid leukemia. *Haematologica.* 2014;99(7):1197-203. PMID: 24658819
20. Cortes JE, Kantarjian HM, Brummendorf TH, et al. Safety and efficacy of bosutinib (SKI-606) in chronic phase Philadelphia chromosome-positive chronic myeloid leukemia patients with resistance or intolerance to imatinib. *Blood.* 2011;118(17):4567-76. PMID: 21865346
21. Khouri HJ, Cortes JE, Kantarjian HM, et al. Bosutinib is active in chronic phase chronic myeloid leukemia after imatinib and dasatinib and/or nilotinib therapy failure. *Blood.* 2012;119(15):3403-12. PMID: 22371878
22. Kantarjian H, Cortes J, Kim DW, et al. Phase 3 study of dasatinib 140 mg once daily versus 70 mg twice daily in patients with chronic myeloid leukemia in accelerated phase resistant or intolerant to imatinib: 15-month median follow-up. *Blood.* 2009;113(25):6322-9. PMID: 19369231
23. Shah NP, Guilhot F, Cortes JE, et al. Long-term outcome with dasatinib after imatinib failure in chronic-phase chronic myeloid leukemia: follow-up of a phase 3 study. *Blood.* 2014;123(15):2317-24. PMID: 24569263
24. Shah NP, Kantarjian H, Kim D, et al. Six-year (yr) follow-up of patients (pts) with imatinib-resistant or -intolerant chronic-phase chronic myeloid leukemia (CML-CP) receiving dasatinib. *J Clin Oncol.* 2012;30(15 Suppl):abstract 650. PMID: none
25. Shah NP, Kim DW, Kantarjian H, et al. Potent, transient inhibition of BCR-ABL with dasatinib 100 mg daily achieves rapid and durable cytogenetic responses and high transformation-free survival rates in chronic phase chronic myeloid leukemia patients with resistance, suboptimal response or intolerance to imatinib. *Haematologica.* 2010;95(2):232-40. PMID: 20139391

26. Shah NP, Rousselot P, Schiffer C, et al. Dasatinib in imatinib-resistant or -intolerant chronic-phase, chronic myeloid leukemia patients: 7-year follow-up of study CA180-034. *Am J Hematol.* 2016;91(9):869-74. PMID: 27192969
27. Giles FJ, le Coutre PD, Pinilla-Ibarz J, et al. Nilotinib in imatinib-resistant or imatinib-intolerant patients with chronic myeloid leukemia in chronic phase: 48-month follow-up results of a phase II study. *Leukemia.* 2013;27(1):107-12. PMID: 22763385
28. Kantarjian HM, Giles F, Gattermann N, et al. Nilotinib (formerly AMN107), a highly selective BCR-ABL tyrosine kinase inhibitor, is effective in patients with Philadelphia chromosome-positive chronic myelogenous leukemia in chronic phase following imatinib resistance and intolerance. *Blood.* 2007;110(10):3540-6. PMID: 17715389
29. Kantarjian HM, Giles FJ, Bhalla KN, et al. Nilotinib is effective in patients with chronic myeloid leukemia in chronic phase after imatinib resistance or intolerance: 24-month follow-up results. *Blood.* 2011;117(4):1141-5. PMID: 21098399
30. Mahon FX, Boquimpani C, Kim DW, et al. Treatment-free remission after second-line nilotinib treatment in patients with chronic myeloid leukemia in chronic phase: results from a single-group, phase 2, open-label study. *Ann Intern Med.* 2018;168(7):461-70. PMID: 29459949
31. Cortes JE, Kim DW, Pinilla-Ibarz J, et al. A phase 2 trial of ponatinib in Philadelphia chromosome-positive leukemias. *N Engl J Med.* 2013;369(19):1783-96. PMID: 24180494
32. Cortes JE, Kim DW, Pinilla-Ibarz J, et al. Ponatinib efficacy and safety in Philadelphia chromosome-positive leukemia: final 5-year results of the phase 2 PACE trial. *Blood.* 2018;132(4):393-404. PMID: 29567798
33. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Chronic Myeloid Leukemia (Version 3.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
34. Cortes JE, Gambacorti-Passerini C, Deininger MW, et al. Bosutinib versus imatinib for newly diagnosed chronic myeloid leukemia: results from the randomized BFORE trial. *J Clin Oncol.* 2018;36(3):231-7. PMID: 29091516
35. Cortes J, Digumarri R, Parikh PM, et al. Phase 2 study of subcutaneous omacetaxine mepesuccinate for chronic-phase chronic myeloid leukemia patients resistant to or intolerant of tyrosine kinase inhibitors. *Am J Hematol.* 2013;88(5):350-4. PMID: 23468307
36. Gambacorti-Passerini C, Cortes JE, Khoury HJ, et al. Safety and efficacy of bosutinib in patients with AP and BP CML and ph+ ALL following resistance/intolerance to imatinib and other TKIs: update from study SKI-200. *J Clin Oncol.* 2010;28(15 Suppl):abstract 6509. PMID: none
37. Cortes J, Kim DW, Raffoux E, et al. Efficacy and safety of dasatinib in imatinib-resistant or -intolerant patients with chronic myeloid leukemia in blast phase. *Leukemia.* 2008;22(12):2176-83. PMID: 18754032
38. le Coutre PD, Giles FJ, Hochhaus A, et al. Nilotinib in patients with Ph+ chronic myeloid leukemia in accelerated phase following imatinib resistance or intolerance: 24-month follow-up results. *Leukemia.* 2012;26(6):1189-94. PMID: 22076466
39. le Coutre P, Ottmann OG, Giles F, et al. Nilotinib (formerly AMN107), a highly selective BCR-ABL tyrosine kinase inhibitor, is active in patients with imatinib-resistant or -intolerant accelerated-phase chronic myelogenous leukemia. *Blood.* 2008;111(4):1834-9. PMID: 18048643
40. Giles FJ, Kantarjian HM, le Coutre PD, et al. Nilotinib is effective in imatinib-resistant or -intolerant patients with chronic myeloid leukemia in blastic phase. *Leukemia.* 2012;26(5):959-62. PMID: 22157807
41. Guilhot F, Hehlmann R. Long-term outcomes of tyrosine kinase inhibitors in chronic myeloid leukemia. *Blood.* 2025;145(9):910-20. PMID: 39486043
42. Hochhaus A, Wang J, Kim DW, et al. Asciminib in newly diagnosed chronic myeloid leukemia. *N Engl J Med.* 2024;391(10):885-98. PMID: 38820078
43. Cortes JE, Kantarjian HM, Rea D, et al. Final analysis of the efficacy and safety of omacetaxine mepesuccinate in patients with chronic- or accelerated-phase chronic myeloid leukemia: Results with 24 months of follow-up. *Cancer.* 2015;121(10):1637-44. PMID: 25586015
44. Rea D, Mauro MJ, Boquimpani C, et al. A phase 3, open-label, randomized study of asciminib, a STAMP Inhibitor, vs bosutinib in CML after >=2 Prior TKIs. *Blood.* 2021;138(21):2031-41. PMID: 34407542
45. Schiffer CA. Asciminib for CML: same target, new arrow. *Blood.* 2021;1(21):2009-10. PMID: 34821938
46. Gambacorti-Passerini C, Kantarjian HM, Baccarani M, et al. Activity and tolerance of bosutinib in patients with AP and BP CML and Ph+ ALL. *J Clin Oncol.* 2008;26(15 Suppl):abstract 7049. PMID: none
47. Cortes JE, Khoury HJ, Kantarjian HM, et al. Long-term bosutinib for chronic phase chronic myeloid leukemia after failure of imatinib plus dasatinib and/or nilotinib. *Am J Hematol.* 2016;91(12):1206-14. PMID: 27531525
48. Khoury HJ, Cortes J, Baccarani M, et al. Omacetaxine mepesuccinate in patients with advanced chronic myeloid leukemia with resistance or intolerance to tyrosine kinase inhibitors. *Leuk Lymphoma.* 2015;56(1):120-7. PMID: 24650054

## Colorectal Adenocarcinoma Pathways

### Adjuvant Therapy

- Stage III
  - Limited to Colon Cancer
    - **Capecitabine (Xeloda)<sup>1</sup>**
    - **FULV:** fluorouracil (5FU) and leucovorin<sup>1-8</sup>
    - **CAPOX:** capecitabine (Xeloda) and oxaliplatin (limited to 3 months duration)<sup>3-5, 9-12</sup>
    - **FOLFOX:** fluorouracil (5-FU), leucovorin, and oxaliplatin<sup>2, 4, 12, 13-20</sup>

### First or Second Lines of Therapy (1<sup>st</sup> or 2<sup>nd</sup> Line)

- Stages IV and Recurrent
  - RAS Wild Type (WT) or Mutant (MT)
    - **Capecitabine (Xeloda)<sup>21, 22</sup>**
  - RAS Wild Type (WT) or Mutant (MT) - Can Be Used With or Without Bevacizumab
    - **FOLFIRI:** fluorouracil (5FU), leucovorin, and irinotecan (Camptosar)<sup>23-35</sup>
    - **FOLFIRINOX:** fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>13, 36</sup>
    - **mFOLFIRINOX:** fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>\*13, 36</sup>
    - **FOLFOX:** fluorouracil (5FU), leucovorin, oxaliplatin<sup>16, 17, 23, 28, 32, 33, 37-44</sup>
    - **FULV:** fluorouracil (5FU) and leucovorin<sup>8, 22, 30, 31, 45-48</sup>
  - RAS Wild Type (WT) and BRAF Wild Type (WT)
    - **FOLFIRI + panitumumab:** fluorouracil (5FU), leucovorin, and irinotecan (Camptosar) with panitumumab (Vectibix)<sup>†49-51</sup>
    - **FOLFOX + panitumumab:** fluorouracil (5-FU), leucovorin, and oxaliplatin with panitumumab (Vectibix)<sup>†52-57</sup>
    - **Irinotecan (Camptosar) and panitumumab (Vectibix)<sup>†49, 50, 58, 59</sup>**
  - MSI-H or dMMR
    - **Pembrolizumab (Keytruda)<sup>‡60-63</sup>**

\* Modified FOLFIRINOX: Bolus 5-FU is not administered and Irinotecan dose is 150mg/m<sup>2</sup>

† EGFR inhibitor (panitumumab) Limit to one line of therapy

‡ Administered at a dose of 200 mg every 3 weeks OR 400 mg every 6 weeks per the FDA label OR 2 mg/kg (up to a maximum of 200 mg) every 3 weeks, as clinically appropriate

## Colorectal Adenocarcinoma References

### NCCN Clinical Practice Guidelines: Colon Cancer. Version 5.2024; Rectal Cancer. Version 4.2024

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1. Twelves C, Scheithauer W, McKendrick J, et al. Capecitabine versus 5-fluorouracil/folinic acid as adjuvant therapy for stage III colon cancer: final results from the X-ACT trial with analysis by age and preliminary evidence of a pharmacodynamic marker of efficacy. *Ann Oncol.* 2012;23(5):1190-7. PMID: 21896539
2. Andre T, Boni C, Navarro M, et al. Improved overall survival with oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment in stage II or III colon cancer in the MOSAIC trial. *J Clin Oncol.* 2009;27(19):3109-16. PMID: 19451431
3. Haller DG, Tabernero J, Maroun J, et al. Capecitabine plus oxaliplatin compared with fluorouracil and folinic acid as adjuvant therapy for stage III colon cancer. *J Clin Oncol.* 2011;29(11):1465-71. PMID: 21383294
4. Sargent DJ, Marsoni S, Monges G, et al. Defective mismatch repair as a predictive marker for lack of efficacy of fluorouracil-based adjuvant therapy in colon cancer. *J Clin Oncol.* 2010;28(20):3219-26. PMID: 20498393
5. Schmoll HJ, Tabernero J, Maroun J, et al. Capecitabine plus oxaliplatin compared with fluorouracil/folinic acid as adjuvant therapy for stage III colon cancer: final results of the NO16968 randomized controlled phase III trial. *J Clin Oncol.* 2015;33(32):3733-40. PMID: 26324362
6. Haller DG, Catalano PJ, Macdonald JS, et al. Phase III study of fluorouracil, leucovorin, and levamisole in high-risk stage II and III colon cancer: final report of Intergroup 0089. *J Clin Oncol.* 2005;23(34):8671-8. PMID: 16314627
7. Lembersky BC, Wieand HS, Petrelli NJ, et al. Oral uracil and tegafur plus leucovorin compared with intravenous fluorouracil and leucovorin in stage II and III carcinoma of the colon: results from National Surgical Adjuvant Breast and Bowel Project protocol C-06. *J Clin Oncol.* 2006;24(13):2059-64. PMID: 16648506
8. Wolmark N, Rockette H, Fisher B, et al. The benefit of leucovorin-modulated fluorouracil as postoperative adjuvant therapy for primary colon cancer: results from National Surgical Adjuvant Breast and Bowel Project protocol C-03. *J Clin Oncol.* 1993;11(10):1879-87. PMID: 8410113
9. Glynne-Jones R, Counsell N, Quirke P, et al. Chronicle: results of a randomised phase III trial in locally advanced rectal cancer after neoadjuvant chemoradiation randomising postoperative adjuvant capecitabine plus oxaliplatin (XELOX) versus control. *Ann Oncol.* 2014;25(7):1356-62. PMID: 24718855
10. Grothey A, Sobrero AF, Shields AF, et al. Duration of adjuvant chemotherapy for stage III colon cancer. *N Engl J Med.* 2018;378(13):1177-88. PMID: 29590544
11. Schmoll HJ, Cartwright T, Tabernero J, et al. Phase III trial of capecitabine plus oxaliplatin as adjuvant therapy for stage III colon cancer: a planned safety analysis in 1,864 patients. *J Clin Oncol.* 2007;25(1):102-9. PMID: 17194911
12. Shi Q, Sobrero AF, Shields AF, et al. Prospective pooled analysis of six phase III trials investigating duration of adjuvant (adjuv) oxaliplatin-based therapy (3 vs 6 months) for patients (pts) with stage III colon cancer (CC): the IDEA (International Duration Evaluation of Adjuvant chemotherapy) collaboration. *J Clin Oncol.* 2017;35(18 Suppl):abstract LBA1. PMID: none
13. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Colon Cancer (Version 5.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
14. Allegra CJ, Yothers G, O'Connell MJ, et al. Bevacizumab in stage II-III colon cancer: 5-year update of the National Surgical Adjuvant Breast and Bowel Project C-08 trial. *J Clin Oncol.* 2013;31(3):359-64. PMID: 23233715
15. Andre T, Boni C, Mounedji-Boudiaf L, et al. Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. *N Engl J Med.* 2004;350(23):2343-51. PMID: 15175436
16. Cheeseman SL, Joel SP, Chester JD, et al. A 'modified de Gramont' regimen of fluorouracil, alone and with oxaliplatin, for advanced colorectal cancer. *British Journal of Cancer.* 2002;87(4):393-9. PMID: 12177775
17. Maindrault-Goebel F, de Gramont A, Louvet C, et al. Evaluation of oxaliplatin dose intensity in bimonthly leucovorin and 48-hour 5-fluorouracil continuous infusion regimens (FOLFOX) in pretreated metastatic colorectal cancer. *Ann Oncol.* 2000;11(11):1477-83. PMID: 11142489
18. Taieb J, Tabernero J, Mini E, et al. Oxaliplatin, fluorouracil, and leucovorin with or without cetuximab in patients with resected stage III colon cancer (PETACC-8): an open-label, randomised phase 3 trial. *Lancet Oncol.* 2014;15(8):862-73. PMID: 24928083
19. Tournigand C, Andre T, Bonnetain F, et al. Adjuvant therapy with fluorouracil and oxaliplatin in stage II and elderly patients (between ages 70 and 75 years) with colon cancer: subgroup analyses of the Multicenter International Study of Oxaliplatin, Fluorouracil, and Leucovorin in the Adjuvant Treatment of Colon Cancer trial. *J Clin Oncol.* 2012;30(27):3353-60. PMID: 22915656
20. Morton D, Seymour M, Magill L, et al. Preoperative chemotherapy for operable colon cancer: mature results of an international randomized controlled trial. *J Clin Oncol.* 2023;41(8):1541-52. PMID: 36657089
21. Cunningham D, Lang I, Marcuello E, et al. Bevacizumab plus capecitabine versus capecitabine alone in elderly patients with previously untreated metastatic colorectal cancer (AVEX): an open-label, randomised phase 3 trial. *Lancet Oncol.* 2013;14(11):1077-85. PMID: 24028813
22. Van Cutsem E, Twelves C, Cassidy J, et al. Oral capecitabine compared with intravenous fluorouracil plus leucovorin in patients with metastatic colorectal cancer: results of a large phase III study. *J Clin Oncol.* 2001;19(21):4097-106. PMID: 11689577
23. Bennouna J, Sastre J, Arnold D, et al. Continuation of bevacizumab after first progression in metastatic colorectal cancer (ML18147): a randomised phase 3 trial. *Lancet Oncol.* 2013;14(1):29-37. PMID: 23168366

24. Cremolini C, Loupakis F, Antoniotti C, et al. FOLFOXIRI plus bevacizumab versus FOLFIRI plus bevacizumab as first-line treatment of patients with metastatic colorectal cancer: updated overall survival and molecular subgroup analyses of the open-label, phase 3 TRIBE study. *Lancet Oncol.* 2015;16(13):1306-15. PMID: 26338525
25. Fuchs CS, Marshall J, Mitchell E, et al. Randomized, controlled trial of irinotecan plus infusional, bolus, or oral fluoropyrimidines in first-line treatment of metastatic colorectal cancer: results from the BICC-C Study. *J Clin Oncol.* 2007;25(30):4779-86. PMID: 17947725
26. Heinemann V, von Weikerthal LF, Decker T, et al. FOLFIRI plus cetuximab versus FOLFIRI plus bevacizumab as first-line treatment for patients with metastatic colorectal cancer (FIRE-3): a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2014;15(10):1065-75. PMID: 25088940
27. Kwon HC, Oh SY, Lee S, et al. Bevacizumab plus infusional 5-fluorouracil, leucovorin and irinotecan for advanced colorectal cancer that progressed after oxaliplatin and irinotecan chemotherapy: a pilot study. *World J Gastroenterol.* 2007;13(46):6231-5. PMID: 18069765
28. Masi G, Loupakis F, Salvatore L, et al. Second-line chemotherapy (CT) with or without bevacizumab (BV) in metastatic colorectal cancer (mCRC) patients (pts) who progressed to a first-line treatment containing BV: updated results of the phase III "BEBYP" trial by the Gruppo Oncologico Nord Ovest (GONO). *J Clin Oncol.* 2013;31(15 Suppl):abstract 3615. PMID: none
29. Sobrero A, Ackland S, Clarke S, et al. Phase IV study of bevacizumab in combination with infusional fluorouracil, leucovorin and irinotecan (FOLFIRI) in first-line metastatic colorectal cancer. *Oncology.* 2009;77(2):113-9. PMID: 19628950
30. Andre T, Louvet C, Maindron-Goebl F, et al. CPT-11 (irinotecan) addition to bimonthly, high-dose leucovorin and bolus and continuous-infusion 5-fluorouracil (FOLFIRI) for pretreated metastatic colorectal cancer. *Eur J Cancer.* 1999;35(9):1343-7. PMID: 10658525
31. Aparicio T, Lavau-Denes S, Phelip JM, et al. Randomized phase III trial in elderly patients comparing LV5FU2 with or without irinotecan for first-line treatment of metastatic colorectal cancer (FFCD 2001-02). *Ann Oncol.* 2016;27(1):121-7. PMID: 26487578
32. Colucci G, Gebbia V, Paoletti G, et al. Phase III randomized trial of FOLFIRI versus FOLFOX4 in the treatment of advanced colorectal cancer: a multicenter study of the Gruppo Oncologico Dell'Italia Meridionale. *J Clin Oncol.* 2005;23(22):4866-75. PMID: 15939922
33. Tournigand C, Andre T, Achille E, et al. FOLFIRI followed by FOLFOX6 or the reverse sequence in advanced colorectal cancer: a randomized GERCOR study. *J Clin Oncol.* 2004;22(2):229-37. PMID: 14657227
34. Van Cutsem E, Kohne CH, Lang I, et al. Cetuximab plus irinotecan, fluorouracil, and leucovorin as first-line treatment for metastatic colorectal cancer: updated analysis of overall survival according to tumor KRAS and BRAF mutation status. *J Clin Oncol.* 2011;29(15):2011-9. PMID: 21502544
35. Van Cutsem E, Tabernero J, Lakomy R, et al. Addition of afibertcept to fluorouracil, leucovorin, and irinotecan improves survival in a phase III randomized trial in patients with metastatic colorectal cancer previously treated with an oxaliplatin-based regimen. *J Clin Oncol.* 2012;30(28):3499-506. PMID: 22949147
36. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Rectal Cancer (Version 4.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
37. Cassidy J, Clarke S, Diaz-Rubio E, et al. Randomized phase III study of capecitabine plus oxaliplatin compared with fluorouracil/folinic acid plus oxaliplatin as first-line therapy for metastatic colorectal cancer. *J Clin Oncol.* 2008;26(12):2006-12. PMID: 18421053
38. Emmanouilides C, Sfakiotaki G, Androulakis N, et al. Front-line bevacizumab in combination with oxaliplatin, leucovorin and 5-fluorouracil (FOLFOX) in patients with metastatic colorectal cancer: a multicenter phase II study. *BMC Cancer.* 2007;7:91. PMID: 17537235
39. Giantonio BJ, Catalano PJ, Meropol NJ, et al. Bevacizumab in combination with oxaliplatin, fluorouracil, and leucovorin (FOLFOX4) for previously treated metastatic colorectal cancer: results from the Eastern Cooperative Oncology Group Study E3200. *J Clin Oncol.* 2007;25(12):1539-44. PMID: 17442997
40. Hochster HS, Hart LL, Ramanathan RK, et al. Safety and efficacy of oxaliplatin and fluoropyrimidine regimens with or without bevacizumab as first-line treatment of metastatic colorectal cancer: results of the TREE Study. *J Clin Oncol.* 2008;26(21):3523-9. PMID: 18640933
41. Masi G, Salvatore L, Boni L, et al. Continuation or reintroduction of bevacizumab beyond progression to first-line therapy in metastatic colorectal cancer: final results of the randomized BEBYP trial. *Ann Oncol.* 2015;26(4):724-30. PMID: 25600568
42. Saltz LB, Clarke S, Diaz-Rubio E, et al. Bevacizumab in combination with oxaliplatin-based chemotherapy as first-line therapy in metastatic colorectal cancer: a randomized phase III study. *J Clin Oncol.* 2008;26(12):2013-9. PMID: 18421054
43. de Gramont A, Figer A, Seymour M, et al. Leucovorin and fluorouracil with or without oxaliplatin as first-line treatment in advanced colorectal cancer. *J Clin Oncol.* 2000;18(16):2938-47. PMID: 10944126
44. Goldberg RM, Sargent DJ, Morton RF, et al. A randomized controlled trial of fluorouracil plus leucovorin, irinotecan, and oxaliplatin combinations in patients with previously untreated metastatic colorectal cancer. *J Clin Oncol.* 2004;22(1):23-30. PMID: 14665611
45. Kabbinavar FF, Hambleton J, Mass RD, et al. Combined analysis of efficacy: the addition of bevacizumab to fluorouracil/leucovorin improves survival for patients with metastatic colorectal cancer. *J Clin Oncol.* 2005;23(16):3706-12. PMID: 15867200
46. Kabbinavar FF, Schulz J, McCleod M, et al. Addition of bevacizumab to bolus fluorouracil and leucovorin in first-line metastatic colorectal cancer: results of a randomized phase II trial. *J Clin Oncol.* 2005;23(16):3697-705. PMID: 15738537
47. Jager E, Heike M, Bernhard H, et al. Weekly high-dose leucovorin versus low-dose leucovorin combined with fluorouracil in advanced colorectal cancer: results of a randomized multicenter trial. Study Group for Palliative Treatment of Metastatic Colorectal Cancer study protocol 1. *J Clin Oncol.* 1996;14(8):2274-9. PMID: 8708717
48. Petrelli N, Douglass HO, Jr., Herrera L, et al. The modulation of fluorouracil with leucovorin in metastatic colorectal carcinoma: a prospective randomized phase III trial. Gastrointestinal Tumor Study Group. *J Clin Oncol.* 1989;7(10):1419-26. PMID: 2674331
49. Peeters M, Price TJ, Cervantes A, et al. Final results from a randomized phase 3 study of FOLFIRI {+/-} panitumumab for second-line treatment of metastatic colorectal cancer. *Ann Oncol.* 2014;25(1):107-16. PMID: 24356622
50. Peeters M, Price TJ, Cervantes A, et al. Randomized phase III study of panitumumab with fluorouracil, leucovorin, and irinotecan (FOLFIRI) compared with FOLFIRI alone as second-line treatment in patients with metastatic colorectal cancer. *J Clin Oncol.* 2010;28(31):4706-13. PMID: 20921462
51. Sobrero AF, Peeters M, Price TJ, et al. Final results from study 181: randomized phase III study of FOLFIRI with or without panitumumab (pmab) for the treatment of second-line metastatic colorectal cancer (mCRC). *J Clin Oncol.* 2012;30(4 Suppl):abstract 387. PMID: none
52. Douillard JY, Siena S, Cassidy J, et al. Final results from PRIME: randomized phase III study of panitumumab with FOLFOX4 for first-line treatment of metastatic colorectal cancer. *Ann Oncol.* 2014;25(7):1346-55. PMID: 24718886
53. Douillard JY, Siena S, Cassidy J, et al. Randomized, phase III trial of panitumumab with infusional fluorouracil, leucovorin, and oxaliplatin (FOLFOX4) versus FOLFOX4 alone as first-line treatment in patients with previously untreated metastatic colorectal cancer: the PRIME study. *J Clin Oncol.* 2010;28(31):4697-705. PMID: 20921465

54. Zhou SW, Huang YY, Wei Y, et al. No survival benefit from adding cetuximab or panitumumab to oxaliplatin-based chemotherapy in the first-line treatment of metastatic colorectal cancer in KRAS wild type patients: a meta-analysis. *PLoS ONE.* 2012;7(11):e50925. PMID: 23226426
55. Watanabe J, Muro K, Shitara K, et al. Panitumumab vs bevacizumab added to standard first-line chemotherapy and overall survival among patients with RAS wild-type, left-sided metastatic colorectal cancer: a randomized clinical trial. *JAMA.* 2023;329(15):1271-82. PMID: 37071094
56. Robinson HR, Lieu CH. Anti-EGFR therapy for left-sided ras wild-type colorectal cancer-PARADIGM shift. *JAMA Oncol.* 2023;9(6):767-9. PMID: 37071419
57. Yoshino T, Watanabe J, Shitara K, et al. Panitumumab (PAN) plus mFOLFOX6 versus bevacizumab (BEV) plus mFOLFOX6 as first-line treatment in patients with RAS wild-type (WT) metastatic colorectal cancer (mCRC): Results from the phase 3 PARADIGM trial. *J Clin Oncol.* 2022;40(17 Suppl):abstract LBA1. PMID: none
58. Andre T, Blons H, Mabro M, et al. Panitumumab combined with irinotecan for patients with KRAS wild-type metastatic colorectal cancer refractory to standard chemotherapy: a GERCOR efficacy, tolerance, and translational molecular study. *Ann Oncol.* 2013;24(2):412-9. PMID: 23041588
59. Seymour MT, Brown SR, Middleton G, et al. Panitumumab and irinotecan versus irinotecan alone for patients with KRAS wild-type, fluorouracil-resistant advanced colorectal cancer (PICCOLO): a prospectively stratified randomised trial. *Lancet Oncol.* 2013;14(8):749-59. PMID: 23725851
60. Andre T, Shiu K, Kim TW, et al. Pembrolizumab versus chemotherapy for microsatellite instability-high/mismatch repair deficient metastatic colorectal cancer: the phase 3 KEYNOTE-177 study. *J Clin Oncol.* 2020;38(18 Suppl):abstract LBA4. PMID: none
61. Andre T, Shiu KK, Kim TW, et al. Pembrolizumab in microsatellite-instability-high advanced colorectal cancer. *N Engl J Med.* 2020;383(23):2207-18. PMID: 33264544
62. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255
63. Diaz LA, Jr., Shiu KK, Kim TW, et al. Pembrolizumab versus chemotherapy for microsatellite instability-high or mismatch repair-deficient metastatic colorectal cancer (KEYNOTE-177): final analysis of a randomised, open-label, phase 3 study. *Lancet Oncol.* 2022;23(5):659-70. PMID: 35427471
64. Yothers G, O'Connell MJ, Allegra CJ, et al. Oxaliplatin as adjuvant therapy for colon cancer: updated results of NSABP C-07 trial, including survival and subset analyses. *J Clin Oncol.* 2011;29(28):3768-74. PMID: 21859995
65. Tabernero J, Van Cutsem E, Lakomy R, et al. Aflibercept versus placebo in combination with fluorouracil, leucovorin and irinotecan in the treatment of previously treated metastatic colorectal cancer: prespecified subgroup analyses from the VELOUR trial. *Eur J Cancer.* 2014;50(2):320-31. PMID: 24140268
66. Fuchs CS, Moore MR, Harker G, et al. Phase III comparison of two irinotecan dosing regimens in second-line therapy of metastatic colorectal cancer. *J Clin Oncol.* 2003;21(5):807-14. PMID: 12610178
67. Haller DG, Rothenberg ML, Wong AO, et al. Oxaliplatin plus irinotecan compared with irinotecan alone as second-line treatment after single-agent fluoropyrimidine therapy for metastatic colorectal carcinoma. *J Clin Oncol.* 2008;26(28):4544-50. PMID: 18824706
68. Borner MM, Dietrich D, Stupp R, et al. Phase II study of capecitabine and oxaliplatin in first- and second-line treatment of advanced or metastatic colorectal cancer. *J Clin Oncol.* 2002;20(7):1759-66. PMID: 11919232
69. Pessino A, Artale S, Sciallero S, et al. First-line single-agent cetuximab in patients with advanced colorectal cancer. *Ann Oncol.* 2008;19(4):711-6. PMID: 18073221
70. Price TJ, Peeters M, Kim TW, et al. Panitumumab versus cetuximab in patients with chemotherapy-refractory wild-type KRAS exon 2 metastatic colorectal cancer (ASPECCT): a randomised, multicentre, open-label, non-inferiority phase 3 study. *Lancet Oncol.* 2014;15(6):569-79. PMID: 24739896
71. Cunningham D, Humblet Y, Siena S, et al. Cetuximab monotherapy and cetuximab plus irinotecan in irinotecan-refractory metastatic colorectal cancer. *N Engl J Med.* 2004;351(4):337-45. PMID: 15269313
72. Grothey A, Van Cutsem E, Sobrero A, et al. Regorafenib monotherapy for previously treated metastatic colorectal cancer (CORRECT): an international, multicentre, randomised, placebo-controlled, phase 3 trial. *Lancet.* 2013;381(9863):303-12. PMID: 23177514
73. Mayer RJ, Van Cutsem E, Falcone A, et al. Randomized trial of TAS-102 for refractory metastatic colorectal cancer. *N Engl J Med.* 2015;372(20):1909-19. PMID: 25970050
74. Yildiz R, Buyukberber S, Uner A, et al. Bevacizumab plus irinotecan-based therapy in metastatic colorectal cancer patients previously treated with oxaliplatin-based regimens. *Cancer Invest.* 2010;28(1):33-7. PMID: 19995229
75. Hochster HS, Grothey A, Hart L, et al. Improved time to treatment failure with an intermittent oxaliplatin strategy: results of CONcePT. *Ann Oncol.* 2014;25(6):1172-8. PMID: 24608198
76. Koopman M, Simkens L, May A, et al. Final results and subgroup analyses of the phase 3 CAIRO3 study: maintenance treatment with capecitabine and bevacizumab versus observation after induction treatment with chemotherapy and bevacizumab in metastatic colorectal cancer (mCRC). *J Clin Oncol.* 2014;32(3 Suppl):abstract LBA388. PMID: none
77. Simkens LH, van Tinteren H, May A, et al. Maintenance treatment with capecitabine and bevacizumab in metastatic colorectal cancer (CAIRO3): a phase 3 randomised controlled trial of the Dutch Colorectal Cancer Group. *Lancet.* 2015;385(9980):1843-52. PMID: 25862517
78. Tabernero J, Yoshino T, Cohn AL, et al. Ramucirumab versus placebo in combination with second-line FOLFIRI in patients with metastatic colorectal carcinoma that progressed during or after first-line therapy with bevacizumab, oxaliplatin, and a fluoropyrimidine (RAISE): a randomised, double-blind, multicentre, phase 3 study. *Lancet Oncol.* 2015;16(5):499-508. PMID: 25877855
79. Marmorino F, Rossini D, Lonardi S, et al. Impact of age and gender on the safety and efficacy of chemotherapy plus bevacizumab in metastatic colorectal cancer: a pooled analysis of TRIBE and TRIBE2 studies. *Ann Oncol.* 2019;30(12):1969-77. PMID: 31573612
80. Gruenberger T, Bridgewater J, Chau I, et al. Bevacizumab plus mFOLFOX-6 or FOLFOXIRI in patients with initially unresectable liver metastases from colorectal cancer: the OLIVIA multinational randomised phase II trial. *Ann Oncol.* 2015;26(4):702-8. PMID: 25538173
81. Cremolini C, Loupakis F, Masi G, et al. FOLFOXIRI or FOLFOXIRI plus bevacizumab as first-line treatment of metastatic colorectal cancer: a propensity score-adjusted analysis from two randomized clinical trials. *Ann Oncol.* 2016;27(5):843-9. PMID: 26861604
82. Cremolini C, Antoniotti C, Rossini D, et al. Upfront FOLFOXIRI plus bevacizumab and reintroduction after progression versus mFOLFOX6 plus bevacizumab followed by FOLFIRI plus bevacizumab in the treatment of patients with metastatic colorectal cancer (TRIBE2): a multicentre, open-label, phase 3, randomised, controlled trial. *Lancet Oncol.* 2020;21(4):497-507. PMID: 32164906
83. Pietrantonio F, Fuca G, Rossini D, et al. FOLFOXIRI-bevacizumab or FOLFOX-panitumumab in patients with left-sided RAS/BRAF wild-type metastatic colorectal cancer: a propensity score-based analysis. *Oncologist.* 2021;26(4):302-9. PMID: 33336844

84. Falcone A, Ricci S, Brunetti I, et al. Phase III trial of infusional fluorouracil, leucovorin, oxaliplatin, and irinotecan (FOLFOXIRI) compared with infusional fluorouracil, leucovorin, and irinotecan (FOLFIRI) as first-line treatment for metastatic colorectal cancer: the Gruppo Oncologico Nord Ovest. *J Clin Oncol.* 2007;25(13):1670-6. PMID: 17470860
85. Cunningham D, Pyrhonen S, James RD, et al. Randomised trial of irinotecan plus supportive care versus supportive care alone after fluorouracil failure for patients with metastatic colorectal cancer. *Lancet.* 1998;352(9138):1413-8. PMID: 9807987
86. Zhang C, Wang J, Gu H, et al. Capecitabine plus oxaliplatin compared with 5-fluorouracil plus oxaliplatin in metastatic colorectal cancer: Meta-analysis of randomized controlled trials. *Oncol.* 2012;3(4):831-8. PMID: 22741002
87. Antoniotti C, Rossini D, Pietrantonio F, et al. Upfront FOLFOXIRI plus bevacizumab with or without atezolizumab in the treatment of patients with metastatic colorectal cancer (AtezoTRIBE): a multicentre, open-label, randomised, controlled, phase 2 trial. *Lancet Oncol.* 2022;23(7):876-87. PMID: 35636444
88. Van Cutsem E, Tejpar S, Vanbeekvoort D, et al. Intrapatient cetuximab dose escalation in metastatic colorectal cancer according to the grade of early skin reactions: the randomized EVEREST study. *J Clin Oncol.* 2012;30(23):2861-8. PMID: 22753904
89. Martin-Martorell P, Rosello S, Rodriguez-Braun E, et al. Biweekly cetuximab and irinotecan in advanced colorectal cancer patients progressing after at least one previous line of chemotherapy: results of a phase II single institution trial. *British Journal of Cancer.* 2008;99(3):455-8. PMID: 18665167
90. Vale CL, Tierney JF, Fisher D, et al. Does anti-EGFR therapy improve outcome in advanced colorectal cancer? A systematic review and meta-analysis. *Cancer Treat Rev.* 2012;38(6):618-25. PMID: 22118887
91. Van Cutsem E, Kohne CH, Hitre E, et al. Cetuximab and chemotherapy as initial treatment for metastatic colorectal cancer. *N Engl J Med.* 2009;360(14):1408-17. PMID: 19339720
92. Ye LC, Liu TS, Ren L, et al. Randomized controlled trial of cetuximab plus chemotherapy for patients with KRAS wild-type unresectable colorectal liver-limited metastases. *J Clin Oncol.* 2013;31(16):1931-8. PMID: 23569301
93. Folprecht G, Gruenberger T, Bechstein WO, et al. Tumour response and secondary resectability of colorectal liver metastases following neoadjuvant chemotherapy with cetuximab: the CELIM randomised phase 2 trial. *Lancet Oncol.* 2010;11(1):38-47. PMID: 19942479
94. Cremolini C, Antoniotti C, Lonardi S, et al. Activity and safety of cetuximab plus modified FOLFOXIRI followed by maintenance with cetuximab or bevacizumab for RAS and BRAF wild-type metastatic colorectal cancer: a randomized phase 2 clinical trial. *JAMA Oncol.* 2018;4(4):529-36. PMID: 29450468
95. Bokemeyer C, Bondarenko I, Makhson A, et al. Fluorouracil, leucovorin, and oxaliplatin with and without cetuximab in the first-line treatment of metastatic colorectal cancer. *J Clin Oncol.* 2009;27(5):663-71. PMID: 19114683
96. Primrose J, Falk S, Finch-Jones M, et al. Systemic chemotherapy with or without cetuximab in patients with resectable colorectal liver metastasis: the New EPOC randomised controlled trial. *Lancet Oncol.* 2014;15(6):601-11. PMID: 24717919
97. Venook AP, Niedzwiecki D, Lenz HJ, et al. CALGB/SWOG 80405: Phase III trial of irinotecan/5-FU/leucovorin (FOLFIRI) or oxaliplatin/5-FU/leucovorin (MFOLFOX6) with bevacizumab (bv) or cetuximab (CET) for patients (PTS) with kras wild-type (WT) untreated metastatic adenocarcinoma of the colon or rectum (MCRC). *J Clin Oncol.* 2014;32(18 Suppl):abstract LBA3. PMID: none
98. Venook AP, Niedzwiecki D, Lenz HJ, et al. Effect of first-line chemotherapy combined with cetuximab or bevacizumab on overall survival in patients with KRAS wild-type advanced or metastatic colorectal cancer: A randomized clinical trial. *JAMA.* 2017;317(23):2392-401. PMID: 28632865
99. Van Cutsem E, Peeters M, Siena S, et al. Open-label phase III trial of panitumumab plus best supportive care compared with best supportive care alone in patients with chemotherapy-refractory metastatic colorectal cancer. *J Clin Oncol.* 2007;25(13):1658-64. PMID: 17470858
100. Overman MJ, McDermott R, Leach JL, et al. Nivolumab in patients with metastatic DNA mismatch repair-deficient or microsatellite instability-high colorectal cancer (CheckMate 142): an open-label, multicentre, phase 2 study. *Lancet Oncol.* 2017;18(9):1182-91. PMID: 28734759
101. Overman MJ, Lonardi S, Wong KYM, et al. Durable clinical benefit with nivolumab plus ipilimumab in DNA mismatch repair-deficient/microsatellite instability-high metastatic colorectal cancer. *J Clin Oncol.* 2018;36(8):773-9. PMID: 29355075
102. Lenz HJ, Lonardi S, Elez E, et al. Nivolumab (NIVO) plus ipilimumab (IPI) vs chemotherapy (chemo) as first-line (1L) treatment for microsatellite instability-high/mismatch repair-deficient (MSI-H/ dMMR) metastatic colorectal cancer (mCRC): expanded efficacy analysis from CheckMate 8HW. *J Clin Oncol.* 2024;42(16 Suppl):abstract 3503. PMID: none
103. Taieb J, Bouche O, Andre T, et al. Avelumab vs standard second-line chemotherapy in patients with metastatic colorectal cancer and microsatellite instability: a randomized clinical trial. *JAMA Oncol.* 2023;9(10):1356-63. PMID: 37535388
104. Sartore-Bianchi A, Trusolino L, Martino C, et al. Dual-targeted therapy with trastuzumab and lapatinib in treatment-refractory, KRAS codon 12/13 wild-type, HER2-positive metastatic colorectal cancer (HERACLES): a proof-of-concept, multicentre, open-label, phase 2 trial. *Lancet Oncol.* 2016;17(6):738-46. PMID: 27108243
105. Meric-Bernstam F, Hurwitz H, Raghav KPS, et al. Pertuzumab plus trastuzumab for HER2-amplified metastatic colorectal cancer (MyPathway): an updated report from a multicentre, open-label, phase 2a, multiple basket study. *Lancet Oncol.* 2019;20(4):518-30. PMID: 30857956
106. Siena S, Di Bartolomeo M, Raghav K, et al. Trastuzumab deruxtecan (DS-8201) in patients with HER2-expressing metastatic colorectal cancer (DESTINY-CRC01): a multicentre, open-label, phase 2 trial. *Lancet Oncol.* 2021;22(6):779-89. PMID: 33961795
107. Raghav KPS, Siena S, Takashima A, et al. Trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2-overexpressing/amplified (HER2+) metastatic colorectal cancer (mCRC): primary results from the multicenter, randomized, phase 2 DESTINY-CRC02 study. *J Clin Oncol.* 2023;41(16 Suppl):abstract 3501. PMID: none
108. Strickler J, Cerce A, Siena S, et al. Primary analysis of MOUNTAINEER: a phase 2 study of tucatinib and trastuzumab for HER2-positive mCRC. *Ann Oncol.* 2022;33(Suppl 4):S375-S6. PMID: none
109. Van Cutsem E, Huijberts S, Grothey A, et al. Binimetinib, encorafenib, and cetuximab triplet therapy for patients with BRAF V600E-mutant metastatic colorectal cancer: safety lead-in results from the phase III BEACON colorectal cancer study. *J Clin Oncol.* 2019;37(17):1460-9. PMID: 30892987
110. Kopetz S, Grothey A, Yaeger R, et al. Encorafenib, binimetinib, and cetuximab in BRAF V600E-mutated colorectal cancer. *N Engl J Med.* 2019;381(17):1632-43. PMID: 31566309
111. Kopetz S, Grothey A, Van Cutsem E, et al. Encorafenib plus cetuximab with or without binimetinib for BRAF V600E-mutant metastatic colorectal cancer: quality-of-life results from a randomized, three-arm, phase III study versus the choice of either irinotecan or FOLFIRI plus cetuximab (BEACON CRC). *J Clin Oncol.* 2020;38(4 Suppl):abstract 8. PMID: none
112. Tabernero J, Grothey A, Van Cutsem E, et al. Encorafenib plus cetuximab as a new standard of care for previously treated BRAF V600E-mutant metastatic colorectal cancer: updated survival results and subgroup analyses from the BEACON study. *J Clin Oncol.* 2021;39(4):273-84. PMID: 33503393

113. Fakih MG, Salvatore L, Esaki T, et al. Sotorasib plus panitumumab in refractory colorectal cancer with mutated KRAS G12C. *N Engl J Med.* 2023;389(23):2125-39. PMID: 37870968
114. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
115. Demetri GD, Paz-Ares L, Farago AF, et al. Efficacy and safety of entrectinib in patients with NTRK fusion-positive (NTRK-fp) tumors: pooled analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol.* 2018;29(Suppl 8):viii713. PMID: none
116. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
117. Van Cutsem E, Martinelli E, Cascinu S, et al. Regorafenib for patients with metastatic colorectal cancer who progressed after standard therapy: results of the large, single-arm, open-label phase IIIb CONSIGN study. *Oncologist.* 2019;24(2):185-92. PMID: 30190299
118. Bekaii-Saab TS, Ou FS, Anderson DM, et al. Regorafenib dose optimization study (ReDOS): Randomized phase II trial to evaluate dosing strategies for regorafenib in refractory metastatic colorectal cancer (mCRC) An ACCRU Network study. *J Clin Oncol.* 2018;36(4 Suppl):abstract 611. PMID: none
119. Bekaii-Saab TS, Ou FS, Ahn DH, et al. Regorafenib dose-optimisation in patients with refractory metastatic colorectal cancer (ReDOS): a randomised, multicentre, open-label, phase 2 study. *Lancet Oncol.* 2019;20(8):1070-82. PMID: 31262657
120. Pfeiffer P, Yilmaz M, Moller S, et al. TAS-102 with or without bevacizumab in patients with chemorefractory metastatic colorectal cancer: an investigator-initiated, open-label, randomised, phase 2 trial. *Lancet Oncol.* 2020;21(3):412-20. PMID: 31999946
121. Prager GW, Taieb J, Fakih M, et al. Trifluridine-tipiracil and bevacizumab in refractory metastatic colorectal cancer. *N Engl J Med.* 2023;388(18):1657-67. PMID: 37133585
122. Dasari A, Lonardi S, Garcia-Carbonero R, et al. Fruquintinib versus placebo in patients with refractory metastatic colorectal cancer (FRESCO-2): an international, multicentre, randomised, double-blind, phase 3 study. *Lancet.* 2023;402(10395):41-53. PMID: 37331369
123. Tie J, Cohen JD, Lahouel K, et al. Circulating tumor DNA analysis guiding adjuvant therapy in stage II colon cancer. *N Engl J Med.* 2022;386(24):2261-72. PMID: 35657320
124. Kuebler JP, Wieand HS, O'Connell MJ, et al. Oxaliplatin combined with weekly bolus fluorouracil and leucovorin as surgical adjuvant chemotherapy for stage II and III colon cancer: results from NSABP C-07. *J Clin Oncol.* 2007;25(16):2198-204. PMID: 17470851
125. Kopetz S, McDonough SL, Lenz HJ, et al. Randomized trial of irinotecan and cetuximab with or without vemurafenib in BRAF-mutant metastatic colorectal cancer (SWOG S1406). *J Clin Oncol.* 2017;35(15 Suppl):abstract 3505. PMID: none
126. Atreya CE, Van Cutsem E, Bendell JC, et al. Updated efficacy of the MEK inhibitor trametinib (T), BRAF inhibitor dabrafenib (D), and anti-EGFR antibody panitumumab (P) in patients (pts) with BRAF V600E mutated (BRAFm) metastatic colorectal cancer (mCRC). *J Clin Oncol.* 2015;33(15 Suppl):abstract 103. PMID: none
127. Karapetis CS, Khambata-Ford S, Jonker DJ, et al. K-ras mutations and benefit from cetuximab in advanced colorectal cancer. *N Engl J Med.* 2008;359(17):1757-65. PMID: 18946061
128. Segelov E, Thavaneswaran S, Waring PM, et al. Response to cetuximab with or without irinotecan in patients with refractory metastatic colorectal cancer harboring the KRAS G13D Mutation: Australasian Gastro-Intestinal Trials Group ICECREAM study. *J Clin Oncol.* 2016;34(19):2258-64. PMID: 27114605

## Gastric, Esophageal, and Gastroesophageal Junction Adenocarcinoma Pathways

### Neoadjuvant Therapy (Pre-Operative, Peri-Operative, Primary Therapy)

- Potentially Resectable Disease
  - **FLOT:** Fluorouracil (5FU), leucovorin, oxaliplatin, and docetaxel (Taxotere)<sup>1,2</sup>
  - Paclitaxel and carboplatin with concurrent RT\*<sup>3,4</sup>

### Adjuvant Therapy (Post Operative-Adjuvant)

- Resected Disease
  - Fluorouracil (5FU) and leucovorin with concurrent RT<sup>5-7</sup>
  - Nivolumab (Opdivo)\*†<sup>8</sup>

### First Line of Therapy

- Locally Advanced, Metastatic, or Recurrent Disease
  - Unresectable, HER2 Positive
    - Cisplatin, fluorouracil (5FU), and trastuzumab<sup>9</sup>
  - HER2 Negative
    - Fluorouracil (5FU) and Cisplatin<sup>#9-13</sup>
    - Fluorouracil (5FU) +/- Leucovorin and irinotecan (Camptosar) FOLFIRI – **Termed 7/14/2025**
    - **FLO/FOLFOX:** fluorouracil (5FU), leucovorin, and oxaliplatin<sup>14,15</sup>
    - **FLP:** fluorouracil (5FU), leucovorin, and cisplatin<sup>14</sup>
    - FOLFOX + nivolumab: fluorouracil (5FU), leucovorin, oxaliplatin, and nivolumab (Opdivo) (**CPS ≥ 5**)<sup>16</sup>
    - Pembrolizumab (Keytruda), fluorouracil (5FU) and cisplatin (**CPS ≥ 5**)<sup>17, 18</sup> – **Clarified 7/14/2025**
    - Pembrolizumab (Keytruda), capecitabine (Xeloda) and oxaliplatin (**CPS ≥ 5**)<sup>17, 18</sup> – **Clarified 7/14/2025**

### Second Line of Therapy (2nd Line)

- Unresectable Locally Advanced, Metastatic, or Recurrent Disease
  - Irinotecan (Camptosar)<sup>19-23</sup>
  - Paclitaxel<sup>20, 21, 24</sup>
  - Trastuzumab deruxtecan (Enhertu)<sup>§</sup> – **(HER2 Positive Only)**<sup>25</sup>

\* Limited to esophageal and gastroesophageal junction cancers only.

† Limited to patients previously treated with chemoradiation with residual pathological disease-- Maximum duration of treatment is one year.

‡ Limited to gastric tumors only

§ Use only after prior trastuzumab based therapy

## Gastric, Esophageal, and Gastroesophageal Junction Adenocarcinomas References

NCCN Clinical Practice Guidelines: *Gastric Cancer. Version 2.2025; Esophageal and Esophagogastric Junction Cancers. Version 3.2025*

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To view the most recent and complete version of the Guideline, go online to [www.nccn.org](http://www.nccn.org). These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Al-Batran SE, Hofheinz RD, Pauligk C, et al. Histopathological regression after neoadjuvant docetaxel, oxaliplatin, fluorouracil, and leucovorin versus epirubicin, cisplatin, and fluorouracil or capecitabine in patients with resectable gastric or gastro-oesophageal junction adenocarcinoma (FLOT4-AIO): results from the phase 2 part of a multicentre, open-label, randomised phase 2/3 trial. *Lancet Oncol.* 2016;17(12):1697-708. PMID: 27776843
2. Al-Batran SE, Homann N, Pauligk C, et al. Perioperative chemotherapy with fluorouracil plus leucovorin, oxaliplatin, and docetaxel versus fluorouracil or capecitabine plus cisplatin and epirubicin for locally advanced, resectable gastric or gastro-oesophageal junction adenocarcinoma (FLOT4): a randomised, phase 2/3 trial. *Lancet.* 2019;393(10184):1948-57. PMID: 30982686
3. Noordman BJ, Verdam MGE, Lagarde SM, et al. Effect of neoadjuvant chemoradiotherapy on health-related quality of life in esophageal or junctional cancer: results from the randomized CROSS trial. *J Clin Oncol.* 2018;36(3):268-75. PMID: 29161204
4. van Hagen P, Hulshof MC, van Lanschot JJ, et al. Preoperative chemoradiotherapy for esophageal or junctional cancer. *N Engl J Med.* 2012;366(22):2074-84. PMID: 22646630
5. Fuchs CS, Niedzwiecki D, Mamon HJ, et al. Adjuvant chemoradiotherapy with epirubicin, cisplatin, and fluorouracil compared with adjuvant chemoradiotherapy with fluorouracil and leucovorin after curative resection of gastric cancer: results from CALGB 80101 (Alliance). *J Clin Oncol.* 2017;35(32):3671-7. PMID: 28976791
6. Macdonald JS, Smalley SR, Benedetti J, et al. Chemoradiotherapy after surgery compared with surgery alone for adenocarcinoma of the stomach or gastroesophageal junction. *N Engl J Med.* 2001;345(10):725-30. PMID: 11547741
7. Smalley SR, Benedetti JK, Haller DG, et al. Updated analysis of SWOG-directed intergroup study 0116: a phase III trial of adjuvant radiochemotherapy versus observation after curative gastric cancer resection. *J Clin Oncol.* 2012;30(19):2327-33. PMID: 22585691
8. Kelly RJ, Ajani JA, Kuzdzal J, et al. Adjuvant nivolumab in resected esophageal or gastroesophageal junction cancer. *N Engl J Med.* 2021;384(13):1191-203. PMID: 33789008
9. Bang YJ, Van Cutsem E, Feyereislova A, et al. Trastuzumab in combination with chemotherapy versus chemotherapy alone for treatment of HER2-positive advanced gastric or gastro-oesophageal junction cancer (ToGA): a phase 3, open-label, randomised controlled trial. *Lancet.* 2010;376(9742):687-97. PMID: 20728210
10. Bouche O, Raoul JL, Bonnetain F, et al. Randomized multicenter phase II trial of a biweekly regimen of fluorouracil and leucovorin (LV5FU2), LV5FU plus cisplatin, or LV5FU2 plus irinotecan in patients with previously untreated metastatic gastric cancer: a Federation Francophone de Cancerologie Digestive Group Study--FFCD 9803. *J Clin Oncol.* 2004;22(21):4319-28. PMID: 15514373
11. Dank M, Zaluski J, Barone C, et al. Randomized phase III study comparing irinotecan combined with 5-fluorouracil and folinic acid to cisplatin combined with 5-fluorouracil in chemotherapy naive patients with advanced adenocarcinoma of the stomach or esophagogastric junction. *Ann Oncol.* 2008;19(8):1450-7. PMID: 18558665
12. Kang YK, Kang WK, Shin DB, et al. Capecitabine/cisplatin versus 5-fluorouracil/cisplatin as first-line therapy in patients with advanced gastric cancer: a randomised phase III noninferiority trial. *Ann Oncol.* 2009;20(4):666-73. PMID: 19153121
13. Lorenzen S, Schuster T, Porschen R, et al. Cetuximab plus cisplatin-5-fluorouracil versus cisplatin-5-fluorouracil alone in first-line metastatic squamous cell carcinoma of the esophagus: a randomized phase II study of the Arbeitsgemeinschaft Internistische Onkologie. *Ann Oncol.* 2009;20(10):1667-73. PMID: 19549707
14. Al-Batran SE, Hartmann JT, Probst S, et al. Phase III trial in metastatic gastroesophageal adenocarcinoma with fluorouracil, leucovorin plus either oxaliplatin or cisplatin: a study of the Arbeitsgemeinschaft Internistische Onkologie. *J Clin Oncol.* 2008;26(9):1435-42. PMID: 18349393
15. Shah MA, Cho JY, Tan IB, et al. A randomized phase II study of FOLFOX with or without the MET inhibitor onartuzumab in advanced adenocarcinoma of the stomach and gastroesophageal junction. *Oncologist.* 2016;21(9):1085-90. PMID: 27401892
16. Moehler MH, Shitara K, Garrido M, et al. First-line (1L) nivolumab (NIVO) plus chemotherapy (chemo) versus chemo in advanced gastric cancer/gastroesophageal junction cancer/esophageal adenocarcinoma (GC/GEJC/EAC): Expanded efficacy and safety data from CheckMate 649. *J Clin Oncol.* 2021;39(15 Suppl):abstract 4002. PMID: none
17. Rha SY, Oh DY, Yanez P, et al. Pembrolizumab plus chemotherapy versus placebo plus chemotherapy for HER2-negative advanced gastric cancer (KEYNOTE-859): a multicentre, randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2023;24(11):1181-95. PMID: 37875143
18. Sun JM, Shen L, Shah MA, et al. Pembrolizumab plus chemotherapy versus chemotherapy alone for first-line treatment of advanced oesophageal cancer (KEYNOTE-590): a randomised, placebo-controlled, phase 3 study. *Lancet.* 2021;398(10302):759-71. PMID: 34454674
19. Fuchs CS, Moore MR, Harker G, et al. Phase III comparison of two irinotecan dosing regimens in second-line therapy of metastatic colorectal cancer. *J Clin Oncol.* 2003;21(5):807-14. PMID: 12610178
20. Hironaka S, Ueda S, Yasui H, et al. Randomized, open-label, phase III study comparing irinotecan with paclitaxel in patients with advanced gastric cancer without severe peritoneal metastasis after failure of prior combination chemotherapy using fluoropyrimidine plus platinum: WJOG 4007 trial. *J Clin Oncol.* 2013;31(35):4438-44. PMID: 24190112

21. Lee KW, Maeng CH, Kim TY, et al. A phase III study to compare the efficacy and safety of paclitaxel versus irinotecan in patients with metastatic or recurrent gastric cancer who failed in first-line therapy (KCSG ST10-01). *Oncologist*. 2019;24(1):18-e24. PMID: 30126861
22. Sym SJ, Hong J, Park J, et al. A randomized phase II study of biweekly irinotecan monotherapy or a combination of irinotecan plus 5-fluorouracil/leucovorin (mFOLFIRI) in patients with metastatic gastric adenocarcinoma refractory to or progressive after first-line chemotherapy. *Cancer Chemother Pharmacol*. 2013;71(2):481-8. PMID: 23192279
23. Thuss-Patience PC, Kretzschmar A, Bichev D, et al. Survival advantage for irinotecan versus best supportive care as second-line chemotherapy in gastric cancer--a randomised phase III study of the Arbeitsgemeinschaft Internistische Onkologie (AIO). *Eur J Cancer*. 2011;47(15):2306-14. PMID: 21742485
24. Ilson DH, Wadleigh RG, Leichman LP, et al. Paclitaxel given by a weekly 1-h infusion in advanced esophageal cancer. *Ann Oncol*. 2007;18(5):898-902. PMID: 17351256
25. Shitara K, Bang YJ, Iwasa S, et al. Trastuzumab deruxtecan in previously treated HER2-positive gastric cancer. *N Engl J Med*. 2020;382(25):2419-30. PMID: 32469182
26. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Esophageal and Esophagogastric Cancers (Version 3.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
27. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Gastric Cancer (Version 2.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
28. Tepper J, Krasna MJ, Niedzwiecki D, et al. Phase III trial of trimodality therapy with cisplatin, fluorouracil, radiotherapy, and surgery compared with surgery alone for esophageal cancer: CALGB 9781. *J Clin Oncol*. 2008;26(7):1086-92. PMID: 18309943
29. Heath EI, Burtress BA, Heitmiller RF, et al. Phase II evaluation of preoperative chemoradiation and postoperative adjuvant chemotherapy for squamous cell and adenocarcinoma of the esophagus. *J Clin Oncol*. 2000;18(4):868-76. PMID: 10673530
30. Alderson D, Cunningham D, Nankivell M, et al. Neoadjuvant cisplatin and fluorouracil versus epirubicin, cisplatin, and capecitabine followed by resection in patients with oesophageal adenocarcinoma (UK MRC OE05): an open-label, randomised phase 3 trial. *Lancet Oncol*. 2017;18(9):1249-60. PMID: 28784312
31. Ychou M, Boige V, Pignon JP, et al. Perioperative chemotherapy compared with surgery alone for resectable gastroesophageal adenocarcinoma: an FNCLCC and FFCD multicenter phase III trial. *J Clin Oncol*. 2011;29(13):1715-21. PMID: 21444866
32. Lee SS, Kim SB, Park SI, et al. Capecitabine and cisplatin chemotherapy (XP) alone or sequentially combined chemoradiotherapy containing XP regimen in patients with three different settings of stage IV esophageal cancer. *Jpn J Clin Oncol*. 2007;37(11):829-35. PMID: 17951334
33. Khushalani NI, Leichman CG, Proulx G, et al. Oxaliplatin in combination with protracted-infusion fluorouracil and radiation: report of a clinical trial for patients with esophageal cancer. *J Clin Oncol*. 2002;20(12):2844-50. PMID: 12065561
34. Park SH, Sohn TS, Lee J, et al. Phase III trial to compare adjuvant chemotherapy with capecitabine and cisplatin versus concurrent chemoradiotherapy in gastric cancer: final report of the Adjuvant Chemoradiotherapy in Stomach Tumors trial, including survival and subset analyses. *J Clin Oncol*. 2015;33(28):3130-6. PMID: 25559811
35. Lee J, Lim DH, Kim S, et al. Phase III trial comparing capecitabine plus cisplatin versus capecitabine plus cisplatin with concurrent capecitabine radiotherapy in completely resected gastric cancer with D2 lymph node dissection: the ARTIST trial. *J Clin Oncol*. 2012;30(3):268-73. PMID: 22184384
36. Guimbaud R, Louvet C, Ries P, et al. Prospective, randomized, multicenter, phase III study of fluorouracil, leucovorin, and irinotecan versus epirubicin, cisplatin, and capecitabine in advanced gastric adenocarcinoma: a French intergroup (Federation Francophone de Cancerologie Digestive, Federation Nationale des Centres de Lutte Contre le Cancer, and Groupe Cooperateur Multidisciplinaire en Oncologie) study. *J Clin Oncol*. 2014;32(31):3520-6. PMID: 25287828
37. van Meerten E, Eskens FA, van Gameren EC, et al. First-line treatment with oxaliplatin and capecitabine in patients with advanced or metastatic oesophageal cancer: a phase II study. *British Journal of Cancer*. 2007;96(9):1348-52. PMID: 17437008
38. Muro K, Hamaguchi T, Ohtsu A, et al. A phase II study of single-agent docetaxel in patients with metastatic esophageal cancer. *Ann Oncol*. 2004;15(6):955-9. PMID: 15151954
39. Shah MA, Janjigian YY, Stoller R, et al. Randomized multicenter phase II study of modified docetaxel, cisplatin, and fluorouracil (DCF) versus DCF plus growth factor support in patients with metastatic gastric adenocarcinoma: a study of the US Gastric Cancer Consortium. *J Clin Oncol*. 2015;33(33):3874-9. PMID: 26438119
40. Rosenberg AJ, Rademaker A, Hochster HS, et al. Docetaxel, oxaliplatin, and 5-fluorouracil (DOF) in metastatic and unresectable gastric/gastroesophageal junction adenocarcinoma: a phase II study with long-term follow-up. *Oncologist*. 2019;24(8):1039-e642. PMID: 31138725
41. Petrasch S, Welt A, Reinacher A, et al. Chemotherapy with cisplatin and paclitaxel in patients with locally advanced, recurrent or metastatic oesophageal cancer. *British Journal of Cancer*. 1998;78(4):511-4. PMID: 9716036
42. El-Rays BF, Shields A, Zalupski M, et al. A phase II study of carboplatin and paclitaxel in esophageal cancer. *Ann Oncol*. 2004;15(6):960-5. PMID: 15151955
43. Ford HE, Marshall A, Bridgewater JA, et al. Docetaxel versus active symptom control for refractory oesophagogastric adenocarcinoma (COUGAR-02): an open-label, phase 3 randomised controlled trial. *Lancet Oncol*. 2014;15(1):78-86. PMID: 24332238
44. Ilson DH, Saltz L, Enzinger P, et al. Phase II trial of weekly irinotecan plus cisplatin in advanced esophageal cancer. *J Clin Oncol*. 1999;17(10):3270-5. PMID: 10506629
45. Ilson DH. Phase II trial of weekly irinotecan/cisplatin in advanced esophageal cancer. *Oncology (Williston)*. 2004;18(14 Suppl 14):22-5. PMID: 15685830
46. Fuchs CS, Tomasek J, Yong CJ, et al. Ramucirumab monotherapy for previously treated advanced gastric or gastro-oesophageal junction adenocarcinoma (REGARD): an international, randomised, multicentre, placebo-controlled, phase 3 trial. *Lancet*. 2014;383(9911):31-9. PMID: 24094768
47. Wilke H, Muro K, Van Cutsem E, et al. Ramucirumab plus paclitaxel versus placebo plus paclitaxel in patients with previously treated advanced gastric or gastro-oesophageal junction adenocarcinoma (RAINBOW): a double-blind, randomised phase 3 trial. *Lancet Oncol*. 2014;15(11):1224-35. PMID: 25240821
48. Hoeppner J, Brunner T, Lordick G, et al. Prospective randomized multicenter phase III trial comparing perioperative chemotherapy (FLOT protocol) to neoadjuvant chemoradiation (CROSS protocol) in patients with adenocarcinoma of the esophagus (ESOPEC trial). *J Clin Oncol*. 2024;42(17 Suppl):abstract LBA1. PMID: none

49. Hoeppner J, Brunner T, Schmoor C, et al. Perioperative chemotherapy or preoperative chemoradiotherapy in esophageal cancer. *N Engl J Med.* 2025;392(4):323-35. PMID: 39842010
50. Leong T, Smithers BM, Michael M, et al. Preoperative chemoradiotherapy for resectable gastric cancer. *N Engl J Med.* 2024;391(19):1810-21. PMID: 39282905
51. Minsky BD, Pajak TF, Ginsberg RJ, et al. INT 0123 (Radiation Therapy Oncology Group 94-05) phase III trial of combined-modality therapy for esophageal cancer: high-dose versus standard-dose radiation therapy. *J Clin Oncol.* 2002;20(5):1167-74. PMID: 11870157
52. Bedenne L, Michel P, Bouche O, et al. Chemoradiation followed by surgery compared with chemoradiation alone in squamous cancer of the esophagus: FFCD 9102. *J Clin Oncol.* 2007;25(10):1160-8. PMID: 17401004
53. Javle MM, Yang G, Nwogu CE, et al. Capecitabine, oxaliplatin and radiotherapy: a phase IB neoadjuvant study for esophageal cancer with gene expression analysis. *Cancer Invest.* 2009;27(2):193-200. PMID: 19235592
54. Conroy T, Galais MP, Raoul JL, et al. Definitive chemoradiotherapy with FOLFOX versus fluorouracil and cisplatin in patients with oesophageal cancer (PRODIGE5/ACCORD17): final results of a randomised, phase 2/3 trial. *Lancet Oncol.* 2014;15(3):305-14. PMID: 24556041
55. Urba SG, Orringer MB, Iannettoni M, et al. Concurrent cisplatin, paclitaxel, and radiotherapy as preoperative treatment for patients with locoregional esophageal carcinoma. *Cancer.* 2003;98(10):2177-83. PMID: 14601087
56. Li QQ, Liu MZ, Hu YH, et al. Definitive concomitant chemoradiotherapy with docetaxel and cisplatin in squamous esophageal carcinoma. *Dis Esophagus.* 2010;23(3):253-9. PMID: 19732130
57. Day FL, Leong T, Ngan S, et al. Phase I trial of docetaxel, cisplatin and concurrent radical radiotherapy in locally advanced oesophageal cancer. *British Journal of Cancer.* 2011;104(2):265-71. PMID: 21157450
58. Albiges L, Bourlon MT, Chacon M, et al. Subcutaneous versus intravenous nivolumab for renal cell carcinoma. *Ann Oncol.* 2025;36(1):99-107. PMID: 39288844
59. Noh SH, Park SR, Yang HK, et al. Adjuvant capecitabine plus oxaliplatin for gastric cancer after D2 gastrectomy (CLASSIC): 5-year follow-up of an open-label, randomised phase 3 trial. *Lancet Oncol.* 2014;15(12):1389-96. PMID: 25439693
60. Lordick F, Mauer ME, Stocker G, et al. Adjuvant immunotherapy in patients with resected gastric and oesophagogastric junction cancer following preoperative chemotherapy with high risk for recurrence (ypN+ and/or R1): European Organisation of Research and Treatment of Cancer (EORTC) 1707 VESTIGE study. *Ann Oncol.* 2025;36(2):197-207. PMID: 39542422
61. Wolff K, Wein A, Reulbach U, et al. Weekly high-dose 5-fluorouracil as a 24-h infusion and sodium folinic acid (AIO regimen) plus irinotecan in patients with locally advanced nonresectable and metastatic adenocarcinoma or squamous cell carcinoma of the oesophagus: a phase II trial. *Anticancer Drugs.* 2009;20(3):165-73. PMID: 19125117
62. Janjigian YY, Shitara K, Moehler M, et al. First-line nivolumab plus chemotherapy versus chemotherapy alone for advanced gastric, gastro-oesophageal junction, and oesophageal adenocarcinoma (CheckMate 649): a randomised, open-label, phase 3 trial. *Lancet.* 2021;398(10294):27-40. PMID: 34102137
63. Moehler M, Xiao H, Blum SI, et al. Health-related quality of life with nivolumab plus chemotherapy versus chemotherapy in patients with advanced gastric/gastroesophageal junction cancer or esophageal adenocarcinoma from CheckMate 649. *J Clin Oncol.* 2023;41(35):5388-99. PMID: 37713657
64. Janjigian YY, Ajani JA, Moehler M, et al. First-line nivolumab plus chemotherapy for advanced gastric, gastroesophageal junction, and esophageal adenocarcinoma: 3-year follow-up of the phase III CheckMate 649 trial. *J Clin Oncol.* 2024;42(17):2012-20. PMID: 38382001
65. Mansoor W, Joo S, Norquist JM, et al. Health-related quality-of-life analysis from KEYNOTE-590: pembrolizumab plus chemotherapy versus chemotherapy for advanced esophageal cancer. *Oncologist.* 2024;29(10):e1324-e35. PMID: 38815152
66. Kang YK, Chen LT, Ryu MH, et al. Nivolumab plus chemotherapy versus placebo plus chemotherapy in patients with HER2-negative, untreated, unresectable advanced or recurrent gastric or gastro-oesophageal junction cancer (ATTRACTON-4): a randomised, multicentre, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2022;23(2):234-47. PMID: 35030335
67. Luo H, Lu J, Bai Y, et al. Effect of camrelizumab vs placebo added to chemotherapy on survival and progression-free survival in patients with advanced or metastatic esophageal squamous cell carcinoma: the ESCORT-1st randomized clinical trial. *JAMA.* 2021;326(10):916-25. PMID: 34519801
68. Kim GM, Jeung HC, Rha SY, et al. A randomized phase II trial of S-1-oxaliplatin versus capecitabine-oxaliplatin in advanced gastric cancer. *Eur J Cancer.* 2012;48(4):518-26. PMID: 22243774
69. Hall PS, Swinson D, Waters JS, et al. Optimizing chemotherapy for frail and elderly patients (pts) with advanced gastroesophageal cancer (aGOAC): the GO2 phase III trial. *J Clin Oncol.* 2019;37(Suppl 15):abstract 4006. PMID: none
70. Albertsson M, Johansson B, Friesland S, et al. Phase II studies on docetaxel alone every third week, or weekly in combination with gemcitabine in patients with primary locally advanced, metastatic, or recurrent esophageal cancer. *Med Oncol.* 2007;24(4):407-12. PMID: 17917090
71. Tebbutt NC, Price TJ, Ferraro DA, et al. Panitumumab added to docetaxel, cisplatin and fluoropyrimidine in oesophagogastric cancer: ATTAX3 phase II trial. *British Journal of Cancer.* 2016;114(5):505-9. PMID: 26867157
72. Blum Murphy MA, Qiao W, Mewada N, et al. A phase I/II study of docetaxel, oxaliplatin, and fluorouracil (D-FOX) chemotherapy in patients with untreated locally unresectable or metastatic adenocarcinoma of the stomach and gastroesophageal junction. *Am J Clin Oncol.* 2018;41(4):321-5. PMID: 26908161
73. Ilson DH, Forastiere A, Arquette M, et al. A phase II trial of paclitaxel and cisplatin in patients with advanced carcinoma of the esophagus. *Cancer J.* 2000;6(5):316-23. PMID: 11079171
74. Gadjeel SM, Shields AF, Heilbrun LK, et al. Phase II study of paclitaxel and carboplatin in patients with advanced gastric cancer. *Am J Clin Oncol.* 2003;26(1):37-41. PMID: 12576922
75. Shitara K, Van Cutsem E, Bang YJ, et al. Efficacy and safety of pembrolizumab or pembrolizumab plus chemotherapy vs chemotherapy alone for patients with first-line, advanced gastric cancer: the KEYNOTE-062 phase 3 randomized clinical trial. *JAMA Oncol.* 2020;6(10):1571-80. PMID: 32880601
76. Ohtsu A, Shimada Y, Shirao K, et al. Randomized phase III trial of fluorouracil alone versus fluorouracil plus cisplatin versus uracil and tegafur plus mitomycin in patients with unresectable, advanced gastric cancer: the Japan Clinical Oncology Group study (JCOG9205). *J Clin Oncol.* 2003;21(1):54-9. PMID: 12506170
77. Hong YS, Song SY, Lee SI, et al. A phase II trial of capecitabine in previously untreated patients with advanced and/or metastatic gastric cancer. *Ann Oncol.* 2004;15(9):1344-7. PMID: 15319239
78. Ajani JA, Ilson DH, Daugherty K, et al. Activity of taxol in patients with squamous cell carcinoma and adenocarcinoma of the esophagus. *J Natl Cancer Inst.* 1994;86(14):1086-91. PMID: 7912736

79. Ajani JA, Fodor MB, Tjulandin SA, et al. Phase II multi-institutional randomized trial of docetaxel plus cisplatin with or without fluorouracil in patients with untreated, advanced gastric, or gastroesophageal adenocarcinoma. *J Clin Oncol.* 2005;23(24):5660-7. PMID: 16110025
80. Kim JY, Do YR, Park KU, et al. A multi-center phase II study of docetaxel plus cisplatin as first-line therapy in patients with metastatic squamous cell esophageal cancer. *Cancer Chemother Pharmacol.* 2010;66(1):31-6. PMID: 19763571
81. Shitara K, Lordick F, Bang YJ, et al. Zolbetuximab plus mFOLFOX6 in patients with CLDN18.2-positive, HER2-negative, untreated, locally advanced unresectable or metastatic gastric or gastro-oesophageal junction adenocarcinoma (SPOTLIGHT): a multicentre, randomised, double-blind, phase 3 trial. *Lancet.* 2023;401(10389):1655-68. PMID: 37068504
82. Kang YK, Shah MA, Shitara K, et al. First-line (1L) zolbetuximab + chemotherapy in patients (pts) with claudin 18.2 (CLDN18.2) +, HER2-, locally advanced (LA) unresectable or metastatic gastric or gastroesophageal junction (mG/GEJ) adenocarcinoma: a pooled final analysis of SPOTLIGHT + GLOW. *Ann Oncol.* 2024;35(Suppl 2):S895. PMID: none
83. Shitara K, Shah MA, Lordick F, et al. Zolbetuximab in gastric or gastroesophageal junction adenocarcinoma. *N Engl J Med.* 2024;391(12):1159-62. PMID: 39282934
84. Shah MA, Shitara K, Ajani JA, et al. Zolbetuximab plus CAPOX in CLDN18.2-positive gastric or gastroesophageal junction adenocarcinoma: the randomized, phase 3 GLOW trial. *Nat Med.* 2023;29(8):2133-41. PMID: 37524953
85. Qiu MZ, Oh DY, Kato K, et al. Tislelizumab plus chemotherapy versus placebo plus chemotherapy as first line treatment for advanced gastric or gastro-oesophageal junction adenocarcinoma: RATIONALE-305 randomised, double blind, phase 3 trial. *BMJ.* 2024;385:e078876. PMID: 38806195
86. Janjigian YY, Kawazoe A, Weber P, et al. Initial data from the phase 3 KEYNOTE-811 study of trastuzumab and chemotherapy with or without pembrolizumab for HER2-positive metastatic gastric or gastroesophageal junction (G/GEJ) cancer. *Ann Oncol.* 2021;32(Suppl 3):S227. PMID: none
87. Janjigian YY, Kawazoe A, Yaney P, et al. The KEYNOTE-811 trial of dual PD-1 and HER2 blockade in HER2-positive gastric cancer. *Nature.* 2021;600(7890):727-30. PMID: 34912120
88. Janjigian YY, Kawazoe A, Bai Y, et al. Pembrolizumab plus trastuzumab and chemotherapy for HER2-positive gastric or gastro-oesophageal junction adenocarcinoma: interim analyses from the phase 3 KEYNOTE-811 randomised placebo-controlled trial. *Lancet.* 2023;402(10418):2197-208. PMID: 37871604
89. Janjigian YY, Kawazoe A, Bai Y, et al. Pembrolizumab in HER2-Positive gastric cancer. *N Engl J Med.* 2024;391(14):1360-2. PMID: 39282917
90. Al-Batran SE, Van Cutsem E, Oh SC, et al. Quality-of-life and performance status results from the phase III RAINBOW study of ramucirumab plus paclitaxel versus placebo plus paclitaxel in patients with previously treated gastric or gastroesophageal junction adenocarcinoma. *Ann Oncol.* 2016;27(4):673-9. PMID: 26747859
91. Randon G, Lonardi S, Fassan M, et al. Ramucirumab plus paclitaxel as switch maintenance versus continuation of first-line oxaliplatin-based chemotherapy in patients with advanced HER2-negative gastric or gastro-oesophageal junction cancer (ARMANI): a randomised, open-label, multicentre, phase 3 trial. *Lancet Oncol.* 2024;25(12):1539-50. PMID: 39557058
92. Pavlakis N, Sjoquist KM, Martin AJ, et al. Regorafenib for the treatment of advanced gastric cancer (INTEGRATE): a multinational placebo-controlled phase II trial. *J Clin Oncol.* 2016;34(23):2728-35. PMID: 27325864
93. Shitara K, Ozguroglu M, Bang YJ, et al. Pembrolizumab versus paclitaxel for previously treated, advanced gastric or gastro-oesophageal junction cancer (KEYNOTE-061): a randomised, open-label, controlled, phase 3 trial. *Lancet.* 2018;392(10142):123-33. PMID: 29880231
94. Shah MA, Kojima T, Hochhauser D, et al. Efficacy and safety of pembrolizumab for heavily pretreated patients with advanced, metastatic adenocarcinoma or squamous cell carcinoma of the esophagus: the phase 2 KEYNOTE-180 study. *JAMA Oncol.* 2019;5(4):546-50. PMID: 30570649
95. Kojima T, Muro K, Francois E, et al. Pembrolizumab versus chemotherapy as second-line therapy for advanced esophageal cancer: phase III KEYNOTE-181 study. *J Clin Oncol.* 2019;37(4 Suppl):abstract 2. PMID: none
96. Kojima T, Shah MA, Muro K, et al. Randomized phase III KEYNOTE-181 study of pembrolizumab versus chemotherapy in advanced esophageal cancer. *J Clin Oncol.* 2020;38(35):4138-48. PMID: 33026938
97. Adenis A, Kulkarni AS, Girotto GC, et al. Impact of pembrolizumab versus chemotherapy as second-line therapy for advanced esophageal cancer on health-related quality of life in KEYNOTE-181. *J Clin Oncol.* 2022;40(4):382-91. PMID: 34730989
98. Chao J, Fuchs CS, Shitara K, et al. Assessment of pembrolizumab therapy for the treatment of microsatellite instability-high gastric or gastroesophageal junction cancer among patients in the KEYNOTE-059, KEYNOTE-061, and KEYNOTE-062 clinical trials. *JAMA Oncol.* 2021;7(6):895-902. PMID: 33792646
99. Fuchs CS, Doi T, Jang RW, et al. Safety and efficacy of pembrolizumab monotherapy in patients with previously treated advanced gastric and gastroesophageal junction cancer: phase 2 clinical KEYNOTE-059 trial. *JAMA Oncol.* 2018;4(5):e180013. PMID: 29543932
100. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255
101. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science.* 2017;357(6349):409-13. PMID: 28596308
102. Lala M, Li TR, de Alwis DP, et al. A six-weekly dosing schedule for pembrolizumab in patients with cancer based on evaluation using modelling and simulation. *Eur J Cancer.* 2020;131:68-75. PMID: 32305010
103. Shitara K, Doi T, Dvorkin M, et al. Trifluridine/tipiracil versus placebo in patients with heavily pretreated metastatic gastric cancer (TAGS): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2018;19(11):1437-48. PMID: 30355453
104. Demetri GD, Paz-Ares L, Farago AF, et al. Efficacy and safety of entrectinib in patients with NTRK fusion-positive (NTRK-fp) tumors: pooled analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol.* 2018;29(Suppl 8):vii713. PMID: none
105. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
106. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
107. Sym SJ, Ryu MH, Lee JL, et al. Salvage chemotherapy with biweekly irinotecan, plus 5-fluorouracil and leucovorin in patients with advanced gastric cancer previously treated with fluoropyrimidine, platinum, and taxane. *Am J Clin Oncol.* 2008;31(2):151-6. PMID: 18391599
108. Assersohn L, Brown G, Cunningham D, et al. Phase II study of irinotecan and 5-fluorouracil/leucovorin in patients with primary refractory or relapsed advanced oesophageal and gastric carcinoma. *Ann Oncol.* 2004;15(1):64-9. PMID: 14679122
109. Tabernero J, Yoshino T, Cohn AL, et al. Ramucirumab versus placebo in combination with second-line FOLFIRI in patients with metastatic colorectal carcinoma that progressed during or after first-line therapy with bevacizumab, oxaliplatin, and a fluoropyrimidine (RAISE): a randomised, double-blind, multicentre, phase 3 study. *Lancet Oncol.* 2015;16(5):499-508. PMID: 25877855

110. Wang F, Shen L, Guo W, et al. Fruquintinib plus paclitaxel versus placebo plus paclitaxel for gastric or gastroesophageal junction adenocarcinoma: the randomized phase 3 FRUTIGA trial. *Nat Med.* 2024;30(8):2189-98. PMID: 38824242
111. Cunningham D, Allum WH, Stenning SP, et al. Perioperative chemotherapy versus surgery alone for resectable gastroesophageal cancer. *N Engl J Med.* 2006;355(1):11-20. PMID: 16822992
112. Cunningham D, Starling N, Rao S, et al. Capecitabine and oxaliplatin for advanced esophagogastric cancer. *N Engl J Med.* 2008;358(1):36-46. PMID: 18172173
113. Enzinger PC, Burtress BA, Niedzwiecki D, et al. CALGB 80403 (Alliance)/E1206: a randomized phase II study of three chemotherapy regimens plus cetuximab in metastatic esophageal and gastroesophageal junction cancers. *J Clin Oncol.* 2016;34(23):2736-42. PMID: 27382098

## Head and Neck Cancer Pathways

### Adjuvant Therapy (Post-Operative Systemic Therapy)

- Stages II-IV (M0) - Candidate for Local Therapy
  - **Non-Nasopharyngeal** (Squamous Cell Carcinoma)
    - High dose cisplatin\* with concurrent RT<sup>1-13</sup>

### First Line of Therapy (1<sup>st</sup> Line)

- Stages II- IVB M0 (Primary/definitive) Candidate for Local Therapy
  - **Non-Nasopharyngeal** (Squamous Cell Carcinoma)
    - High dose cisplatin\* with concurrent RT<sup>1-13</sup>
- Stages III-IV, Unresectable and Recurrent
  - **Non-Nasopharyngeal** (Squamous Cell Carcinoma)
    - Carboplatin, fluorouracil (5FU), and cetuximab (Erbitux)<sup>14</sup>
    - Cisplatin, fluorouracil (5FU), and cetuximab (Erbitux)<sup>14</sup>
    - Pembrolizumab (Keytruda)<sup>†15, 16</sup> (**CPS ≥ 20**)
    - Pembrolizumab (Keytruda), cisplatin, and fluorouracil (5FU)<sup>†15, 16</sup> (**CPS ≥ 1**)
    - Pembrolizumab (Keytruda), carboplatin, and fluorouracil (5FU)<sup>†15, 16</sup> (**CPS ≥ 1**)
- Stage II-IVA Candidate for Local Therapy (M0) (Induction, Primary/definitive and sequential therapy)
  - Nasopharynx
    - Cisplatin with concurrent RT<sup>9, 12, 13, 17</sup>
    - Cisplatin and gemcitabine (Gemzar) followed by concurrent cisplatin/RT<sup>18</sup>
- Stages IVB and Recurrent (Metastatic and Recurrent Disease)
  - Nasopharynx
    - Cisplatin, gemcitabine (Gemzar), and toripalimab (Loqtorzi)<sup>19</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Stages IV and Recurrent
  - **Non-Nasopharyngeal** (Squamous Cell Carcinoma)
    - Nivolumab (Opdivo)<sup>20,21</sup> (**CPS ≥ 1**)
    - Paclitaxel<sup>22</sup>

\* Cisplatin dosed at 100 mg/m<sup>2</sup> every three to four weeks OR dosed at 40 mg/m<sup>2</sup> weekly over the course of radiotherapy.

† Administered at a dose of 200 mg every 3 weeks OR 400 mg every 6 weeks per the FDA label

## Head and Neck Cancer References

### NCCN Clinical Practice Guidelines: Head and Neck Cancers V4.2024

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Adelstein DJ, Li Y, Adams GL, et al. An intergroup phase III comparison of standard radiation therapy and two schedules of concurrent chemoradiotherapy in patients with unresectable squamous cell head and neck cancer. *J Clin Oncol.* 2003;21(1):92-8. PMID: 12506176
2. Bachaud JM, Cohen-Jonathan E, Alzieu C, et al. Combined postoperative radiotherapy and weekly cisplatin infusion for locally advanced head and neck carcinoma: final report of a randomized trial. *Int J Radiat Oncol Biol Phys.* 1996;36(5):999-1004. PMID: 8985019
3. Bernier J, Cooper JS, Pajak TF, et al. Defining risk levels in locally advanced head and neck cancers: a comparative analysis of concurrent postoperative radiation plus chemotherapy trials of the EORTC (#22931) and RTOG (# 9501). *Head Neck.* 2005;27(10):843-50. PMID: 16161069
4. Bernier J, Domenge C, Ozsahin M, et al. Postoperative irradiation with or without concomitant chemotherapy for locally advanced head and neck cancer. *N Engl J Med.* 2004;350(19):1945-52. PMID: 15128894
5. Cooper JS, Pajak TF, Forastiere AA, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. *N Engl J Med.* 2004;350(19):1937-44. PMID: 15128893
6. Cooper JS, Zhang Q, Pajak TF, et al. Long-term follow-up of the RTOG 9501/intergroup phase III trial: postoperative concurrent radiation therapy and chemotherapy in high-risk squamous cell carcinoma of the head and neck. *Int J Radiat Oncol Biol Phys.* 2012;84(5):1198-205. PMID: 22749632
7. Forastiere AA, Goepfert H, Maor M, et al. Concurrent chemotherapy and radiotherapy for organ preservation in advanced laryngeal cancer. *N Engl J Med.* 2003;349(22):2091-8. PMID: 14645636
8. Forastiere AA, Zhang Q, Weber RS, et al. Long-term results of RTOG 91-11: a comparison of three nonsurgical treatment strategies to preserve the larynx in patients with locally advanced larynx cancer. *J Clin Oncol.* 2013;31(7):845-52. PMID: 23182993
9. Gillison ML, Trott AM, Harris J, et al. Radiotherapy plus cetuximab or cisplatin in human papillomavirus-positive oropharyngeal cancer (NRG Oncology RTOG 1016): a randomised, multicentre, non-inferiority trial. *Lancet.* 2019;393(10166):40-50. PMID: 30449625
10. Kiyota N, Tahara M, Fujii H, et al. Phase II/III trial of post-operative chemoradiotherapy comparing 3-weekly cisplatin with weekly cisplatin in high-risk patients with squamous cell carcinoma of head and neck (JCOG1008). *J Clin Oncol.* 2020;38(15 Suppl):abstract 6502. PMID: none
11. Kiyota N, Tahara M, Mizusawa J, et al. Weekly cisplatin plus radiation for postoperative head and neck cancer (JCOG1008): a multicenter, noninferiority, phase II/III randomized controlled trial. *J Clin Oncol.* 2022;40(18):1980-90. PMID: 35230884
12. Noronha V, Joshi A, Patil VM, et al. Once-a-week versus once-every-3-weeks cisplatin chemoradiation for locally advanced head and neck cancer: a phase III randomized noninferiority trial. *J Clin Oncol.* 2018;36(11):1064-72. PMID: 29220295
13. Sztruz P, Wouters K, Kiyota N, et al. Weekly low-dose versus three-weekly high-dose cisplatin for concurrent chemoradiation in locoregionally advanced non-nasopharyngeal head and neck cancer: a systematic review and meta-analysis of aggregate data. *Oncologist.* 2017;22(9):1056-66. PMID: 28533474
14. Vermorken JB, Mesia R, Rivera F, et al. Platinum-based chemotherapy plus cetuximab in head and neck cancer. *N Engl J Med.* 2008;359(11):1116-27. PMID: 18784101
15. Burtness B, Harrington KJ, Greil R, et al. Pembrolizumab alone or with chemotherapy versus cetuximab with chemotherapy for recurrent or metastatic squamous cell carcinoma of the head and neck (KEYNOTE-048): a randomised, open-label, phase 3 study. *Lancet.* 2019;394(10212):1915-28. PMID: 31679945
16. Burtness B, Rischin D, Greil R, et al. Pembrolizumab alone or with chemotherapy for recurrent/metastatic head and neck squamous cell carcinoma in KEYNOTE-048: subgroup analysis by programmed death ligand-1 combined positive score. *J Clin Oncol.* 2022;40(21):2321-32. PMID: 35333599
17. Al-Sarraf M, LeBlanc M, Giri PG, et al. Chemoradiotherapy versus radiotherapy in patients with advanced nasopharyngeal cancer: phase III randomized Intergroup study 0099. *J Clin Oncol.* 1998;16(4):1310-7. PMID: 9552031
18. Zhang Y, Chen L, Hu GQ, et al. Gemcitabine and cisplatin induction chemotherapy in nasopharyngeal carcinoma. *N Engl J Med.* 2019;381(12):1124-35. PMID: 31150573
19. Mai HQ, Chen QY, Chen D, et al. Toripalimab plus chemotherapy for recurrent or metastatic nasopharyngeal carcinoma: the JUPITER-02 randomized clinical trial. *JAMA.* 2023;330(20):1961-70. PMID: 38015220
20. Ferris RL, Blumenschein G, Jr., Fayette J, et al. Nivolumab for recurrent squamous-cell carcinoma of the head and neck. *N Engl J Med.* 2016;375(19):1856-67. PMID: 27718784
21. Gillison ML, Blumenschein G, Jr., Fayette J, et al. CheckMate 141: 1-year update and subgroup analysis of nivolumab as first-line therapy in patients with recurrent/metastatic head and neck cancer. *Oncologist.* 2018;23(9):1079-82. PMID: 29866947
22. Grau JJ, Caballero M, Verger E, et al. Weekly paclitaxel for platin-resistant stage IV head and neck cancer patients. *Acta Otolaryngol (Stockh).* 2009;129(11):1294-9. PMID: 19863327
23. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Head and Neck Cancers (Version 4.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
24. Posner MR, Hershock DM, Blajman CR, et al. Cisplatin and fluorouracil alone or with docetaxel in head and neck cancer. *N Engl J Med.* 2007;357(17):1705-15. PMID: 17960013
25. Hitt R, Lopez-Pousa A, Martinez-Trufero J, et al. Phase III study comparing cisplatin plus fluorouracil to paclitaxel, cisplatin, and fluorouracil induction chemotherapy followed by chemoradiotherapy in locally advanced head and neck cancer. *J Clin Oncol.* 2005;23(34):8636-45. PMID: 16275937

26. Denis F, Garaud P, Bardet E, et al. Final results of the 94-01 French Head and Neck Oncology and Radiotherapy Group randomized trial comparing radiotherapy alone with concomitant radiochemotherapy in advanced-stage oropharynx carcinoma. *J Clin Oncol.* 2004;22(1):69-76. PMID: 14657228
27. Calais G, Alfonsi M, Bardet E, et al. Randomized trial of radiation therapy versus concomitant chemotherapy and radiation therapy for advanced-stage oropharynx carcinoma. *J Natl Cancer Inst.* 1999;91(24):2081-6. PMID: 10601378
28. Bonner JA, Harari PM, Giralt J, et al. Radiotherapy plus cetuximab for squamous-cell carcinoma of the head and neck. *N Engl J Med.* 2006;354(6):567-78. PMID: 16467544
29. Vermorken JB, Trigo J, Hitt R, et al. Open-label, uncontrolled, multicenter phase II study to evaluate the efficacy and toxicity of cetuximab as a single agent in patients with recurrent and/or metastatic squamous cell carcinoma of the head and neck who failed to respond to platinum-based therapy. *J Clin Oncol.* 2007;25(16):2171-7. PMID: 17538161
30. Burtness B, Goldwasser MA, Flood W, et al. Phase III randomized trial of cisplatin plus placebo compared with cisplatin plus cetuximab in metastatic/recurrent head and neck cancer: an Eastern Cooperative Oncology Group study. *J Clin Oncol.* 2005;23(34):8646-54. PMID: 16314626
31. Guigay J, Fayette J, Dillies AF, et al. Cetuximab, docetaxel, and cisplatin as first-line treatment in patients with recurrent or metastatic head and neck squamous cell carcinoma: a multicenter, phase II GORTEC study. *Ann Oncol.* 2015;26(9):1941-7. PMID: 26109631
32. Martinez-Trufero J, Isla D, Adansa JC, et al. Phase II study of capecitabine as palliative treatment for patients with recurrent and metastatic squamous head and neck cancer after previous platinum-based treatment. *British Journal of Cancer.* 2010;102(12):1687-91. PMID: 20485287
33. Al-Sarraf M, Metch B, Kish J, et al. Platinum analogs in recurrent and advanced head and neck cancer: a Southwest Oncology Group and Wayne State University study. *Cancer Treat Rep.* 1987;71(7-8):723-6. PMID: 3300967
34. Samlowski WE, Moon J, Kuebler JP, et al. Evaluation of the combination of docetaxel/carboplatin in patients with metastatic or recurrent squamous cell carcinoma of the head and neck (SCCHN): a Southwest Oncology Group phase II study. *Cancer Invest.* 2007;25(3):182-8. PMID: 17530488
35. Clark JI, Hofmeister C, Choudhury A, et al. Phase II evaluation of paclitaxel in combination with carboplatin in advanced head and neck carcinoma. *Cancer.* 2001;92(9):2334-40. PMID: 11745288
36. Jacobs C, Lyman G, Velez-Garcia E, et al. A phase III randomized study comparing cisplatin and fluorouracil as single agents and in combination for advanced squamous cell carcinoma of the head and neck. *J Clin Oncol.* 1992;10(2):257-63. PMID: 1732427
37. Gibson MK, Li Y, Murphy B, et al. Randomized phase III evaluation of cisplatin plus fluorouracil versus cisplatin plus paclitaxel in advanced head and neck cancer (E1395): an intergroup trial of the Eastern Cooperative Oncology Group. *J Clin Oncol.* 2005;23(15):3562-7. PMID: 15908667
38. Forastiere AA, Metch B, Schuller DE, et al. Randomized comparison of cisplatin plus fluorouracil and carboplatin plus fluorouracil versus methotrexate in advanced squamous-cell carcinoma of the head and neck: a Southwest Oncology Group study. *J Clin Oncol.* 1992;10(8):1245-51. PMID: 1634913
39. Guardiola E, Peyrade F, Chaigneau L, et al. Results of a randomised phase II study comparing docetaxel with methotrexate in patients with recurrent head and neck cancer. *Eur J Cancer.* 2004;40(14):2071-6. PMID: 15341981
40. Chen L, Hu CS, Chen XZ, et al. Adjuvant chemotherapy in patients with locoregionally advanced nasopharyngeal carcinoma: long-term results of a phase 3 multicentre randomised controlled trial. *Eur J Cancer.* 2017;75:150-8. PMID: 28235726
41. Chow LQM, Haddad R, Gupta S, et al. Antitumor activity of pembrolizumab in biomarker-unselected patients with recurrent and/or metastatic head and neck squamous cell carcinoma: results from the phase Ib KEYNOTE-012 expansion cohort. *J Clin Oncol.* 2016;34(32):3838-45. PMID: 27646946
42. Seiwert TY, Burtness B, Mehra R, et al. Safety and clinical activity of pembrolizumab for treatment of recurrent or metastatic squamous cell carcinoma of the head and neck (KEYNOTE-012): an open-label, multicentre, phase 1b trial. *Lancet Oncol.* 2016;17(7):956-65. PMID: 27247226
43. Cohen EEW, Soulieres D, Le Tourneau C, et al. Pembrolizumab versus methotrexate, docetaxel, or cetuximab for recurrent or metastatic head-and-neck squamous cell carcinoma (KEYNOTE-040): a randomised, open-label, phase 3 study. *Lancet.* 2019;10(167):156-67. PMID: 30509740
44. Chan AT, Hsu MM, Goh BC, et al. Multicenter, phase II study of cetuximab in combination with carboplatin in patients with recurrent or metastatic nasopharyngeal carcinoma. *J Clin Oncol.* 2005;23(15):3568-76. PMID: 15809453
45. Jin Y, Shi YX, Cai XY, et al. Comparison of five cisplatin-based regimens frequently used as the first-line protocols in metastatic nasopharyngeal carcinoma. *J Cancer Res Clin Oncol.* 2012;138(10):1717-25. PMID: 22684794
46. Zhang L, Zhang Y, Huang PY, et al. Phase II clinical study of gemcitabine in the treatment of patients with advanced nasopharyngeal carcinoma after the failure of platinum-based chemotherapy. *Cancer Chemother Pharmacol.* 2008;61(1):33-8. PMID: 17909810
47. Stewart JS, Cohen EE, Licitra L, et al. Phase III study of gefitinib compared with intravenous methotrexate for recurrent squamous cell carcinoma of the head and neck *J Clin Oncol.* 2009;27(11):1864-71. PMID: 19289630
48. Pointreau Y, Garaud P, Chapet S, et al. Randomized trial of induction chemotherapy with cisplatin and 5-fluorouracil with or without docetaxel for larynx preservation. *J Natl Cancer Inst.* 2009;101(7):498-506. PMID: 19318632
49. Janoray G, Pointreau Y, Garaud P, et al. Long-term results of a multicenter randomized phase III trial of induction chemotherapy with cisplatin, 5-fluorouracil, +/- docetaxel for larynx preservation. *J Natl Cancer Inst.* 2016;108(4):djv368. PMID: 26681800
50. Vermorken JB, Remenar E, van Herpen C, et al. Cisplatin, fluorouracil, and docetaxel in unresectable head and neck cancer. *N Engl J Med.* 2007;357(17):1695-704. PMID: 17960012
51. Haddad RI, Posner M, Hitt R, et al. Induction chemotherapy in locally advanced squamous cell carcinoma of the head and neck: role, controversy, and future directions. *Ann Oncol.* 2018;29(5):1130-40. PMID: 29635316
52. Haddad R, O'Neill A, Rabinowitz G, et al. Induction chemotherapy followed by concurrent chemoradiotherapy (sequential chemoradiotherapy) versus concurrent chemoradiotherapy alone in locally advanced head and neck cancer (PARADIGM): a randomised phase 3 trial. *Lancet Oncol.* 2013;14(3):257-64. PMID: 23414589
53. Chitapanarux I, Lorvidhaya V, Kamnerdsupaphon P, et al. Chemoradiation comparing cisplatin versus carboplatin in locally advanced nasopharyngeal cancer: randomised, non-inferiority, open trial. *Eur J Cancer.* 2007;43(9):1399-406. PMID: 17467265
54. Lefebvre JL, Pointreau Y, Rolland F, et al. Induction chemotherapy followed by either chemoradiotherapy or bioradiotherapy for larynx preservation: the TREMLIN randomized phase II study. *J Clin Oncol.* 2013;31(7):853-9. PMID: 23341517
55. Bourhis J, Sire C, Graff P, et al. Concomitant chemoradiotherapy versus acceleration of radiotherapy with or without concomitant chemotherapy in locally advanced head and neck carcinoma (GORTEC 99-02): an open-label phase 3 randomised trial. *Lancet Oncol.* 2012;13(2):145-53. PMID: 22261362
56. Bonner JA, Harari PM, Giralt J, et al. Radiotherapy plus cetuximab for locoregionally advanced head and neck cancer: 5-year survival data from a phase 3 randomised trial, and relation between cetuximab-induced rash and survival. *Lancet Oncol.* 2010;11(1):21-8. PMID: 19897418

57. Machiels JP, Tao Y, Licitra L, et al. Pembrolizumab plus concurrent chemoradiotherapy versus placebo plus concurrent chemoradiotherapy in patients with locally advanced squamous cell carcinoma of the head and neck (KEYNOTE-412): a randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2024;25(5):572-87. PMID: 38561010
58. Harrington KJ, Burtness B, Greil R, et al. Pembrolizumab with or without chemotherapy in recurrent or metastatic head and neck squamous cell carcinoma: updated results of the phase III KEYNOTE-048 study. *J Clin Oncol.* 2023;41(4):790-802. PMID: 36219809
59. Herbst RS, Arquette M, Shin DM, et al. Phase II multicenter study of the epidermal growth factor receptor antibody cetuximab and cisplatin for recurrent and refractory squamous cell carcinoma of the head and neck. *J Clin Oncol.* 2005;23(24):5578-87. PMID: 16009949
60. Glisson BS, Murphy BA, Frenette G, et al. Phase II trial of docetaxel and cisplatin combination chemotherapy in patients with squamous cell carcinoma of the head and neck. *J Clin Oncol.* 2002;20(6):1593-9. PMID: 11896109
61. Tang LL, Guo R, Zhang N, et al. Effect of radiotherapy alone vs radiotherapy with concurrent chemoradiotherapy on survival without disease relapse in patients with low-risk nasopharyngeal carcinoma: a randomized clinical trial. *JAMA.* 2022;328(8):728-36. PMID: 35997729
62. Zhang Y, Chen L, Hu GQ, et al. Final overall survival analysis of gemcitabine and cisplatin induction chemotherapy in nasopharyngeal carcinoma: a multicenter, randomized phase III trial. *J Clin Oncol.* 2022;40(22):2420-5. PMID: 35709465
63. Chan AT, Leung SF, Ngan RK, et al. Overall survival after concurrent cisplatin-radiotherapy compared with radiotherapy alone in locoregionally advanced nasopharyngeal carcinoma. *J Natl Cancer Inst.* 2005;97(7):536-9. PMID: 15812080
64. Yan M, Kumachev A, Siu LL, et al. Chemoradiotherapy regimens for locoregionally advanced nasopharyngeal carcinoma: a bayesian network meta-analysis. *Eur J Cancer.* 2015;51(12):1570-9. PMID: 26044925
65. Dechaphunkul T, Pruegsanusak K, Sangthawan D, et al. Concurrent chemoradiotherapy with carboplatin followed by carboplatin and 5-fluorouracil in locally advanced nasopharyngeal carcinoma. *Head Neck Oncol.* 2011;3(30):[8 p.]. PMID: 21639934
66. Sun Y, Li WF, Chen NY, et al. Induction chemotherapy plus concurrent chemoradiotherapy versus concurrent chemoradiotherapy alone in locoregionally advanced nasopharyngeal carcinoma: a phase 3, multicentre, randomised controlled trial. *Lancet Oncol.* 2016;17(11):1509-20. PMID: 27686945
67. Bae WK, Hwang JE, Shim HJ, et al. Phase II study of docetaxel, cisplatin, and 5-FU induction chemotherapy followed by chemoradiotherapy in locoregionally advanced nasopharyngeal cancer. *Cancer Chemother Pharmacol.* 2010;65(3):589-95. PMID: 19830427
68. Chen YP, Tang LL, Yang Q, et al. Induction chemotherapy plus concurrent chemoradiotherapy in endemic nasopharyngeal carcinoma: individual patient data pooled analysis of four randomized trials. *Clin Cancer Res.* 2018;24(8):1824-33. PMID: 29431618
69. Liu X, Zhang Y, Yang KY, et al. Induction-concurrent chemoradiotherapy with or without sintilimab in patients with locoregionally advanced nasopharyngeal carcinoma in China (CONTINUUM): a multicentre, open-label, parallel-group, randomised, controlled, phase 3 trial. *Lancet.* 2024;403(10445):2720-31. PMID: 38824941
70. Gillison ML, Blumenschein G, Fayette J, et al. Long-term outcomes with nivolumab as first-line treatment in recurrent or metastatic head and neck cancer: subgroup analysis of CheckMate 141. *Oncologist.* 2022;27(2):e194-e8. PMID: 35641218
71. Leong SS, Wee J, Tay MH, et al. Paclitaxel, carboplatin, and gemcitabine in metastatic nasopharyngeal carcinoma: a Phase II trial using a triplet combination. *Cancer.* 2005;103(3):569-75. PMID: 15611975
72. Zhang L, Huang Y, Hong S, et al. Gemcitabine plus cisplatin versus fluorouracil plus cisplatin in recurrent or metastatic nasopharyngeal carcinoma: a multicentre, randomised, open-label, phase 3 trial. *Lancet.* 2016;388(10054):1883-92. PMID: 27567279
73. Hong S, Zhang Y, Yu G, et al. Gemcitabine plus cisplatin versus fluorouracil plus cisplatin as first-line therapy for recurrent or metastatic nasopharyngeal carcinoma: final overall survival analysis of GEM20110714 phase III study. *J Clin Oncol.* 2021;39(29):3273-82. PMID: 34379443
74. Liu LT, Liu H, Huang Y, et al. Concurrent chemoradiotherapy followed by adjuvant cisplatin-gemcitabine versus cisplatin-fluorouracil chemotherapy for N2-3 nasopharyngeal carcinoma: a multicentre, open-label, randomised, controlled, phase 3 trial. *Lancet Oncol.* 2023;24(7):798-810. PMID: 37290468
75. Catimel G, Verweij J, Mattijsen V, et al. Docetaxel (Taxotere®): an active drug for the treatment of patients with advanced squamous cell carcinoma of the head and neck. *Ann Oncol.* 1994;5(6):533-7. PMID: 7918125
76. Wang FH, Wei XL, Feng J, et al. Efficacy, safety, and correlative biomarkers of toripalimab in previously treated recurrent or metastatic nasopharyngeal carcinoma: a phase II clinical trial (POLARIS-02). *J Clin Oncol.* 2021;39(7):704-12. PMID: 33492986
77. Taylor SG, Murthy AK, Vannetzel JM, et al. Randomized comparison of neoadjuvant cisplatin and fluorouracil infusion followed by radiation versus concomitant treatment in advanced head and neck cancer. *J Clin Oncol.* 1994;12(2):385-95. PMID: 8113846
78. Garden AS, Harris J, Vokes EE, et al. Preliminary results of Radiation Therapy Oncology Group 97-03: a randomized phase II trial of concurrent radiation and chemotherapy for advanced squamous cell carcinomas of the head and neck. *J Clin Oncol.* 2004;22(14):2856-64. PMID: 15254053
79. Degardin M, Oliveira J, Geoffrois L, et al. An EORTC-ECSG phase II study of vinorelbine in patients with recurrent and/or metastatic squamous cell carcinoma of the head and neck. *Ann Oncol.* 1998;9(10):1103-7. PMID: 9834823
80. Li WZ, Lv X, Hu D, et al. Effect of induction chemotherapy with paclitaxel, cisplatin, and capecitabine vs cisplatin and fluorouracil on failure-free survival for patients with stage IVA to IVB nasopharyngeal carcinoma: a multicenter phase 3 randomized clinical trial. *JAMA Oncol.* 2022;8(5):706-14. PMID: 35323856
81. Chen C, Wang FH, Wang ZQ, et al. Salvage gemcitabine-vinorelbine chemotherapy in patients with metastatic nasopharyngeal carcinoma pretreated with platinum-based chemotherapy. *Oral Oncol.* 2012;48(11):1146-51. PMID: 22748450

## Hepatocellular Carcinoma Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- Unresectable, Metastatic, Recurrent Disease
  - Atezolizumab (Tecentriq) and bevacizumab<sup>1,2</sup>
  - Sorafenib (Nexavar) – **Termed 7/14/2025**

### Second Line of Therapy (2<sup>nd</sup> Line)

- Unresectable, Metastatic, Recurrent Disease
  - Cabozantinib (Cabometyx)<sup>3</sup>
  - Regorafenib (Stivarga)<sup>4</sup>

# Hepatocellular Carcinoma References

## NCCN Practice Guidelines: Hepatocellular Carcinoma Version 1.2025

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1. Finn RS, Qin S, Ikeda M, et al. Atezolizumab plus bevacizumab in unresectable hepatocellular carcinoma. *N Engl J Med.* 2020;382(20):1894-905. PMID: 32402160
2. Galle PR, Finn RS, Qin S, et al. Patient-reported outcomes (PROs) from the phase III IMBrave150 trial of atezolizumab (atezo) + bevacizumab (bev) vs sorafenib (sor) as first-line treatment (tx) for patients (pts) with unresectable hepatocellular carcinoma (HCC). *J Clin Oncol.* 2020;38(4 Suppl):abstract 476. PMID: none
3. Abou-Alfa GK, Meyer T, Cheng AL, et al. Cabozantinib in patients with advanced and progressing hepatocellular carcinoma. *N Engl J Med.* 2018;379(1):54-63. PMID: 29972759
4. Bruix J, Qin S, Merle P, et al. Regorafenib for patients with hepatocellular carcinoma who progressed on sorafenib treatment (RESORCE): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet.* 2017;389(10064):56-66. PMID: 27932229
5. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Hepatocellular Carcinoma (Version 1.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
6. Cheng AL, Qin S, Ikeda M, et al. Updated efficacy and safety data from IMBrave150: atezolizumab plus bevacizumab vs. sorafenib for unresectable hepatocellular carcinoma. *J Hepatol.* 2022;76(4):862-73. PMID: 34902530
7. Burotto M, Zvirbule Z, Mochalova A, et al. IMscin001 part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications. *Ann Oncol.* 2023;34(8):693-702. PMID: 37268157
8. Burotto M, Zvirbule Z, Mochalova A, et al. Corrigendum to 'IMscin001 Part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications': [Annals of Oncology 34 (2023) p693-702]. *Ann Oncol.* 2024;35(5):482. PMID: 38195363
9. Llovet JM, Ricci S, Mazzaferro V, et al. Sorafenib in advanced hepatocellular carcinoma. *N Engl J Med.* 2008;359(4):378-90. PMID: 18650514
10. Cheng AL, Kang YK, Chen Z, et al. Efficacy and safety of sorafenib in patients in the Asia-Pacific region with advanced hepatocellular carcinoma: a phase III randomised, double-blind, placebo-controlled trial. *Lancet Oncol.* 2009;10(1):25-34. PMID: 19095497
11. Miller AA, Murry DJ, Owzar K, et al. Phase I and pharmacokinetic study of sorafenib in patients with hepatic or renal dysfunction: CALGB 60301. *J Clin Oncol.* 2009;27(11):1800-5. PMID: 19255312
12. Kudo M, Finn RS, Qin S, et al. Lenvatinib versus sorafenib in first-line treatment of patients with unresectable hepatocellular carcinoma: a randomised phase 3 non-inferiority trial. *Lancet.* 2018;391(10126):1163-73. PMID: 29433850
13. Alsina A, Kudo M, Vogel A, et al. Subsequent anticancer medication following first-line lenvatinib: a posthoc responder analysis from the phase 3 REFLECT study in unresectable hepatocellular carcinoma. *J Clin Oncol.* 2019;37(4 Suppl):abstract 371. PMID: none
14. Qin S, Bi F, Gu S, et al. Donafenib versus sorafenib in first-line treatment of unresectable or metastatic hepatocellular carcinoma: a randomized, open-label, parallel-controlled phase II-III trial. *J Clin Oncol.* 2021;39(27):3002-11. PMID: 34185551
15. Abou-Alfa GK, Chan SL, Kudo M, et al. Phase 3 randomized, open-label, multicenter study of tremelimumab (T) and durvalumab (D) as first-line therapy in patients (pts) with unresectable hepatocellular carcinoma (uHCC): HIMALAYA. *J Clin Oncol.* 2022;40(4 Suppl):abstract 379. PMID: none
16. Abou-Alfa GK, Lau G, Kudo M, et al. Tremelimumab plus durvalumab in unresectable hepatocellular carcinoma. *NEJM Evid.* 2022;1(8):EVIDoaa2100070. PMID: 38319882
17. Sangro B, Chan SL, Kelley RK, et al. Four-year overall survival update from the phase III HIMALAYA study of tremelimumab plus durvalumab in unresectable hepatocellular carcinoma. *Ann Oncol.* 2024;35(5):448-57. PMID: 38382875
18. Sangro B, Galle PR, Kelley RK, et al. Patient-reported outcomes from the phase III HIMALAYA study of tremelimumab plus durvalumab in unresectable hepatocellular carcinoma. *J Clin Oncol.* 2024;42(23):2790-9. PMID: 38805668
19. Rimassa L, Chan SL, Sangro B, et al. Five-year overall survival update from the HIMALAYA study of tremelimumab plus durvalumab in unresectable HCC. *J Hepatol.* 2025:[Epub ahead of print]. PMID: 40222621
20. Kelley RK, Rimassa L, Cheng AL, et al. Cabozantinib plus atezolizumab versus sorafenib for advanced hepatocellular carcinoma (COSMIC-312): a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2022;23(8):995-1008. PMID: 35798016
21. Yau T, Kaseb A, Cheng AL, et al. Cabozantinib plus atezolizumab versus sorafenib for advanced hepatocellular carcinoma (COSMIC-312): final results of a randomised phase 3 study. *Lancet Gastroenterol Hepatol.* 2024;9(4):310-22. PMID: 38364832
22. Qin S, Chan SL, Gu S, et al. Camrelizumab plus rioceranib versus sorafenib as first-line therapy for unresectable hepatocellular carcinoma (CARES-310): a randomised, open-label, international phase 3 study. *Lancet.* 2023;402(10408):1133-46. PMID: 37499670
23. Decaens T, Yau T, Kudo M, et al. Nivolumab (NIVO) plus ipilimumab (IPI) vs lenvatinib (LEN) or sorafenib (SOR) as first-line (1L) treatment for unresectable hepatocellular carcinoma (uHCC): expanded analyses from CheckMate 9DW. *Ann Oncol.* 2024;35(Suppl 2):S657. PMID: none
24. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
25. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156

26. El-Khoueiry AB, Sangro B, Yau T, et al. Nivolumab in patients with advanced hepatocellular carcinoma (CheckMate 040): an open-label, non-comparative, phase 1/2 dose escalation and expansion trial. Lancet. 2017;389(10088):2492-502. PMID: 28434648
27. Crocenzi TS, El-Khoueiry AB, Yau TC, et al. Nivolumab (nivo) in sorafenib (sor)-naive and-experienced pts with advanced hepatocellular carcinoma (HCC): CheckMate 040 study. J Clin Oncol. 2017;35(15 Suppl):abstract 4013. PMID: none
28. Kudo M, Matilla A, Santoro A, et al. Checkmate-040: nivolumab (NIVO) in patients (pts) with advanced hepatocellular carcinoma (aHCC) and Child-Pugh B (CPB) status. J Clin Oncol. 2019;37(4 Suppl):abstract 327. PMID: none
29. Kambhampati S, Bauer KE, Bracci PM, et al. Nivolumab in patients with advanced hepatocellular carcinoma and Child-Pugh class B cirrhosis: safety and clinical outcomes in a retrospective case series. Cancer. 2019;125(18):3234-41. PMID: 31154669
30. Albiges L, Bourlon MT, Chacon M, et al. Subcutaneous versus intravenous nivolumab for renal cell carcinoma. Ann Oncol. 2025;36(1):99-107. PMID: 39288844
31. Yau T, Kang YK, Kim TY, et al. Efficacy and safety of nivolumab plus ipilimumab in patients with advanced hepatocellular carcinoma previously treated with sorafenib: the CheckMate 040 randomized clinical trial. JAMA Oncol. 2020;6(11):e204564. PMID: 33001135
32. Melero I, Yau T, Kang YK, et al. Nivolumab plus ipilimumab combination therapy in patients with advanced hepatocellular carcinoma previously treated with sorafenib: 5-year results from CheckMate 040. Ann Oncol. 2024;35(6):537-48. PMID: 38844309
33. Zhu AX, Kang YK, Yen CJ, et al. REACH-2: a randomized, double-blind, placebo-controlled phase 3 study of ramucirumab versus placebo as second-line treatment in patients with advanced hepatocellular carcinoma (HCC) and elevated baseline alpha-fetoprotein (AFP) following first-line sorafenib. J Clin Oncol. 2018;36(15 Suppl):abstract 4003. PMID: none
34. Zhu AX, Park JO, Ryoo BY, et al. Ramucirumab versus placebo as second-line treatment in patients with advanced hepatocellular carcinoma following first-line therapy with sorafenib (REACH): a randomised, double-blind, multicentre, phase 3 trial. Lancet Oncol. 2015;16(7):859-70. PMID: 26095784
35. Yau T, Park JW, Finn RS, et al. CheckMate 459: a randomized, multi-center phase III study of nivolumab (NIVO) vs sorafenib (SOR) as first-line (1L) treatment in patients (pts) with advanced hepatocellular carcinoma (aHCC). Ann Oncol. 2019;30 (Suppl 5):v874-v5. PMID: none
36. Yau T, Park JW, Finn RS, et al. Nivolumab versus sorafenib in advanced hepatocellular carcinoma (CheckMate 459): a randomised, multicentre, open-label, phase 3 trial. Lancet Oncol. 2022;23(10):77-90. PMID: 34914889

## Hodgkin Lymphoma Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- Stages IA-IIB\* (Early Stage)
  - Classical Hodgkin's Lymphoma, Favorable and Unfavorable Risk
    - **ABVD:** doxorubicin (Adriamycin), bleomycin, vinblastine, and dacarbazine (DTIC) ± ISRT†<sup>1-9</sup>
- Stages IIIA-IVB\* (Advanced Stage)
  - Classical Hodgkin's Lymphoma
    - **ABVD:** doxorubicin (Adriamycin), bleomycin, vinblastine, and dacarbazine (DTIC) ± ISRT†<sup>10-14</sup>
    - **A-AVD:** brentuximab vedotin (Adcetris), doxorubicin (Adriamycin), vinblastine, and dacarbazine<sup>15</sup>
    - **Nivolumab-AVD:** nivolumab (Opdivo), doxorubicin (Adriamycin), vinblastine, and dacarbazine<sup>16, 17</sup>

\* With or without extranodal disease

† ISRT – Involved site radiation therapy

## Hodgkin Lymphoma References

### NCCN Clinical Practice Guidelines: Hodgkin Lymphoma V4.2024

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1. Advani RH, Hong F, Fisher RI, et al. Randomized phase III trial comparing ABVD plus radiotherapy with the Stanford V regimen in patients with stages I or II locally extensive, bulky mediastinal Hodgkin lymphoma: a subset analysis of the North American Intergroup E2496 Trial. *J Clin Oncol.* 2015;33(17):1936-42. PMID: 25897153
2. Bonadonna G, Bonfante V, Viviani S, et al. ABVD plus subtotal nodal versus involved-field radiotherapy in early-stage Hodgkin's disease: long-term results. *J Clin Oncol.* 2004;22(14):2835-41. PMID: 15199092
3. Eich HT, Diehl V, Gorgen H, et al. Intensified chemotherapy and dose-reduced involved-field radiotherapy in patients with early unfavorable Hodgkin's lymphoma: final analysis of the German Hodgkin Study Group HD11 trial. *J Clin Oncol.* 2010;28(27):4199-206. PMID: 20713848
4. Engert A, Plutschow A, Eich HT, et al. Reduced treatment intensity in patients with early-stage Hodgkin's lymphoma. *N Engl J Med.* 2010;363(7):640-52. PMID: 20818855
5. Ferme C, Thomas J, Brice P, et al. ABVD or BEACOPPbaseline along with involved-field radiotherapy in early-stage Hodgkin lymphoma with risk factors: results of the European Organisation for Research and Treatment of Cancer (EORTC)-Groupe d'Etude des Lymphomes de l'Adulte (GELA) H9-U intergroup randomised trial. *Eur J Cancer.* 2017;81:45-55. PMID: 28601705
6. Meyer RM, Gospodarowicz MK, Connors JM, et al. ABVD alone versus radiation-based therapy in limited-stage Hodgkin's lymphoma. *N Engl J Med.* 2012;366(5):399-408. PMID: 22149921
7. Radford J, Illidge T, Counsell N, et al. Results of a trial of PET-directed therapy for early-stage Hodgkin's lymphoma. *N Engl J Med.* 2015;372(17):1598-607. PMID: 25901426
8. Sasse S, Brockelmann PJ, Goergen H, et al. Long-term follow-up of contemporary treatment in early-stage Hodgkin lymphoma: updated analyses of the German Hodgkin Study Group HD7, HD8, HD10, and HD11 trials. *J Clin Oncol.* 2017;35(18):1999-2007. PMID: 28418763
9. von Tresckow B, Plutschow A, Fuchs M, et al. Dose-intensification in early unfavorable Hodgkin's lymphoma: final analysis of the German Hodgkin Study Group HD14 trial. *J Clin Oncol.* 2012;30(9):907-13. PMID: 22271480
10. Carde P, Karrasch M, Fortpied C, et al. Eight cycles of ABVD versus four cycles of BEACOPPescalated plus four cycles of BEACOPPbaseline in stage III to IV, International Prognostic Score >= 3, high-risk Hodgkin lymphoma: first results of the phase III EORTC 20012 Intergroup trial. *J Clin Oncol.* 2016;34(17):2028-36. PMID: 27114593
11. Duggan DB, Petroni GR, Johnson JL, et al. Randomized comparison of ABVD and MOPP/ABV hybrid for the treatment of advanced Hodgkin's disease: report of an intergroup trial. *J Clin Oncol.* 2003;21(4):607-14. PMID: 12586796
12. Federico M, Luminari S, Iannitto E, et al. ABVD compared with BEACOPP compared with CEC for the initial treatment of patients with advanced Hodgkin's lymphoma: results from the HD2000 Gruppo Italiano per lo Studio dei Linfomi trial. *J Clin Oncol.* 2009;27(5):805-11. PMID: 19124807
13. Gordon LI, Hong F, Fisher RI, et al. Randomized phase III trial of ABVD versus Stanford V with or without radiation therapy in locally extensive and advanced-stage Hodgkin lymphoma: an intergroup study coordinated by the Eastern Cooperative Oncology Group (E2496). *J Clin Oncol.* 2013;31(6):684-91. PMID: 23182987
14. Merli F, Luminari S, Gobbi PG, et al. Long-term results of the HD2000 trial comparing ABVD versus BEACOPP versus COPP-EBV-CAD in untreated patients with advanced Hodgkin lymphoma: a study by Fondazione Italiana Linfomi. *J Clin Oncol.* 2016;34(11):1175-81. PMID: 26712220
15. Ansell SM, Radford J, Connors JM, et al. Overall survival with brentuximab vedotin in stage III or IV Hodgkin's lymphoma. *N Engl J Med.* 2022;387(14):310-20. PMID: 35830649
16. Armitage JO, Longo DL. Therapy for Hodgkin's lymphoma - can it get any better? *N Engl J Med.* 2024;391(15):1452-4. PMID: 39413381
17. Herrera AF, LeBlanc M, Castellino SM, et al. Nivolumab+AVD in advanced-stage classic Hodgkin's lymphoma. *N Engl J Med.* 2024;391(15):1379-89. PMID: 39413375
18. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Hodgkin Lymphoma (Version 4.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
19. Johnson P, Federico M, Kirkwood A, et al. Adapted treatment guided by interim PET-CT scan in advanced Hodgkin's lymphoma. *N Engl J Med.* 2016;374(25):2419-29. PMID: 27332902
20. Engert A, Havercamp H, Kobe C, et al. Reduced-intensity chemotherapy and PET-guided radiotherapy in patients with advanced stage Hodgkin's lymphoma (HD15 trial): a randomised, open-label, phase 3 non-inferiority trial. *Lancet.* 2012;379(9828):1791-9. PMID: 22480758
21. Andre MPE, Girinsky T, Federico M, et al. Early positron emission tomography response-adapted treatment in stage I and II Hodgkin lymphoma: final results of the randomized EORTC/LYSA/FIL H10 trial. *J Clin Oncol.* 2017;35(16):1786-94. PMID: 28291393
22. Federico M, Fortpied C, Stepanishyna Y, et al. Long-term follow-up of the response-adapted intergroup EORTC/LYSA/FIL H10 trial for localized Hodgkin lymphoma. *J Clin Oncol.* 2024;42(1):19-25. PMID: 37967311
23. Straus DJ, Jung SH, Pitcher B, et al. CALGB 50604: risk-adapted treatment of nonbulky early-stage Hodgkin lymphoma based on interim PET. *Blood.* 2018;132(10):1013-21. PMID: 30049811
24. Connors JM, Jurczak W, Straus DJ, et al. Brentuximab vedotin with chemotherapy for stage III or IV Hodgkin's lymphoma. *N Engl J Med.* 2018;378(4):331-44. PMID: 29224502
25. Straus DJ, Drugsz-Danecka M, Alekseev S, et al. Brentuximab vedotin with chemotherapy for stage III/IV classical Hodgkin lymphoma: 3-year update of the ECHELON-1 study. *Blood.* 2020;135(10):735-42. PMID: 31945149

26. Casasnovas RO, Bouabdallah R, Brice P, et al. PET-adapted treatment for newly diagnosed advanced Hodgkin lymphoma (AHL2011): a randomised, multicentre, non-inferiority, phase 3 study. Lancet Oncol. 2019;20(2):202-15. PMID: 30658935
27. Borchmann P, Goergen H, Kobe C, et al. PET-guided treatment in patients with advanced-stage Hodgkin's lymphoma (HD18): final results of an open-label, international, randomised phase 3 trial by the German Hodgkin Study Group. Lancet. 2018;390(10114):2790-802. PMID: 29061295
28. Advani RH, Hoppe RT, Baer D, et al. Efficacy of abbreviated Stanford V chemotherapy and involved-field radiotherapy in early-stage Hodgkin lymphoma: mature results of the G4 trial. Ann Oncol. 2013;24(4):1044-8. PMID: 23136225
29. Edwards-Bennett SM, Jacks LM, Moskowitz CH, et al. Stanford V program for locally extensive and advanced Hodgkin lymphoma: the Memorial Sloan-Kettering Cancer Center experience. Ann Oncol. 2010;21(3):574-81. PMID: 19759185

## Kidney Cancer (Clear Cell Carcinoma) Pathway

### First Line of Therapy (1<sup>st</sup> Line)

- Stages IV and Recurrent
    - Unfavorable Risk
      - Nivolumab (Opdivo) and cabozantinib (Cabometyx)<sup>1, 2</sup>
      - Nivolumab (Opdivo) and ipilimumab (Yervoy)<sup>3-5</sup>
      - Pembrolizumab (Keytruda) and axitinib (Inlyta)<sup>6</sup>
    - Favorable Risk
      - Nivolumab (Opdivo) and cabozantinib (Cabometyx)<sup>1, 2</sup>
      - Pembrolizumab (Keytruda) and axitinib (Inlyta)<sup>6</sup>
-

## Kidney Cancer (Clear Cell Carcinoma) References

### NCCN Practice Guideline: Kidney Cancer 3.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

The NCCN Guidelines® are a statement of consensus of its authors regarding their views of currently accepted approaches to treatment. Any clinician seeking to apply or consult any NCCN Guidelines® is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment. The National Comprehensive Cancer Network makes no warranties of any kind whatsoever regarding their content, use or application and disclaims any responsibility for their application or use in any way.

1. Choueiri TK, Powles T, Burotto M, et al. Nivolumab plus cabozantinib versus sunitinib for advanced renal-cell carcinoma. *N Engl J Med.* 2021;384(9):829-41. PMID: 33657295
2. Choueiri TK, Powles T, Burotto M, et al. Nivolumab + cabozantinib vs sunitinib in first-line treatment for advanced renal cell carcinoma: First results from the randomized phase III CheckMate 9ER trial. *Ann Oncol.* 2020;31(Suppl 4):S1159. PMID: none
3. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Kidney Cancer (Version 3.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
4. Motzer RJ, Tannir NM, McDermott DF, et al. Nivolumab plus ipilimumab versus sunitinib in advanced renal-cell carcinoma. *N Engl J Med.* 2018;378(14):1277-90. PMID: 29562145
5. Motzer RJ, Rini BI, McDermott DF, et al. Nivolumab plus ipilimumab versus sunitinib in first-line treatment for advanced renal cell carcinoma: extended follow-up of efficacy and safety results from a randomised, controlled, phase 3 trial. *Lancet Oncol.* 2019;20(10):1370-85. PMID: 31427204
6. Rini BI, Plimack ER, Stus V, et al. Pembrolizumab plus axitinib versus sunitinib for advanced renal-cell carcinoma. *N Engl J Med.* 2019;380(12):1116-27. PMID: 30779529
7. Sternberg CN, Hawkins RE, Wagstaff J, et al. A randomised, double-blind phase III study of pazopanib in patients with advanced and/or metastatic renal cell carcinoma: final overall survival results and safety update. *Eur J Cancer.* 2013;49(6):1287-96. PMID: 23321547
8. Motzer RJ, Hutson TE, Tomczak P, et al. Overall survival and updated results for sunitinib compared with interferon alfa in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2009;27(22):3584-90. PMID: 19487381
9. Gore ME, Szczylik C, Porta C, et al. Safety and efficacy of sunitinib for metastatic renal-cell carcinoma: an expanded-access trial. *Lancet Oncol.* 2009;10(8):757-63. PMID: 19615940
10. Motzer RJ, Hutson TE, Olsen MR, et al. Randomized phase II trial of sunitinib on an intermittent versus continuous dosing schedule as first-line therapy for advanced renal cell carcinoma. *J Clin Oncol.* 2012;30(12):1371-7. PMID: 22430274
11. Motzer RJ, Escudier B, McDermott DF, et al. Nivolumab versus everolimus in advanced renal-cell carcinoma. *N Engl J Med.* 2015;373(19):1803-13. PMID: 26406148
12. Motzer RJ, Escudier B, Tomczak P, et al. Axitinib versus sorafenib as second-line treatment for advanced renal cell carcinoma: overall survival analysis and updated results from a randomised phase 3 trial. *Lancet Oncol.* 2013;14(6):552-62. PMID: 23598172
13. Choueiri TK, Escudier B, Powles T, et al. Cabozantinib versus everolimus in advanced renal-cell carcinoma. *N Engl J Med.* 2015;373(19):1814-23. PMID: 26406150
14. Motzer RJ, Escudier B, Oudard S, et al. Phase 3 trial of everolimus for metastatic renal cell carcinoma : final results and analysis of prognostic factors. *Cancer.* 2010;116(18):4256-65. PMID: 20549832
15. Hainsworth JD, Rubin MS, Arrowsmith ER, et al. Pazopanib as second-line treatment after sunitinib or bevacizumab in patients with advanced renal cell carcinoma: a Sarah Cannon Oncology Research Consortium Phase II Trial. *Clin Genitourin Cancer.* 2013;11(3):270-5. PMID: 23665131
16. Sternberg CN, Davis ID, Mardiak J, et al. Pazopanib in locally advanced or metastatic renal cell carcinoma: results of a randomized phase III trial. *J Clin Oncol.* 2010;28(6):1061-8. PMID: 20100962
17. Escudier B, Roigas J, Gillessen S, et al. Phase II study of sunitinib administered in a continuous once-daily dosing regimen in patients with cytokine-refractory metastatic renal cell carcinoma. *J Clin Oncol.* 2009;27(25):4068-75. PMID: 19652072
18. Rini BI, Michaelson MD, Rosenberg JE, et al. Antitumor activity and biomarker analysis of sunitinib in patients with bevacizumab-refractory metastatic renal cell carcinoma. *J Clin Oncol.* 2008;26(22):3743-8. PMID: 18669461
19. Choueiri TK, Tomczak P, Park SH, et al. Adjuvant pembrolizumab after nephrectomy in renal-cell carcinoma. *N Engl J Med.* 2021;384(8):683-94. PMID: 34407342
20. Powles T, Tomczak P, Park SH, et al. Pembrolizumab versus placebo as post-nephrectomy adjuvant therapy for clear cell renal cell carcinoma (KEYNOTE-564): 30-month follow-up analysis of a multicentre, randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2022;23(9):1133-44. PMID: 36055304
21. Choueiri TK, Tomczak P, Park SH, et al. Patient-reported outcomes in KEYNOTE-564: adjuvant pembrolizumab versus placebo for renal cell carcinoma. *Oncologist.* 2024;29(2):142-50. PMID: 37589219
22. Choueiri TK, Tomczak P, Park SH, et al. Overall survival with adjuvant pembrolizumab in renal-cell carcinoma. *N Engl J Med.* 2024;380(15):1359-71. PMID: 38631003
23. Celli D, Choueiri TK, Hamilton M, et al. The relationship between health-related quality of life and overall survival in patients with advanced renal cell carcinoma in CheckMate 214. *Oncologist.* 2024;29(6):511-8. PMID: 38280218
24. Tannir NM, Albiges L, McDermott DF, et al. Nivolumab plus ipilimumab versus sunitinib for first-line treatment of advanced renal cell carcinoma: extended 8-year follow-up results of efficacy and safety from the phase III CheckMate 214 trial. *Ann Oncol.* 2024;35(11):1026-38. PMID: 39098455
25. Plimack ER, Powles T, Stus V, et al. Pembrolizumab plus axitinib versus sunitinib as first-line treatment of advanced renal cell carcinoma: 43-month follow-up of the phase 3 KEYNOTE-426 study. *Eur Urol.* 2023;84(5):449-54. PMID: 37500340
26. Motzer RJ, Powles T, Burotto M, et al. Nivolumab plus cabozantinib versus sunitinib in first-line treatment for advanced renal cell carcinoma (CheckMate 9ER): long-term follow-up results from an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2022;23(7):888-98. PMID: 35688173

27. Powles T, Burotto M, Escudier B, et al. Nivolumab plus cabozantinib versus sunitinib for first-line treatment of advanced renal cell carcinoma: extended follow-up from the phase III randomised CheckMate 9ER trial. *ESMO open.* 2024;9(5):102994. PMID: 38642472
28. Motzer R, Alekseev B, Rha SY, et al. Lenvatinib plus pembrolizumab or everolimus for advanced renal cell carcinoma. *N Engl J Med.* 2021;384(14):1289-300. PMID: 33616314
29. Choueiri TK, Eto M, Motzer R, et al. Lenvatinib plus pembrolizumab versus sunitinib as first-line treatment of patients with advanced renal cell carcinoma (CLEAR): extended follow-up from the phase 3, randomised, open-label study. *Lancet Oncol.* 2023;24(3):228-38. PMID: 36858721
30. Motzer R, Porta C, Alekseev B, et al. Health-related quality-of-life outcomes in patients with advanced renal cell carcinoma treated with lenvatinib plus pembrolizumab or everolimus versus sunitinib (CLEAR): a randomised, phase 3 study. *Lancet Oncol.* 2022;23(6):768-80. PMID: 35489363
31. Motzer RJ, Porta C, Eto M, et al. Lenvatinib plus pembrolizumab versus sunitinib in first-line treatment of advanced renal cell carcinoma: final prespecified overall survival analysis of CLEAR, a phase III study. *J Clin Oncol.* 2024;42(11):1222-8. PMID: 38227898
32. Motzer RJ, Penkov K, Haanen J, et al. Avelumab plus axitinib versus sunitinib for advanced renal-cell carcinoma. *N Engl J Med.* 2019;380(12):1103-15. PMID: 30779531
33. Choueiri TK, Penkov K, Uemura H, et al. Avelumab + axitinib vs sunitinib as first-line treatment for patients with advanced renal cell carcinoma: final analysis of the phase 3 JAVELIN Renal 101 trial. *Ann Oncol.* 2025;36(4):387-92. PMID: 39706335
34. Choueiri TK, Halabi S, Sanford BL, et al. Cabozantinib versus sunitinib as initial targeted therapy for patients with metastatic renal cell carcinoma of poor or intermediate risk: the Alliance A031203 CABOSUN trial. *J Clin Oncol.* 2017;35(6):591-7. PMID: 28199818
35. Motzer RJ, Hutson TE, Celli D, et al. Pazopanib versus sunitinib in metastatic renal-cell carcinoma. *N Engl J Med.* 2013;368(18):722-31. PMID: 23964934
36. Escudier B, Porta C, Bono P, et al. Randomized, controlled, double-blind, cross-over trial assessing treatment preference for pazopanib versus sunitinib in patients with metastatic renal cell carcinoma: PISCES Study. *J Clin Oncol.* 2014;32(14):1412-8. PMID: 24687826
37. Garnick MB. How to interpret patient preferences in selecting the best drug: are the current measurements up to the job? *J Clin Oncol.* 2014;32(14):1392-3. PMID: 24687838
38. Motzer RJ, Hutson TE, Tomczak P, et al. Sunitinib versus interferon alfa in metastatic renal-cell carcinoma. *N Engl J Med.* 2007;357(1):115-24. PMID: 17215529
39. Jonasch E, Slack RS, Geynisman DM, et al. Phase II study of two weeks on, one week off sunitinib scheduling in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2018;36(16):1588-93. PMID: 29641297
40. Ornstein MC, Wood LS, Elson P, et al. A phase II study of intermittent sunitinib in previously untreated patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2017;35(16):1764-9. PMID: 28113029
41. Ruiz-Morales JM, Swierkowski M, Wells JC, et al. First-line sunitinib versus pazopanib in metastatic renal cell carcinoma: results from the International Metastatic Renal Cell Carcinoma Database Consortium. *Eur J Cancer.* 2016;65:102-8. PMID: 27487293
42. Nolla K, Benjamin DJ, Celli D. Patient-reported outcomes in metastatic renal cell carcinoma trials using combinations versus sunitinib as first-line treatment. *Nat Rev Urol.* 2023;20(7):420-33. PMID: 36928615
43. Rini BI, Dorff TB, Elson P, et al. Active surveillance in metastatic renal-cell carcinoma: a prospective, phase 2 trial. *Lancet Oncol.* 2016;17(9):1317-24. PMID: 27498080
44. Yan XQ, Ye MJ, Zou Q, et al. Toripalimab plus axitinib versus sunitinib as first-line treatment for advanced renal cell carcinoma: RENOTORCH, a randomized, open-label, phase III study. *Ann Oncol.* 2024;35(2):190-9. PMID: 37872020
45. Choueiri TK, Powles T, Albiges L, et al. Cabozantinib plus nivolumab and ipilimumab in renal-cell carcinoma. *N Engl J Med.* 2023;388(19):1767-78. PMID: 37163623
46. Armstrong AJ, Halabi S, Eisen T, et al. Everolimus versus sunitinib for patients with metastatic non-clear cell renal cell carcinoma (ASPEN): a multicentre, open-label, randomised phase 2 trial. *Lancet Oncol.* 2016;17(3):378-88. PMID: 26794930
47. Tannir NM, Jonasch E, Albiges L, et al. Everolimus versus sunitinib prospective evaluation in metastatic non-clear cell renal cell carcinoma (ESPN): a randomized multicenter phase 2 trial. *Eur Urol.* 2016;69(5):866-74. PMID: 26626617
48. Ciccarese C, Iacovelli R, Brunelli M, et al. Addressing the best treatment for non-clear cell renal cell carcinoma: A meta-analysis of randomised clinical trials comparing VEGFR-TKis versus mTORi-targeted therapies. *Eur J Cancer.* 2017;83:237-46. PMID: 28756136
49. Park I, Lee SH, Lee JL. A multicenter phase II trial of axitinib in patients with recurrent or metastatic non-clear-cell renal cell carcinoma who had failed prior treatment with temsirolimus. *Clin Genitourin Cancer.* 2018;16(5):e997-e1002. PMID: 29903415
50. Irshad T, Olencki T, Zynger DL, et al. Bevacizumab in metastatic papillary renal cell carcinoma (PRCC). *J of Clin Oncol.* 2011;29(15 Suppl):abstract e15158. PMID: none
51. Srinivasan R, Su D, Stamatakis L, et al. Mechanism based targeted therapy for hereditary leiomyomatosis and renal cell cancer (HLRCC) and sporadic papillary renal cell carcinoma: Interim results from a phase 2 study of bevacizumab and erlotinib. *Eur J Cancer.* 2014;50(Suppl 6):[8 p.]. PMID: none
52. Voss MH, Molina AM, Chen YB, et al. Phase II trial and correlative genomic analysis of everolimus plus bevacizumab in advanced non-clear cell renal cell carcinoma. *J Clin Oncol.* 2016;34(32):3846-53. PMID: 27601542
53. Martinez Chanza N, Xie W, Asim Bilen M, et al. Cabozantinib in advanced non-clear-cell renal cell carcinoma: a multicentre, retrospective, cohort study. *Lancet Oncol.* 2019;20(4):581-90. PMID: 30827746
54. Campbell MT, Bilen MA, Shah AY, et al. Cabozantinib for the treatment of patients with metastatic non-clear cell renal cell carcinoma: a retrospective analysis. *Eur J Cancer.* 2018;104:188-94. PMID: 30380460
55. Blank CU, Bono P, Larkin JMG, et al. Safety and efficacy of everolimus in patients with non-clear cell renal cell carcinoma refractory to VEGF-targeted therapy: subgroup analysis of REACT. *J Clin Oncol.* 2012;30(5 Suppl):abstract 402. PMID: 71008684
56. Koh Y, Kim JY, Lim HY, et al. Phase II trial of RAD001 in renal cell carcinoma patients with non-clear cell histology. *J Clin Oncol.* 2012;30(15 Suppl):abstract 4544. PMID: none
57. Escudier B, Molinie V, Bracarda S, et al. Open-label phase 2 trial of first-line everolimus monotherapy in patients with papillary metastatic renal cell carcinoma: RAPTOR final analysis. *Eur J Cancer.* 2016;69:226-35. PMID: 27680407
58. Motzer RJ, Hutson TE, Ren M, et al. Independent assessment of lenvatinib plus everolimus in patients with metastatic renal cell carcinoma. *Lancet Oncol.* 2016;17(1):e4-5. PMID: 26758760
59. Cella D, Grunwald V, Nathan P, et al. Quality of life in patients with advanced renal cell carcinoma given nivolumab versus everolimus in CheckMate 025: a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2016;17(7):994-1003. PMID: 27283863
60. Koshkin VS, Barata PC, Zhang T, et al. Clinical activity of nivolumab in patients with non-clear cell renal cell carcinoma. *J Immunother Cancer.* 2018;6(1):9. PMID: 29378660

61. McKay RR, Bosse D, Xie W, et al. The clinical activity of PD-1/PD-L1 inhibitors in metastatic non-clear cell renal cell carcinoma. *Cancer Immunol Res.* 2018;6(7):758-65. PMID: 29748390
62. Rini BI, Escudier B, Tomczak P, et al. Comparative effectiveness of axitinib versus sorafenib in advanced renal cell carcinoma (AXIS): a randomised phase 3 trial. *Lancet.* 2011;378(9807):1931-9. PMID: 22056247
63. Escudier B, Michaelson MD, Motzer RJ, et al. Axitinib versus sorafenib in advanced renal cell carcinoma: subanalyses by prior therapy from a randomised phase III trial. *British Journal of Cancer.* 2014;110(12):2821-8. PMID: 24823696
64. Rini BI, de La Motte Rouge T, Harzstark AL, et al. Five-year survival in patients with cytokine-refractory metastatic renal cell carcinoma treated with axitinib. *Clin Genitourin Cancer.* 2013;11(2):107-14. PMID: 23391371
65. Choueiri TK, Escudier B, Powles T, et al. Cabozantinib versus everolimus in advanced renal cell carcinoma (METEOR): final results from a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2016;17(7):917-27. PMID: 27279544
66. Motzer RJ, Escudier B, Powles T, et al. Long-term follow-up of overall survival for cabozantinib versus everolimus in advanced renal cell carcinoma. *British Journal of Cancer.* 2018;118(9):1176-8. PMID: 29576624
67. Motzer RJ, Escudier B, Oudard S, et al. Efficacy of everolimus in advanced renal cell carcinoma: a double-blind, randomised, placebo-controlled phase III trial. *Lancet.* 2008;372(9637):449-56. PMID: 18653228
68. Bracarda S, Hutson TE, Porta C, et al. Everolimus in metastatic renal cell carcinoma patients intolerant to previous VEGFR-TKI therapy: a RECORD-1 subgroup analysis. *British Journal of Cancer.* 2012;106(9):1475-80. PMID: 22441644
69. Motzer RJ, Barrios CH, Kim TM, et al. Phase II randomized trial comparing sequential first-line everolimus and second-line sunitinib versus first-line sunitinib and second-line everolimus in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2014;32(25):2765-72. PMID: 25049330
70. Knox JJ, Barrios CH, Kim TM, et al. Final overall survival analysis for the phase II RECORD-3 study of first-line everolimus followed by sunitinib versus first-line sunitinib followed by everolimus in metastatic RCC. *Ann Oncol.* 2017;28(6):1339-45. PMID: 28327953
71. Motzer RJ, Hutson TE, Glen H, et al. Lenvatinib, everolimus, and the combination in patients with metastatic renal cell carcinoma: a randomised, phase 2, open-label, multicentre trial. [Erratum appears in Lancet Oncol. 2016 Jul;17 (7):e270; PMID: 27733289], [Erratum appears in Lancet Oncol. 2018 Oct;19(10):e509; PMID: 30303125]. *Lancet Oncol.* 2015;16(15):1473-82. PMID: 26482279
72. Bergerot C, Young Rha S, Pal S, et al. Health-related quality of life outcomes with two different starting doses of lenvatinib in combination with everolimus for previously treated renal cell carcinoma. *Oncologist.* 2023;28(1):59-71. PMID: 35881028
73. Hammers HJ, Plimack ER, Infante JR, et al. Safety and efficacy of nivolumab in combination with ipilimumab in metastatic renal cell carcinoma: the CheckMate 016 study. *J Clin Oncol.* 2017;35(34):3851-8. PMID: 28678668
74. Matrana MR, Duran C, Shetty A, et al. Outcomes of patients with metastatic clear-cell renal cell carcinoma treated with pazopanib after disease progression with other targeted therapies. *Eur J Cancer.* 2013;49(15):3169-75. PMID: 23810246
75. Motzer RJ, Michaelson MD, Redman BG, et al. Activity of SU11248, a multitargeted inhibitor of vascular endothelial growth factor receptor and platelet-derived growth factor receptor, in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2006;24(1):16-24. PMID: 16330672
76. Motzer RJ, Rini BI, Bukowski RM, et al. Sunitinib in patients with metastatic renal cell carcinoma. *JAMA.* 2006;295(21):2516-24. PMID: 16757724
77. Rini BI, Pal SK, Escudier BJ, et al. Tivozanib versus sorafenib in patients with advanced renal cell carcinoma (TIVO-3): a phase 3, multicentre, randomised, controlled, open-label study. *Lancet Oncol.* 2020;21(1):95-104. PMID: 31810797
78. Beckermann KE, Asnis-Albozez AG, Atkins MB, et al. Long-term survival in patients with relapsed/refractory advanced renal cell carcinoma treated with tivozanib: analysis of the phase III TIVO-3 trial. *Oncologist.* 2024;29(3):254-62. PMID: 38262444
79. Zugman M, McDermott DF, Escudier BJ, et al. Updated overall survival in patients with prior checkpoint inhibitor therapy in the phase III TIVO-3 study. *Oncologist.* 2025;30(2):[6 p.]. PMID: 39912344
80. Jonasch E, Donskov F, Iliopoulos O, et al. Phase II study of the oral HIF-2alpha inhibitor MK-6482 for Von Hippel-Lindau disease-associated renal cell carcinoma. *J Clin Oncol.* 2020;38(15):abstract 5003. PMID: none
81. U.S. Food & Drug Administration (FDA). WELIREG™ (belzutifan) tablets, for oral use. 2021 [revised 2024 Feb]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/215383Orig1s007lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/215383Orig1s007lbl.pdf).
82. Jonasch E, Donskov F, Iliopoulos O, et al. Belzutifan for renal cell carcinoma in von Hippel-Lindau disease. *N Engl J Med.* 2021;345(12):2036-46. PMID: 34818478
83. Albiges L, Rini BI, Peltola K, et al. Belzutifan versus everolimus in participants (pts) with previously treated advanced clear cell renal cell carcinoma (ccRCC): randomized open-label phase III LITESPARK-005 study. *Ann Oncol.* 2023;34(Suppl 2):S1329-S30. PMID: none
84. Choueiri TK, Powles T, Peltola K, et al. Belzutifan versus everolimus for advanced renal-cell carcinoma. *N Engl J Med.* 2024;391(8):710-21. PMID: 39167807
85. Powles T, Choueiri TK, Albiges L, et al. Health-related quality of life with belzutifan versus everolimus for advanced renal cell carcinoma (LITESPARK-005): patient-reported outcomes from a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2025;26(4):491-502. PMID: 40112850
86. Albiges L, Bourlon MT, Chacon M, et al. Subcutaneous versus intravenous nivolumab for renal cell carcinoma. *Ann Oncol.* 2025;36(1):99-107. PMID: 39288844
87. Rini BI, Bellmunt J, Clancy J, et al. Randomized phase III trial of temsirolimus and bevacizumab versus interferon alfa and bevacizumab in metastatic renal cell carcinoma: INTORACT trial. *J Clin Oncol.* 2014;32(8):752-9. PMID: 24297945
88. Rini BI, Halabi S, Rosenberg JE, et al. Phase III trial of bevacizumab plus interferon alfa versus interferon alfa monotherapy in patients with metastatic renal cell carcinoma: final results of CALGB 90206. *J Clin Oncol.* 2010;28(13):2137-43. PMID: 20368558
89. Escudier B, Bellmunt J, Negrier S, et al. Phase III trial of bevacizumab plus interferon alfa-2a in patients with metastatic renal cell carcinoma (AVOREN): final analysis of overall survival. *J Clin Oncol.* 2010;28(13):2144-50. PMID: 20368553
90. Hudes G, Carducci M, Tomczak P, et al. Temsirolimus, interferon alfa, or both for advanced renal-cell carcinoma. *N Engl J Med.* 2007;356(22):2271-81. PMID: 17538086
91. Yang JC, Sherry RM, Steinberg SM, et al. Randomized study of high-dose and low-dose interleukin-2 in patients with metastatic renal cancer. *J Clin Oncol.* 2003;21(16):3127-32. PMID: 12915604
92. Hutson TE, Lesovoy V, Al-Shukri S, et al. Axitinib versus sorafenib as first-line therapy in patients with metastatic renal-cell carcinoma: a randomised open-label phase 3 trial. *Lancet Oncol.* 2013;14(13):1287-94. PMID: 24206640
93. Rini BI, Halabi S, Rosenberg JE, et al. Bevacizumab plus interferon alfa compared with interferon alfa monotherapy in patients with metastatic renal cell carcinoma: CALGB 90206. *J Clin Oncol.* 2008;26(33):5422-8. PMID: 18936475
94. Ratain MJ, Eisen T, Stadler WM, et al. Phase II placebo-controlled randomized discontinuation trial of sorafenib in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2006;24(16):2505-12. PMID: 16636341

95. Motzer RJ, Nosov D, Eisen T, et al. Tivozanib versus sorafenib as initial targeted therapy for patients with metastatic renal cell carcinoma: results from a phase III trial. *J Clin Oncol.* 2013;31(30):3791-9. PMID: 24019545
96. Rini B, Szczylik C, Tannir NM, et al. AMG 386 in combination with sorafenib in patients with metastatic clear cell carcinoma of the kidney: a randomized, double-blind, placebo-controlled, phase 2 study. *Cancer.* 2012;118(24):6152-61. PMID: 22692704
97. Rini BI, Powles T, Atkins MB, et al. Atezolizumab plus bevacizumab versus sunitinib in patients with previously untreated metastatic renal cell carcinoma (IMmotion151): a multicentre, open-label, phase 3, randomised controlled trial. *Lancet.* 2019;393(10189):2404-15. PMID: 31079938
98. McDermott DF, Cheng SC, Signoretti S, et al. The high-dose aldesleukin "select" trial: a trial to prospectively validate predictive models of response to treatment in patients with metastatic renal cell carcinoma. *Clin Cancer Res.* 2015;21(3):561-8. PMID: 25424850
99. Jung KS, Lee SJ, Park SH, et al. Pazopanib for the treatment of non-clear cell renal cell carcinoma: a single-arm, open-label, multicenter, Phase II study. *Cancer Research & Treatment.* 2018;50(2):488-94. PMID: 28546525
100. Buti S, Bersanelli M, Maines F, et al. First-line PAzopanib in NOn-clear-cell Renal cArcinoMA: the Italian retrospective multicenter PANORAMA study. *Clin Genitourin Cancer.* 2017;15(4):e609-e14. PMID: 28108284
101. Dutcher JP, de Souza P, McDermott D, et al. Effect of temsirolimus versus interferon-alpha on outcome of patients with advanced renal cell carcinoma of different tumor histologies. *Med Oncol.* 2009;26(2):202-9. PMID: 19229667
102. Gordon MS, Hussey M, Nagle RB, et al. Phase II study of erlotinib in patients with locally advanced or metastatic papillary histology renal cell cancer: SWOG S0317. *J Clin Oncol.* 2009;27(34):5788-93. PMID: 19884559
103. Yang JC, Haworth L, Sherry RM, et al. A randomized trial of bevacizumab, an anti-vascular endothelial growth factor antibody, for metastatic renal cancer. *N Engl J Med.* 2003;349(5):427-34. PMID: 12890841
104. Hutson TE, Escudier B, Esteban E, et al. Randomized phase III trial of temsirolimus versus sorafenib as second-line therapy after sunitinib in patients with metastatic renal cell carcinoma. *J Clin Oncol.* 2014;32(8):760-7. PMID: 24297950
105. Motzer RJ, Porta C, Vogelzang NJ, et al. Dovitinib versus sorafenib for third-line targeted treatment of patients with metastatic renal cell carcinoma: an open-label, randomised phase 3 trial. *Lancet Oncol.* 2014;15(3):286-96. PMID: 24556040
106. Escudier B, Eisen T, Stadler WM, et al. Sorafenib in advanced clear-cell renal-cell carcinoma. *N Engl J Med.* 2007;356(2):125-34. PMID: 17215530
107. Escudier B, Eisen T, Stadler WM, et al. Sorafenib for treatment of renal cell carcinoma: final efficacy and safety results of the phase III treatment approaches in renal cancer global evaluation trial. *J Clin Oncol.* 2009;27(20):3312-8. PMID: 19451442
108. Atkins MB, Hidalgo M, Stadler WM, et al. Randomized phase II study of multiple dose levels of CCI-779, a novel mammalian target of rapamycin kinase inhibitor, in patients with advanced refractory renal cell carcinoma. *J Clin Oncol.* 2004;22(5):909-18. PMID: 14990647

## Lung Cancer: Non-Small Cell Lung Cancer (NSCLC) Pathways

### Chemoradiation for Localized Disease

- Stages IA-IIIC - Definitive Concurrent Chemoradiation
  - Cisplatin and etoposide<sup>1, 2</sup>
  - Paclitaxel and carboplatin<sup>3</sup>

### Adjuvant Therapy

- Stages IB-IIIB
  - Carboplatin and paclitaxel<sup>4</sup>
  - Cisplatin and gemcitabine (Gemzar)<sup>5</sup>
  - Cisplatin and pemetrexed (Alimta)<sup>6, 7</sup>
  - Cisplatin and vinorelbine (Navelbine)<sup>8-11</sup>

### First Line of Therapy (1<sup>st</sup> Line) – Stages IIIB-IV, and Recurrent

- Squamous and Non-Squamous Cell Carcinoma
  - PD-L1 Expression (TPS) greater or equal to 50%, without known actionable oncogenic targets\*
    - Cemiplimab-rwlc (Libtayo)<sup>12</sup>
    - Pembrolizumab (Keytruda)†<sup>13-16</sup>
  - Ineligible for Immunotherapy
    - Carboplatin or cisplatin and paclitaxel<sup>19-25</sup>
    - Carboplatin or cisplatin and gemcitabine (Gemzar)<sup>23, 26-31</sup>
  - ALK Rearrangement Positive
    - Alectinib (Alecensa)<sup>32, 33</sup>
    - Lorlatinib (Lobrena)<sup>17, 18</sup>
  - EGFR exon 19 deletion or exon 21 L858R mutation positive
    - Osimertinib (Tagrisso)<sup>34-37</sup>
    - Carboplatin or cisplatin, pemetrexed, and osimertinib (Tagrisso) (Non-Squamous ONLY)<sup>38, 39</sup>
- Non-Squamous Cell Carcinoma Only
  - PD-L1 Expression (TPS) less than 50%, without known actionable oncogenic targets\*
    - Carboplatin or cisplatin, pemetrexed (Alimta), and pembrolizumab (Keytruda)†<sup>40-43</sup>
    - Carboplatin or cisplatin, pemetrexed (Alimta), and cemiplimab-rwlc (Libtayo)<sup>44, 45</sup>
  - PD-L1 Expression (TPS) greater or equal to 50%, without known actionable oncogenic targets\*
    - Atezolizumab (Tecentriq)<sup>46, 47</sup>
  - Ineligible for Immunotherapy
    - Carboplatin, paclitaxel, and bevacizumab<sup>48-50</sup>
    - Carboplatin or cisplatin and pemetrexed (Alimta)<sup>30, 51</sup>
- Squamous Cell Carcinoma Only
  - PD-L1 Expression (TPS) less than 50%, without known actionable oncogenic targets\*
    - Pembrolizumab (Keytruda)†, carboplatin, and paclitaxel<sup>52</sup>
    - Carboplatin, paclitaxel, and cemiplimab-rwlc (Libtayo)<sup>44, 45</sup>
    - Cisplatin, paclitaxel, and cemiplimab-rwlc (Libtayo)<sup>44, 45</sup>

\* Actionable oncogenic targets refer to the driver aberrations in EGFR, ALK, and ROS1

† Administered at a dose of 200 mg every 3 weeks OR 400 mg every 6 weeks per the FDA label OR 2 mg/kg (up to a maximum of 200 mg) every 3 weeks, as clinically appropriate

# Lung Cancer: Non-Small Cell Lung Cancer (NSCLC) References

## NCCN Clinical Practice Guidelines: Non-Small Cell Lung Cancer V11.2024

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1. Albain KS, Crowley JJ, Turrissi AT, 3rd, et al. Concurrent cisplatin, etoposide, and chest radiotherapy in pathologic stage IIIB non-small-cell lung cancer: a Southwest Oncology Group phase II study, SWOG 9019. *J Clin Oncol.* 2002;20(16):3454-60. PMID: 12177106
2. Curran WJ, Jr., Paulus R, Langer CJ, et al. Sequential vs. concurrent chemoradiation for stage III non-small cell lung cancer: randomized phase III trial RTOG 9410. *J Natl Cancer Inst.* 2011;103(19):1452-60. PMID: 21903745
3. Bradley JD, Paulus R, Komaki R, et al. Standard-dose versus high-dose conformal radiotherapy with concurrent and consolidation carboplatin plus paclitaxel with or without cetuximab for patients with stage IIIA or IIIB non-small-cell lung cancer (RTOG 0617): a randomised, two-by-two factorial phase 3 study. *Lancet Oncol.* 2015;16(2):187-99. PMID: 25601342
4. Strauss GM, Herndon JE, 2nd, Maddaus MA, et al. Adjuvant paclitaxel plus carboplatin compared with observation in stage IB non-small-cell lung cancer: CALGB 9633 with the Cancer and Leukemia Group B, Radiation Therapy Oncology Group, and North Central Cancer Treatment Group Study Groups. *J Clin Oncol.* 2008;26(31):5043-51. PMID: 18809614
5. Perol M, Chouaid C, Perol D, et al. Randomized, phase III study of gemcitabine or erlotinib maintenance therapy versus observation, with predefined second-line treatment, after cisplatin-gemcitabine induction chemotherapy in advanced non-small-cell lung cancer. *J Clin Oncol.* 2012;30(28):3516-24. PMID: 22949150
6. Kenmotsu H, Yamamoto N, Yamanaka T, et al. Randomized phase III study of pemetrexed plus cisplatin versus vinorelbine plus cisplatin for completely resected stage II to IIIA nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2020;38(19):2187-219. PMID: 32407216
7. Kreuter M, Vansteenkiste J, Fischer JR, et al. Randomized phase 2 trial on refinement of early-stage NSCLC adjuvant chemotherapy with cisplatin and pemetrexed versus cisplatin and vinorelbine: the TREAT study. *Ann Oncol.* 2013;24(4):986-92. PMID: 23161898
8. Arriagada R, Bergman B, Dunant A, et al. Cisplatin-based adjuvant chemotherapy in patients with completely resected non-small-cell lung cancer. *N Engl J Med.* 2004;350(4):351-60. PMID: 14736927
9. Arriagada R, Dunant A, Pignon JP, et al. Long-term results of the international adjuvant lung cancer trial evaluating adjuvant cisplatin-based chemotherapy in resected lung cancer. *J Clin Oncol.* 2010;28(1):35-42. PMID: 19933916
10. Douillard JY, Rosell R, De Lena M, et al. Adjuvant vinorelbine plus cisplatin versus observation in patients with completely resected stage IB-IIIA non-small-cell lung cancer (Adjuvant Navelbine International Trialist Association [ANITA]): a randomised controlled trial. *Lancet Oncol.* 2006;7(9):719-27. PMID: 16945766
11. Winton T, Livingston R, Johnson D, et al. Vinorelbine plus cisplatin vs. observation in resected non-small-cell lung cancer. *N Engl J Med.* 2005;352(25):2589-97. PMID: 15972865
12. Sezer A, Kilicak S, Gumer M, et al. Cemiplimab monotherapy for first-line treatment of advanced non-small-cell lung cancer with PD-L1 of at least 50%: a multicentre, open-label, global, phase 3, randomised, controlled trial. *Lancet.* 2021;397(10274):592-604. PMID: 33581821
13. Mok TSK, Wu YL, Kudaba I, et al. Pembrolizumab versus chemotherapy for previously untreated, PD-L1-expressing, locally advanced or metastatic non-small-cell lung cancer (KEYNOTE-042): a randomised, open-label, controlled, phase 3 trial. *Lancet.* 2019;393(10183):1819-30. PMID: 30955977
14. Reck M, Rodriguez-Abreu D, Robinson AG, et al. Pembrolizumab versus chemotherapy for PD-L1-positive non-small-cell lung cancer. *N Engl J Med.* 2016;375(19):1823-33. PMID: 27718847
15. Reck M, Rodriguez-Abreu D, Robinson AG, et al. Updated analysis of KEYNOTE-024: pembrolizumab versus platinum-based chemotherapy for advanced non-small-cell lung cancer with PD-L1 tumor proportion score of 50% or greater. *J Clin Oncol.* 2019;37(7):537-46. PMID: 30620668
16. Reck M, Rodriguez-Abreu D, Robinson AG, et al. Five-year outcomes with pembrolizumab versus chemotherapy for metastatic non-small-cell lung cancer with PD-L1 tumor proportion score >= 50. *J Clin Oncol.* 2021;39(21):2339-49. PMID: 33872070
17. Shaw AT, Bauer TM, de Marinis F, et al. First-line lorlatinib or crizotinib in advanced ALK-positive lung cancer. *N Engl J Med.* 2020;383(21):2018-29. PMID: 33207094
18. Solomon BJ, Bauer TM, Ignatius Ou SH, et al. Post hoc analysis of lorlatinib intracranial efficacy and safety in patients with ALK-positive advanced non-small-cell lung cancer from the phase III CROWN study. *J Clin Oncol.* 2022;40(31):3593-602. PMID: 35605188
19. Belani CP, Ramalingam S, Perry MC, et al. Randomized, phase III study of weekly paclitaxel in combination with carboplatin versus standard every-3-weeks administration of carboplatin and paclitaxel for patients with previously untreated advanced non-small-cell lung cancer. *J Clin Oncol.* 2008;26(3):468-73. PMID: 18202422
20. Kelly K, Crowley J, Bunn PA, Jr., et al. Randomized phase III trial of paclitaxel plus carboplatin versus vinorelbine plus cisplatin in the treatment of patients with advanced non-small-cell lung cancer: a Southwest Oncology Group trial. *J Clin Oncol.* 2001;19(13):3210-8. PMID: 11432888
21. Langer CJ, Hirsh V, Okamoto I, et al. Survival, quality-adjusted survival, and other clinical end points in older advanced non-small-cell lung cancer patients treated with albumin-bound paclitaxel. *British Journal of Cancer.* 2015;113(1):20-9. PMID: 26035702
22. Ohe Y, Ohashi Y, Kubota K, et al. Randomized phase III study of cisplatin plus irinotecan versus carboplatin plus paclitaxel, cisplatin plus gemcitabine, and cisplatin plus vinorelbine for advanced non-small-cell lung cancer: Four-Arm Cooperative Study in Japan. *Ann Oncol.* 2007;18(2):317-23. PMID: 17079694
23. Schiller JH, Harrington D, Belani CP, et al. Comparison of four chemotherapy regimens for advanced non-small-cell lung cancer. *N Engl J Med.* 2002;346(2):92-8. PMID: 11784875

24. Smit EF, van Meerbeeck JP, Lianes P, et al. Three-arm randomized study of two cisplatin-based regimens and paclitaxel plus gemcitabine in advanced non-small-cell lung cancer: a phase III trial of the European Organization for Research and Treatment of Cancer Lung Cancer Group--EORTC 08975. *J Clin Oncol.* 2003;21(21):3909-17. PMID: 14581415
25. Socinski MA, Bondarenko I, Karaseva NA, et al. Weekly nab-paclitaxel in combination with carboplatin versus solvent-based paclitaxel plus carboplatin as first-line therapy in patients with advanced non-small-cell lung cancer: final results of a phase III trial. *J Clin Oncol.* 2012;30(17):2055-62. PMID: 22547591
26. Gronberg BH, Bremnes RM, Flotten O, et al. Phase III study by the Norwegian lung cancer study group: pemetrexed plus carboplatin compared with gemcitabine plus carboplatin as first-line chemotherapy in advanced non-small-cell lung cancer. *J Clin Oncol.* 2009;27(19):3217-24. PMID: 19433683
27. Helbekkmo N, Sundstrom SH, Aasebo U, et al. Vinorelbine/carboplatin vs gemcitabine/carboplatin in advanced NSCLC shows similar efficacy, but different impact of toxicity. *British Journal of Cancer.* 2007;97(3):283-9. PMID: 17595658
28. Masters GA, Argiris AE, Hahn EA, et al. A randomized phase II trial using two different treatment schedules of gemcitabine and carboplatin in patients with advanced non-small-cell lung cancer. *J Thorac Oncol.* 2006;1(1):19-24. PMID: 17409822
29. Scagliotti GV, De Marinis F, Rinaldi M, et al. Phase III randomized trial comparing three platinum-based doublets in advanced non-small-cell lung cancer. *J Clin Oncol.* 2002;20(21):4285-91. PMID: 12409326
30. Scagliotti GV, Parikh P, von Pawel J, et al. Phase III study comparing cisplatin plus gemcitabine with cisplatin plus pemetrexed in chemotherapy-naive patients with advanced-stage non-small-cell lung cancer. *J Clin Oncol.* 2008;26(21):3543-51. PMID: 18506025
31. Thatcher N, Hirsch FR, Luft AV, et al. Necitumumab plus gemcitabine and cisplatin versus gemcitabine and cisplatin alone as first-line therapy in patients with stage IV squamous non-small-cell lung cancer (SQUIRE): an open-label, randomised, controlled phase 3 trial. *Lancet Oncol.* 2015;16(7):763-74. PMID: 26045340
32. Hida T, Nokihara H, Kondo M, et al. Alectinib versus crizotinib in patients with ALK-positive non-small-cell lung cancer (J-ALEX): an open-label, randomised phase 3 trial. *Lancet.* 2017;390(10089):29-39. PMID: 28501140
33. Peters S, Camidge DR, Shaw AT, et al. Alectinib versus crizotinib in untreated ALK-positive non-small-cell lung cancer. *N Engl J Med.* 2017;377(9):829-38. PMID: 28586279
34. Aguiar PN, Jr., Haaland B, Park W, et al. Cost-effectiveness of osimertinib in the first-line treatment of patients with EGFR-mutated advanced non-small cell lung cancer. *JAMA Oncol.* 2018;4(8):1080-4. PMID: 29852038
35. Mok TS, Wu YL, Ahn MJ, et al. Osimertinib or platinum-pemetrexed in EGFR T790M-positive lung cancer. *N Engl J Med.* 2017;376(7):629-40. PMID: 27959700
36. Ramalingam SS, Vansteenkiste J, Planchard D, et al. Overall survival with osimertinib in untreated, EGFR-mutated advanced NSCLC. *N Engl J Med.* 2019;382(1):41-50. PMID: 31751012
37. Soria JC, Ohe Y, Vansteenkiste J, et al. Osimertinib in untreated EGFR-mutated advanced non-small-cell lung cancer. *N Engl J Med.* 2018;378(2):113-25. PMID: 29151359
38. Planchard D, Janne PA, Cheng Y, et al. Osimertinib with or without chemotherapy in EGFR-mutated advanced NSCLC. *N Engl J Med.* 2023;389(21):1935-48. PMID: 37937763
39. Wu YL, Zhou Q. Combination therapy for EGFR-mutated lung cancer. *N Engl J Med.* 2023;389(21):2005-7. PMID: 37937797
40. Gadgeel S, Rodriguez-Abreu D, Speranza G, et al. Updated analysis from KEYNOTE-189: pembrolizumab or placebo plus pemetrexed and platinum for previously untreated metastatic nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2020;38(14):1505-17. PMID: 32150489
41. Gandhi L, Rodriguez-Abreu D, Gadgeel S, et al. Pembrolizumab plus chemotherapy in metastatic non-small-cell lung cancer. *N Engl J Med.* 2018;378(22):2078-92. PMID: 29658856
42. Garassino MC, Gadgeel S, Esteban E, et al. Patient-reported outcomes following pembrolizumab or placebo plus pemetrexed and platinum in patients with previously untreated, metastatic, non-squamous non-small-cell lung cancer (KEYNOTE-189): a multicentre, double-blind, randomised, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2020;21(3):387-97. PMID: 32035514
43. Rodriguez-Abreu D, Powell SF, Hochmair MJ, et al. Pemetrexed plus platinum with or without pembrolizumab in patients with previously untreated metastatic nonsquamous NSCLC: protocol-specified final analysis from KEYNOTE-189. *Ann Oncol.* 2021;32(7):881-95. PMID: 33894335
44. Gogishvili M, Melkadze T, Makharadze T, et al. Cemiplimab plus chemotherapy versus chemotherapy alone in non-small cell lung cancer: a randomized, controlled, double-blind phase 3 trial. *Nat Med.* 2022;28(11):2374-80. PMID: 36008722
45. Makharadze T, Gogishvili M, Melkadze T, et al. Cemiplimab plus chemotherapy versus chemotherapy alone in advanced NSCLC: 2-year follow-up from the phase 3 EMPOWER-Lung 3 part 2 trial. *J Thorac Oncol.* 2023;18(6):755-68. PMID: 37001859
46. Jassem J, Herbst RS, de Marinis F, et al. IMpower110: clinical safety in a phase III study of atezolizumab (atezo) monotherapy (mono) vs platinum-based chemotherapy (chemo) in first-line non-small cell lung cancer (NSCLC). *J Clin Oncol.* 2020;38(15 Suppl):abstract e21623. PMID: none
47. Spigel D, De Marinis F, Giaccone G, et al. IMpower110: interim overall survival (OS) analysis of a phase III study of atezolizumab (atezo) vs platinum-based chemotherapy (chemo) as first-line (1L) treatment (tx) in PD-L1-selected NSCLC. *Ann Oncol.* 2019;30(Suppl 5):v915. PMID: none
48. Hanna NH, Schneider BJ, Temin S, et al. Therapy for stage IV non-small-cell lung cancer without driver alterations: ASCO and OH (CCO) joint guideline update. *J Clin Oncol.* 2020;38(14):1608-32. PMID: 31990617
49. Patel JD, Socinski MA, Garon EB, et al. PointBreak: a randomized phase III study of pemetrexed plus carboplatin and bevacizumab followed by maintenance pemetrexed and bevacizumab versus paclitaxel plus carboplatin and bevacizumab followed by maintenance bevacizumab in patients with stage IIIB or IV nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2013;31(34):4349-57. PMID: 24145346
50. Sandler A, Gray R, Perry MC, et al. Paclitaxel-carboplatin alone or with bevacizumab for non-small-cell lung cancer. *N Engl J Med.* 2006;355(24):2542-50. PMID: 17167137
51. Socinski MA, Smit EF, Lorian P, et al. Phase III study of pemetrexed plus carboplatin compared with etoposide plus carboplatin in chemotherapy-naive patients with extensive-stage small-cell lung cancer. *J Clin Oncol.* 2009;27(28):4787-92. PMID: 19720897
52. Paz-Ares L, Luft A, Vicente D, et al. Pembrolizumab plus chemotherapy for squamous non-small-cell lung cancer. *N Engl J Med.* 2018;379(21):2040-51. PMID: 30280635
53. Johnson BE, Kabbinavar F, Fehrenbacher L, et al. ATLAS: randomized, double-blind, placebo-controlled, phase IIIB trial comparing bevacizumab therapy with or without erlotinib, after completion of chemotherapy, with bevacizumab for first-line treatment of advanced non-small-cell lung cancer. *J Clin Oncol.* 2013;31(31):3926-34. PMID: 24101054

54. Lopez-Chavez A, Young T, Fages S, et al. Bevacizumab maintenance in patients with advanced non-small-cell lung cancer, clinical patterns, and outcomes in the Eastern Cooperative Oncology Group 4599 Study: results of an exploratory analysis. *J Thorac Oncol.* 2012;7(11):1707-12. PMID: 23059774
55. Kulkarni S, Vella ET, Coakley N, et al. The use of systemic treatment in the maintenance of patients with non-small cell lung cancer: a systematic review. *J Thorac Oncol.* 2016;11(7):989-1002. PMID: 27013406
56. Paz-Ares LG, de Marinis F, Dediu M, et al. PARAMOUNT: final overall survival results of the phase III study of maintenance pemetrexed versus placebo immediately after induction treatment with pemetrexed plus cisplatin for advanced nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2013;31(23):2895-902. PMID: 23835707
57. Ramalingam SS, Dahlberg SE, Belani CP, et al. Pemetrexed, bevacizumab, or the combination as maintenance therapy for advanced nonsquamous non-small-cell lung cancer: ECOG-ACRIN 5508. *J Clin Oncol.* 2019;37(26):2360-7. PMID: 31361535
58. Ciuleanu T, Brodowicz T, Zielinski C, et al. Maintenance pemetrexed plus best supportive care versus placebo plus best supportive care for non-small-cell lung cancer: a randomised, double-blind, phase 3 study. *Lancet.* 2009;374(9699):1432-40. PMID: 19767093
59. Langer CJ, Gadgeel SM, Borghaei H, et al. Carboplatin and pemetrexed with or without pembrolizumab for advanced, non-squamous non-small-cell lung cancer: a randomised, phase 2 cohort of the open-label KEYNOTE-021 study. *Lancet Oncol.* 2016;17(11):1497-508. PMID: 27745820
60. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Non-Small Cell Lung Cancer (Version 11.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
61. Belani CP, Choy H, Bonomi P, et al. Combined chemoradiotherapy regimens of paclitaxel and carboplatin for locally advanced non-small-cell lung cancer: a randomized phase II locally advanced multi-modality protocol. *J Clin Oncol.* 2005;23(25):5883-91. PMID: 16087941
62. Govindan R, Bogart J, Stinchcombe T, et al. Randomized phase II study of pemetrexed, carboplatin, and thoracic radiation with or without cetuximab in patients with locally advanced unresectable non-small-cell lung cancer: Cancer and Leukemia Group B trial 30407. *J Clin Oncol.* 2011;29(23):3120-5. PMID: 21747084
63. Choy H, Gerber DE, Bradley JD, et al. Concurrent pemetrexed and radiation therapy in the treatment of patients with inoperable stage III non-small cell lung cancer: a systematic review of completed and ongoing studies. *Lung Cancer.* 2015;87(3):232-40. PMID: 25650301
64. Fossella F, Pereira JR, von Pawel J, et al. Randomized, multinational, phase III study of docetaxel plus platinum combinations versus vinorelbine plus cisplatin for advanced non-small-cell lung cancer: the TAX 326 study group. *J Clin Oncol.* 2003;21(16):3016-24. PMID: 12837811
65. Klästersky J, Sculier JP, Lacroix H, et al. A randomized study comparing cisplatin or carboplatin with etoposide in patients with advanced non-small-cell lung cancer: European Organization for Research and Treatment of Cancer Protocol 07861. *J Clin Oncol.* 1990;8(9):1556-62. PMID: 2167953
66. Scagliotti GV, Kortsik C, Dark GG, et al. Pemetrexed combined with oxaliplatin or carboplatin as first-line treatment in advanced non-small cell lung cancer: a multicenter, randomized, phase II trial. *Clin Cancer Res.* 2005;11(2 Pt 1):690-6. PMID: 15701857
67. Abe T, Takeda K, Ohe Y, et al. Randomized phase III trial comparing weekly docetaxel plus cisplatin versus docetaxel monotherapy every 3 weeks in elderly patients with advanced non-small-cell lung cancer: the intergroup trial JCOG0803/WJOG4307L. *J Clin Oncol.* 2015;33(6):575-81. PMID: 25584004
68. Sederholm C, Hillerdal G, Lamberg K, et al. Phase III trial of gemcitabine plus carboplatin versus single-agent gemcitabine in the treatment of locally advanced or metastatic non-small-cell lung cancer: the Swedish Lung Cancer Study Group. *J Clin Oncol.* 2005;23(33):8380-8. PMID: 16293868
69. Pujol JL, Breton JL, Gervais R, et al. Gemcitabine-docetaxel versus cisplatin-vinorelbine in advanced or metastatic non-small-cell lung cancer: a phase III study addressing the case for cisplatin. *Ann Oncol.* 2005;16(4):602-10. PMID: 15741225
70. Georgoulias V, Aravanis A, Tsiafaki X, et al. Vinorelbine plus cisplatin versus docetaxel plus gemcitabine in advanced non-small-cell lung cancer: a phase III randomized trial. *J Clin Oncol.* 2005;23(13):2937-45. PMID: 15728228
71. Binder D, Schweisfurth H, Grah C, et al. Docetaxel/gemcitabine or cisplatin/gemcitabine followed by docetaxel in the first-line treatment of patients with metastatic non-small cell lung cancer (NSCLC): results of a multicentre randomized phase II trial. *Cancer Chemother Pharmacol.* 2007;60(1):143-50. PMID: 17031643
72. Socinski MA, Evans T, Gettinger S, et al. Treatment of stage IV non-small cell lung cancer: diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest.* 2013;143(5 Suppl):e341S-e68S. PMID: 23649446
73. Borghaei H, Paz-Ares L, Horn L, et al. Nivolumab versus docetaxel in advanced nonsquamous non-small-cell lung cancer. *N Engl J Med.* 2015;373(17):1627-39. PMID: 26412456
74. U.S. Food & Drug Administration (FDA). OPDIVO (nivolumab) injection, for intravenous use 2014 [revised 2023 Oct]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2023/125554Orig1s121lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/125554Orig1s121lbl.pdf).
75. Soria JC, Felip E, Cobo M, et al. Afatinib versus erlotinib as second-line treatment of patients with advanced squamous cell carcinoma of the lung (LUX-Lung 8): an open-label randomised controlled phase 3 trial. *Lancet Oncol.* 2015;16(8):897-907. PMID: 26156651
76. Hanna N, Shepherd FA, Fossella FV, et al. Randomized phase III trial of pemetrexed versus docetaxel in patients with non-small-cell lung cancer previously treated with chemotherapy. *J Clin Oncol.* 2004;22(9):1589-97. PMID: 15117980
77. 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(2):123-35. PMID: 26028407
78. Bidoli P, Cappuzzo F, Favaretto A, et al. Update of REVEL: a randomized, double-blind, phase III study of docetaxel (DOC) and ramucirumab (RAM; IMC-1121B) versus DOC and placebo (PL) in the second-line (2L) treatment of stage IV non-small cell lung cancer (NSCLC) including subgroup analysis of histology. *Ann Oncol.* 2015;26(Suppl 6):vi73–vi89. PMID: none
79. Herbst RS, Baas P, Kim DW, et al. Pembrolizumab versus docetaxel for previously treated, PD-L1-positive, advanced non-small-cell lung cancer (KEYNOTE-010): a randomised controlled trial. *Lancet.* 2016;387(10027):1540-50. PMID: 26712084
80. Ciuleanu T, Stelmakh L, Cicenas S, et al. Efficacy and safety of erlotinib versus chemotherapy in second-line treatment of patients with advanced, non-small-cell lung cancer with poor prognosis (TITAN): a randomised multicentre, open-label, phase 3 study. *Lancet Oncol.* 2012;13(3):300-8. PMID: 22277837
81. Garon EB, Ciuleanu TE, Arrieta O, et al. Ramucirumab plus docetaxel versus placebo plus docetaxel for second-line treatment of stage IV non-small-cell lung cancer after disease progression on platinum-based therapy (REVEL): a multicentre, double-blind, randomised phase 3 trial. *Lancet.* 2014;384(9944):665-73. PMID: 2493332
82. Drilon A, Clark JW, Weiss J, et al. Antitumor activity of crizotinib in lung cancers harboring a MET exon 14 alteration. *Nat Med.* 2020;26(1):47-51. PMID: 31932802

83. Camidge DR, Ou SHI, Shapiro G, et al. Efficacy and safety of crizotinib in patients with advanced c-MET-amplified non-small cell lung cancer (NSCLC). *J Clin Oncol.* 2014;32(15 Suppl):abstract 8001. PMID: none
84. Hellmann MD, Ciuleanu TE, Pluzanski A, et al. Nivolumab plus ipilimumab in lung cancer with a high tumor mutational burden. *N Engl J Med.* 2018;378(22):2093-104. PMID: 29658845
85. Shaw AT, Kim DW, Nakagawa K, et al. Crizotinib versus chemotherapy in advanced ALK-positive lung cancer. *N Engl J Med.* 2013;368(25):2385-94. PMID: 23724913
86. Solomon BJ, Mok T, Kim DW, et al. First-line crizotinib versus chemotherapy in ALK-positive lung cancer. *N Engl J Med.* 2014;371(23):2167-77. PMID: 25470694
87. Sequist LV, Yang JC, Yamamoto N, et al. Phase III study of afatinib or cisplatin plus pemetrexed in patients with metastatic lung adenocarcinoma with EGFR mutations. *J Clin Oncol.* 2013;31(27):3327-34. PMID: 23816960
88. Janne PA, Wang X, Socinski MA, et al. Randomized phase II trial of erlotinib alone or with carboplatin and paclitaxel in patients who were never or light former smokers with advanced lung adenocarcinoma: CALGB 30406 trial. *J Clin Oncol.* 2012;30(17):2063-9. PMID: 22547605
89. Wu YL, Zhou C, Liam CK, et al. First-line erlotinib versus gemcitabine/cisplatin in patients with advanced EGFR mutation-positive non-small-cell lung cancer: analyses from the phase III, randomized, open-label, ENSURE study. *Ann Oncol.* 2015;26(9):1883-9. PMID: 26105600
90. Zhou C, Wu YL, Chen G, et al. Erlotinib versus chemotherapy as first-line treatment for patients with advanced EGFR mutation-positive non-small-cell lung cancer (OPTIMAL, CTONG-0802): a multicentre, open-label, randomised, phase 3 study. *Lancet Oncol.* 2011;12(8):735-42. PMID: 21783417
91. U.S. Food & Drug Administration (FDA). TARCEVA (erlotinib) tablets, for oral use 2004 [revised 2016 Oct].
92. Ou SH, Ahn JS, De Petris L, et al. Alectinib in crizotinib-refractory ALK-rearranged non-small-cell lung cancer: a phase II global study. *J Clin Oncol.* 2016;34(7):661-8. PMID: 26598747
93. Shaw AT, Kim DW, Mehra R, et al. Ceritinib in ALK-rearranged non-small-cell lung cancer. *N Engl J Med.* 2014;370(13):1189-97. PMID: 24670165
94. Shepherd FA, Rodrigues Pereira J, Ciuleanu T, et al. Erlotinib in previously treated non-small-cell lung cancer. *N Engl J Med.* 2005;353(2):123-32. PMID: 16014882
95. Miller VA, Hirsh V, Cadrae J, et al. Afatinib versus placebo for patients with advanced, metastatic non-small-cell lung cancer after failure of erlotinib, gefitinib, or both, and one or two lines of chemotherapy (LUX-Lung 1): a phase 2b/3 randomised trial. *Lancet Oncol.* 2012;13(5):528-38. PMID: 22452896
96. Kenmotsu H, Yamamoto N, Misumi T, et al. Five-year overall survival analysis of the JIPANG study: pemetrexed or vinorelbine plus cisplatin for resected stage II-IIIA nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2023;41(34):5242-6. PMID: 37656928
97. Usami N, Yokoi K, Hasegawa Y, et al. Phase II study of carboplatin and gemcitabine as adjuvant chemotherapy in patients with completely resected non-small cell lung cancer: a report from the Central Japan Lung Study Group, CJLSG 0503 trial. *Int J Clin Oncol.* 2010;15(6):583-7. PMID: 20714770
98. Zhang L, Ou W, Liu Q, et al. Pemetrexed plus carboplatin as adjuvant chemotherapy in patients with curative resected non-squamous non-small cell lung cancer. *Thorac Cancer.* 2014;5(1):50-6. PMID: 26766972
99. Zhong WZ, Wang Q, Mao WM, et al. Gefitinib versus vinorelbine plus cisplatin as adjuvant treatment for stage II-IIIA (N1-N2) EGFR-mutant NSCLC: final overall survival analysis of CTONG1104 phase III trial. *J Clin Oncol.* 2020;39(7):713-22. PMID: 33332190
100. Felip E, Altorki N, Zhou C, et al. Adjuvant atezolizumab after adjuvant chemotherapy in resected stage IB-IIIA non-small-cell lung cancer (IMpower010): a randomised, multicentre, open-label, phase 3 trial. *Lancet.* 2021;398(10308):1344-57. PMID: 34555333
101. Sorin M, Prosty C, Ghaleb L, et al. Neoadjuvant chemoimmunotherapy for NSCLC: a systematic review and meta-analysis. *JAMA Oncol.* 2024;10(5):621-33. PMID: 38512301
102. Forde PM, Spicer J, Lu S, et al. Nivolumab (NIVO) + platinum-doublet chemotherapy (chemo) vs chemo as neoadjuvant treatment (tx) for resectable (IB-IIIA) non-small cell lung cancer (NSCLC) in the phase 3 CheckMate 816 trial. *Cancer Res.* 2021;81(13 Suppl):abstract CT003. PMID: none
103. Forde PM, Spicer J, Lu S, et al. Neoadjuvant nivolumab plus chemotherapy in resectable lung cancer. *N Engl J Med.* 2022;386(21):1973-85. PMID: 35403841
104. Provencio M, Nadal E, Gonzalez-Larriba JL, et al. Perioperative nivolumab and chemotherapy in stage III non-small-cell lung cancer. *N Engl J Med.* 2023;389(6):504-13. PMID: 37379158
105. Cascone T, Awad MM, Spicer JD, et al. CheckMate 77T: phase III study comparing neoadjuvant nivolumab (NIVO) plus chemotherapy (chemo) vs neoadjuvant placebo plus chemo followed by surgery and adjuvant NIVO or placebo for previously untreated, resectable stage II-IIb NSCLC. *Ann Oncol.* 2023;34(Suppl 2):S1295. PMID: none
106. Cascone T, Awad MM, Spicer JD, et al. Perioperative nivolumab in resectable lung cancer. *N Engl J Med.* 2024;390(19):1756-69. PMID: 38749033
107. O'Brien M, Paz-Ares L, Marreraud S, et al. Pembrolizumab versus placebo as adjuvant therapy for completely resected stage IB-IIIA non-small-cell lung cancer (PEARLS/KEYNOTE-091): an interim analysis of a randomised, triple-blind, phase 3 trial. *Lancet Oncol.* 2022;23(10):1274-86. PMID: 36108662
108. U.S. Food & Drug Administration (FDA). KEYTRUDA® (pembrolizumab) for injection, for intravenous use. 2014 [revised 2024 Nov]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/125514s164lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/125514s164lbl.pdf).
109. Wakelee H, Liberman M, Kato T, et al. Perioperative pembrolizumab for early-stage non-small-cell lung cancer. *N Engl J Med.* 2023;389(6):491-503. PMID: 37272513
110. Spicer JD, Gao S, Liberman M, et al. Overall survival in the KEYNOTE-671 study of perioperative pembrolizumab for early-stage non-small-cell lung cancer (NSCLC). *Ann Oncol.* 2023;34(Suppl 2):S1297-S8. PMID: none
111. Heymach JV, Harpole D, Mitsudomi T, et al. Perioperative durvalumab for resectable non-small-cell lung cancer. *N Engl J Med.* 2023;389(18):1672-84. PMID: 37870974
112. Lu S, Zhang W, Wu L, et al. Perioperative toripalimab plus chemotherapy for patients with resectable non-small cell lung cancer: the Neotorch randomized clinical trial. *JAMA.* 2024;331(3):201-11. PMID: 38227033
113. Wu YL, Dziadziuszko R, Ahn JS, et al. Alectinib in resected ALK-positive non-small-cell lung cancer. *N Engl J Med.* 2024;390(14):1265-76. PMID: 38598794

114. Senan S, Brade A, Wang LH, et al. PROCLAIM: randomized phase III trial of pemetrexed-cisplatin or etoposide-cisplatin plus thoracic radiation therapy followed by consolidation chemotherapy in locally advanced nonsquamous non-small-cell lung cancer. *J Clin Oncol.* 2016;34(9):953-62. PMID: 26811519
115. Antonia SJ, Villegas A, Daniel D, et al. Durvalumab after chemoradiotherapy in stage III non-small-cell lung cancer. *N Engl J Med.* 2017;377(20):1919-29. PMID: 28885881
116. Antonia SJ, Villegas A, Daniel D, et al. Overall survival with durvalumab after chemoradiotherapy in stage III NSCLC. *N Engl J Med.* 2018;379(24):2342-50. PMID: 30280658
117. Hui R, Ozguroglu M, Villegas A, et al. Patient-reported outcomes with durvalumab after chemoradiotherapy in stage III, unresectable non-small-cell lung cancer (PACIFIC): a randomised, controlled, phase 3 study. *Lancet Oncol.* 2019;20(12):1670-80. PMID: 31601496
118. Criss SD, Mooradian MJ, Sheehan DF, et al. Cost-effectiveness and budgetary consequence analysis of durvalumab consolidation therapy vs no consolidation therapy after chemoradiotherapy in stage III non-small cell lung cancer in the context of the US health care system. *JAMA Oncol.* 2018;5(3):358-65. PMID: 30543349
119. Spigel DR, Fairen-Finn C, Gray JE, et al. Five-year survival outcomes from the PACIFIC trial: durvalumab after chemoradiotherapy in stage III non-small-cell lung cancer. *J Clin Oncol.* 2022;40(12):1301-11. PMID: 35108059
120. Wu YL, Tsuboi M, He J, et al. Osimertinib in resected EGFR-mutated non-small-cell lung cancer. *N Engl J Med.* 2020;383(18):1711-23. PMID: 32955177
121. Tsuboi M, Herbst RS, John T, et al. Overall survival with osimertinib in resected EGFR-mutated NSCLC. *N Engl J Med.* 2023;389(2):137-47. PMID: 37272535
122. Zhou Q, Chen M, Jiang O, et al. Sugemalimab versus placebo after concurrent or sequential chemoradiotherapy in patients with locally advanced, unresectable, stage III non-small-cell lung cancer in China (GEMSTONE-301): interim results of a randomised, double-blind, multicentre, phase 3 trial. *Lancet Oncol.* 2022;23(2):209-19. PMID: 35038429
123. de Castro G, Jr., Kudaba I, Wu YL, et al. Five-year outcomes with pembrolizumab versus chemotherapy as first-line therapy in patients with non-small-cell lung cancer and programmed death ligand-1 tumor proportion score  $\geq 1\%$  in the KEYNOTE-042 study. *J Clin Oncol.* 2023;41(11):1986-91. PMID: 36306479
124. Ozguroglu M, Kilickap S, Sezer A, et al. First-line cemiplimab monotherapy and continued cemiplimab beyond progression plus chemotherapy for advanced non-small-cell lung cancer with PD-L1 50% or more (EMPOWER-Lung 1): 35-month follow-up from a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2023;24(9):989-1001. PMID: 37591293
125. Herbst RS, Giaccone G, de Marinis F, et al. Atezolizumab for first-line treatment of PD-L1-selected patients with NSCLC. *N Engl J Med.* 2020;383(14):1328-39. PMID: 32997907
126. Novello S, Kowalski DM, Luft A, et al. Pembrolizumab plus chemotherapy in squamous non-small-cell lung cancer: 5-year update of the phase III KEYNOTE-407 study. *J Clin Oncol.* 2023;41(11):1999-2006. PMID: 36735893
127. Reck M, Ciuleanu T, Cobo Dols M, et al. Nivolumab (NIVO) + ipilimumab (IPI) + 2 cycles of platinum-doublet chemotherapy (chemo) vs 4 cycles chemo as first-line (1L) treatment (tx) for stage IV/recurrent non-small cell lung cancer (NSCLC): CheckMate 9LA. *J Clin Oncol.* 2020;38(15 Suppl):abstract 9501. PMID: none
128. Paz-Ares L, Ciuleanu TE, Cobo M, et al. First-line nivolumab plus ipilimumab combined with two cycles of chemotherapy in patients with non-small-cell lung cancer (CheckMate 9LA): an international, randomised, open-label, phase 3 trial. *Lancet Oncol.* 2021;22(2):198-211. PMID: 33476593
129. Hellmann MD, Paz-Ares L, Bernabe Caro R, et al. Nivolumab plus ipilimumab in advanced non-small-cell lung cancer. *N Engl J Med.* 2019;381(21):2020-31. PMID: 31562796
130. Burotto M, Zvirbulė Z, Mochalova A, et al. IMscin001 part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications. *Ann Oncol.* 2023;34(8):693-702. PMID: 37268157
131. Burotto M, Zvirbulė Z, Mochalova A, et al. Corrigendum to 'IMscin001 Part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications': [Annals of Oncology 34 (2023) p693-702]. *Ann Oncol.* 2024;35(5):482. PMID: 38195363
132. Garassino MC, Gadgeel S, Speranza G, et al. Pembrolizumab plus pemetrexed and platinum in nonsquamous non-small-cell lung cancer: 5-year outcomes from the phase 3 KEYNOTE-189 study. *J Clin Oncol.* 2023;41(10):1992-8. PMID: 36809080
133. Socinski MA, Jotte RM, Cappuzzo F, et al. Atezolizumab for first-line treatment of metastatic nonsquamous NSCLC. *N Engl J Med.* 2018;378(24):2288-301. PMID: 29863955
134. Reck M, Wehler T, Orlandi F, et al. Safety and patient-reported outcomes of atezolizumab plus chemotherapy with or without bevacizumab versus bevacizumab plus chemotherapy in non-small-cell lung cancer. *J Clin Oncol.* 2020;38(22):2530-42. PMID: 32459597
135. Sugawara S, Lee JS, Kang JH, et al. Nivolumab with carboplatin, paclitaxel, and bevacizumab for first-line treatment of advanced non-squamous non-small cell lung cancer. *Ann Oncol.* 2021;32(9):1137-47. PMID: 34139272
136. West H, McCleod M, Hussein M, et al. Atezolizumab in combination with carboplatin plus nab-paclitaxel chemotherapy compared with chemotherapy alone as first-line treatment for metastatic non-squamous non-small-cell lung cancer (IMpower130): a multicentre, randomised, open-label, phase 3 trial. *Lancet Oncol.* 2019;20(7):924-37. PMID: 31122901
137. Johnson ML, Cho BC, Luft A, et al. Durvalumab with or without tremelimumab in combination with chemotherapy as first-line therapy for metastatic non-small-cell lung cancer: the phase III POSEIDON study. *J Clin Oncol.* 2023;41(6):1213-27. PMID: 36327426
138. Frasci G, Comella P, Panza N, et al. Carboplatin-oral etoposide personalized dosing in elderly non-small cell lung cancer patients. *Gruppo Oncologico Cooperativo Sud-Italia. Eur J Cancer.* 1998;34(11):1710-4. PMID: 9893657
139. Danson S, Middleton MR, O'Byrne KJ, et al. Phase III trial of gemcitabine and carboplatin versus mitomycin, ifosfamide, and cisplatin or mitomycin, vinblastine, and cisplatin in patients with advanced nonsmall cell lung carcinoma. *Cancer.* 2003;98(3):542-53. PMID: 12879472
140. Rizvi NA, Riely GJ, Azzoli CG, et al. Phase I/II trial of weekly intravenous 130-nm albumin-bound paclitaxel as initial chemotherapy in patients with stage IV non-small-cell lung cancer. *J Clin Oncol.* 2008;26(4):639-43. PMID: 18235124
141. Cardenal F, Lopez-Cabrerizo MP, Anton A, et al. Randomized phase III study of gemcitabine-cisplatin versus etoposide-cisplatin in the treatment of locally advanced or metastatic non-small-cell lung cancer. *J Clin Oncol.* 1999;17(1):12-8. PMID: 10458212

142. Fossella FV, DeVore R, Kerr RN, et al. Randomized phase III trial of docetaxel versus vinorelbine or ifosfamide in patients with advanced non-small-cell lung cancer previously treated with platinum-containing chemotherapy regimens. [Erratum appears in J Clin Oncol. 2004 Jan 1;22(1):209]. *J Clin Oncol.* 2000;18(12):2354-62. PMID: 10856094
143. Fidias PM, Dakhil SR, Lyss AP, et al. Phase III study of immediate compared with delayed docetaxel after front-line therapy with gemcitabine plus carboplatin in advanced non-small-cell lung cancer. *J Clin Oncol.* 2009;27(4):591-8. PMID: 19075278
144. Zatloukal P, Kanitz E, Magyar P, et al. Gemcitabine in locally advanced and metastatic non-small cell lung cancer: the central European phase II study. *Lung Cancer.* 1998;22(3):243-50. PMID: 10048477
145. Tan EH, Szczesna A, Krzakowski M, et al. Randomized study of vinorelbine-gemcitabine versus vinorelbine-carboplatin in patients with advanced non-small cell lung cancer. *Lung Cancer.* 2005;49(2):233-40. PMID: 16022917
146. Green MR, Manikhas GM, Orlov S, et al. Abraxane, a novel cremophor-free, albumin-bound particle form of paclitaxel for the treatment of advanced non-small-cell lung cancer. *Ann Oncol.* 2006;17(8):1263-8. PMID: 16740598
147. Lilienbaum RC, Herndon JE, 2nd, List MA, et al. Single-agent versus combination chemotherapy in advanced non-small-cell lung cancer: the cancer and leukemia group B (study 9730). *J Clin Oncol.* 2005;23(1):190-6. PMID: 15625373
148. Ceresoli GL, Gregorc V, Cordio S, et al. Phase II study of weekly paclitaxel as second-line therapy in patients with advanced non-small cell lung cancer. *Lung Cancer.* 2004;44(2):231-9. PMID: 15084388
149. Yasuda K, Igishi T, Kawasaki Y, et al. Phase II study of weekly paclitaxel in patients with non-small cell lung cancer who have failed previous treatments. *Oncology.* 2004;66(5):347-52. PMID: 15331920
150. Barlesi F, Scherpereel A, Rittmeyer A, et al. Randomized phase III trial of maintenance bevacizumab with or without pemetrexed after first-line induction with bevacizumab, cisplatin, and pemetrexed in advanced nonsquamous non-small-cell lung cancer: AVAPERL (MO22089). *J Clin Oncol.* 2013;31(24):3004-11. PMID: 23835708
151. Zhou C, Wang Z, Sun Y, et al. Sugemalimab versus placebo, in combination with platinum-based chemotherapy, as first-line treatment of metastatic non-small-cell lung cancer (GEMSTONE-302): interim and final analyses of a double-blind, randomised, phase 3 clinical trial. *Lancet Oncol.* 2022;23(2):220-33. PMID: 35038432
152. Seto T, Azuma K, Yamanaka T, et al. Randomized phase III study of continuation maintenance bevacizumab with or without pemetrexed in advanced nonsquamous non-small-cell lung cancer: COMPASS (WJOG5610L). *J Clin Oncol.* 2019;38(8):793-803. PMID: 31880966
153. Lu S, Kato T, Dong X, et al. Osimertinib after chemoradiotherapy in stage III EGFR-Mutated NSCLC. *N Engl J Med.* 2024;391(7):585-97. PMID: 38828946
154. Lu S, Ahn MJ, Reungwetwattana T, et al. Osimertinib after definitive chemoradiotherapy in unresectable stage III epidermal growth factor receptor-mutated non-small-cell lung cancer: analyses of central nervous system efficacy and distant progression from the phase III LAURA study. *Ann Oncol.* 2024;35(12):1116-25. PMID: 39289145
155. Rittmeyer A, Barlesi F, Waterkamp D, et al. Atezolizumab versus docetaxel in patients with previously treated non-small-cell lung cancer (OAK): a phase 3, open-label, multicentre randomised controlled trial. *Lancet.* 2017;389(10066):255-65. PMID: 27979383
156. Vokes EE, Ready N, Felip E, et al. Nivolumab versus docetaxel in previously treated advanced non-small-cell lung cancer (CheckMate 017 and CheckMate 057): 3-year update and outcomes in patients with liver metastases. *Ann Oncol.* 2018;29(4):959-65. PMID: 29408986
157. Rizvi NA, Mazieres J, Planchard D, et al. Activity and safety of nivolumab, an anti-PD-1 immune checkpoint inhibitor, for patients with advanced, refractory squamous non-small-cell lung cancer (CheckMate 063): a phase 2, single-arm trial. *Lancet Oncol.* 2015;16(3):257-65. PMID: 25704439
158. Antonia SJ, Borghaei H, Ramalingam SS, et al. Four-year survival with nivolumab in patients with previously treated advanced non-small-cell lung cancer: a pooled analysis. *Lancet Oncol.* 2019;20(10):1395-408. PMID: 31422028
159. Borghaei H, Gettinger S, Vokes EE, et al. Five-year outcomes from the randomized, phase III trials CheckMate 017 and 057: nivolumab versus docetaxel in previously treated non-small-cell lung cancer. *J Clin Oncol.* 2021;39(7):723-33. PMID: 33449799
160. Yang JC, Lee DH, Lee JS, et al. Phase III KEYNOTE-789 study of pemetrexed and platinum with or without pembrolizumab for tyrosine kinase inhibitor-resistant, EGFR-mutant, metastatic nonsquamous non-small cell lung cancer. *J Clin Oncol.* 2024;35(12):1116-25. PMID: 39173098
161. Garassino MC, Martelli O, Broggini M, et al. Erlotinib versus docetaxel as second-line treatment of patients with advanced non-small-cell lung cancer and wild-type EGFR tumours (TAILOR): a randomised controlled trial. *Lancet Oncol.* 2013;14(10):981-8. PMID: 23883922
162. Leighl NB, Shepherd FA, Kwong R, et al. Economic analysis of the TAX 317 trial: docetaxel versus best supportive care as second-line therapy of advanced non-small-cell lung cancer. *J Clin Oncol.* 2002;20(5):1344-52. PMID: 11870178
163. Anderson H, Hopwood P, Stephens RJ, et al. Gemcitabine plus best supportive care (BSC) vs BSC in inoperable non-small cell lung cancer--a randomized trial with quality of life as the primary outcome. UK NSCLC Gemcitabine Group. *Non-Small Cell Lung Cancer. British Journal of Cancer.* 2000;83(4):447-53. PMID: 10945489
164. Herbst RS, Garon EB, Kim DW, et al. Long-term outcomes and retreatment among patients with previously treated, programmed death-ligand 1-positive, advanced non-small-cell lung cancer in the KEYNOTE-010 study. *J Clin Oncol.* 2020;38(14):1580-90. PMID: 32078391
165. Arrieta O, Barron F, Ramirez-Tirado LA, et al. Efficacy and Safety of pembrolizumab plus docetaxel vs docetaxel alone in patients with previously treated advanced non-small cell lung cancer: the PROLONG phase 2 randomized clinical trial. *JAMA Oncol.* 2020;6(6):856-64. PMID: 32271354
166. Reckamp KL, Redman MW, Dragnev KH, et al. Phase II randomized study of ramucirumab and pembrolizumab versus standard of care in advanced non-small-cell lung cancer previously treated with immunotherapy-lung-MAP S1800A. *J Clin Oncol.* 2022;40(21):2295-306. PMID: 35658002
167. Neal J, Pavlakis N, Kim SW, et al. CONTACT-01: a randomized phase III trial of atezolizumab + cabozantinib versus docetaxel for metastatic non-small cell lung cancer after a checkpoint inhibitor and chemotherapy. *J Clin Oncol.* 2024;42(20):2393-403. PMID: 38552197
168. Zhao Y, He Y, Wang W, et al. Efficacy and safety of immune checkpoint inhibitors for individuals with advanced EGFR-mutated non-small-cell lung cancer who progressed on EGFR tyrosine-kinase inhibitors: a systematic review, meta-analysis, and network meta-analysis. *Lancet Oncol.* 2024;25(10):1347-56. PMID: 39159630
169. Ahn MJ, Tanaka K, Paz-Ares L, et al. Datopotamab deruxtecan versus docetaxel for previously treated advanced or metastatic non-small cell lung cancer: the randomized, open-label phase III TROPION-Lung01 study. *J Clin Oncol.* 2024:[Epub ahead of print]. PMID: 39250535
170. Li BT, Shen R, Buonocore D, et al. Ado-trastuzumab emtansine in patients with HER2 mutant lung cancers: results from a phase ii basket trial. *J Clin Oncol.* 2017;35(15 Suppl):abstract 8510. PMID: none
171. Li BT, Shen R, Buonocore D, et al. Ado-trastuzumab emtansine for patients with HER2-mutant lung cancers: results from a phase II basket trial. *J Clin Oncol.* 2018;36(24):2532-7. PMID: 29989854
172. Drilon A, Rekhtman N, Arcila M, et al. Cabozantinib in patients with advanced RET-rearranged non-small-cell lung cancer: an open-label, single-centre, phase 2, single-arm trial. *Lancet Oncol.* 2016;17(12):1653-60. PMID: 27825636

173. Drilon A, Wang L, Hasanovic A, et al. Response to cabozantinib in patients with RET fusion-positive lung adenocarcinomas. *Cancer Discov.* 2013;3(6):630-5. PMID: 23533264
174. Awad MM, Oxnard GR, Jackman DM, et al. MET exon 14 mutations in non-small-cell lung cancer are associated with advanced age and stage-dependent MET genomic amplification and c-Met overexpression. *J Clin Oncol.* 2016;34(7):721-30. PMID: 26729443
175. Frampton GM, Ali SM, Rosenzweig M, et al. Activation of MET via diverse exon 14 splicing alterations occurs in multiple tumor types and confers clinical sensitivity to MET inhibitors. *Cancer Discov.* 2015;5(8):850-9. PMID: 25971938
176. Heist RS, Shim HS, Gingipally S, et al. MET exon 14 skipping in non-small cell lung cancer. *Oncologist.* 2016;21(4):481-6. PMID: 27022036
177. Ou SH, Kwak EL, Siwak-Tapp C, et al. Activity of crizotinib (PF02341066), a dual mesenchymal-epithelial transition (MET) and anaplastic lymphoma kinase (ALK) inhibitor, in a non-small cell lung cancer patient with de novo MET amplification. *J Thorac Oncol.* 2011;6(5):942-6. PMID: 21623265
178. Paik PK, Drilon A, Fan PD, et al. Response to MET inhibitors in patients with stage IV lung adenocarcinomas harboring MET mutations causing exon 14 skipping. *Cancer Discov.* 2015;5(8):842-9. PMID: 25971939
179. Wang SXY, Zhang BM, Wakelee HA, et al. Case series of MET exon 14 skipping mutation-positive non-small-cell lung cancers with response to crizotinib and cabozantinib. *Anticancer Drugs.* 2019;30(5):537-41. PMID: 30762593
180. Carbone DP, Reck M, Paz-Ares L, et al. First-line nivolumab in stage IV or recurrent non-small-cell lung cancer. *N Engl J Med.* 2017;376(25):2415-26. PMID: 28636851
181. Wolf J, Seto T, Han JY, et al. Capmatinib (INC280) in METΔex14-mutated advanced non-small cell lung cancer (NSCLC): efficacy data from the phase II GEOMETRY mono-1 study. *J Clin Oncol.* 2019;37(Suppl 15):abstract 9004. PMID: none
182. Wolf J, Seto T, Han JY, et al. Capmatinib in MET exon 14-mutated or MET-amplified non-small-cell lung cancer. *N Engl J Med.* 2020;383(10):944-57. PMID: 32877583
183. Drilon A, Oxnard GR, Tan DSW, et al. Efficacy of selpercatinib in RET fusion-positive non-small-cell lung cancer. *N Engl J Med.* 2020;383(10):944-57. PMID: 32846060
184. Zhou C, Solomon B, Loong HH, et al. First-line selpercatinib or chemotherapy and pembrolizumab in RET fusion-positive nsclc. *N Engl J Med.* 2023;389(20):1839-50. PMID: 37870973
185. Gainor JF, Curigliano G, Kim D, et al. Registrational dataset from the phase I/II ARROW trial of pralsetinib (BLU-667) in patients (pts) with advanced RET fusion+ non-small cell lung cancer (NSCLC). *J Clin Oncol.* 2020;38(15 Suppl):abstract 9515. PMID: none
186. Gainor JF, Lee DH, Curigliano G, et al. Clinical activity and tolerability of BLU-667, a highly potent and selective RET inhibitor, in patients (pts) with advanced RET-fusion+ non-small cell lung cancer (NSCLC). *J Clin Oncol.* 2019;37(15 Suppl):abstract 9008. PMID: none
187. Griesinger F, Curigliano G, Thomas M, et al. Safety and efficacy of pralsetinib in RET fusion-positive non-small-cell lung cancer including as first-line therapy: update from the ARROW trial. *Ann Oncol.* 2022;33(11):1168-78. PMID: 35973665
188. U.S. Food & Drug Administration (FDA). GAVRETO® (pralsetinib) capsules, for oral use. 2020 [revised 2024 Mar]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/213721s015lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/213721s015lbl.pdf).
189. Paik PK, Felip E, Veillon R, et al. Tepotinib in non-small-cell lung cancer with MET exon 14 skipping mutations. *N Engl J Med.* 2020;383(10):931-43. PMID: 32469185
190. Mazieres J, Paik PK, Garassino MC, et al. Tepotinib treatment in patients with MET exon 14-skipping non-small cell lung cancer: long-term follow-up of the VISION phase 2 nonrandomized clinical trial. *JAMA Oncol.* 2023;9(9):1260-6. PMID: 37270698
191. Skoulidis F, Li BT, Dy GK, et al. Sotorasib for lung cancers with KRAS p.G12C mutation. *N Engl J Med.* 2021;384(25):2371-81. PMID: 34096690
192. de Langen AJ, Johnson ML, Mazieres J, et al. Sotorasib versus docetaxel for previously treated non-small-cell lung cancer with KRAS G12C mutation: a randomised, open-label, phase 3 trial. *Lancet.* 2023;401(10378):733-46. PMID: 36764316
193. Janne PA, Riely GJ, Gadgeel SM, et al. Adagrasib in non-small-cell lung cancer harboring a KRAS<sup>G12C</sup> mutation. *N Engl J Med.* 2022;387(2):120-31. PMID: 35658005
194. Smit E, Nakagawa K, Nagasaka M, et al. Trastuzumab deruxtecan in HER2-mutated metastatic non-small cell lung cancer (NSCLC): interim results of DESTINY-Lung01. *J Thorac Oncol.* 2021;16(3 Suppl):S173. PMID: none
195. Nakagawa K, Nagasaka M, Felip E, et al. Trastuzumab deruxtecan in HER2-overexpressing metastatic non-small cell lung cancer: interim results of DESTINY-Lung01. *J Thorac Oncol.* 2021;16(3 Suppl):S109-S10. PMID: none
196. Smit EF, Felip E, Uprety D, et al. Trastuzumab deruxtecan in patients (pts) with HER2-overexpressing (HER2-OE) metastatic non-small cell lung cancer (NSCLC): results from the DESTINY-Lung01 trial. *Ann Oncol.* 2022;33(Suppl 7):S994-S5. PMID: none
197. Smit EF, Felip E, Uprety D, et al. Trastuzumab deruxtecan in patients with metastatic non-small-cell lung cancer (DESTINY-Lung01): primary results of the HER2-overexpressing cohorts from a single-arm, phase 2 trial. *Lancet Oncol.* 2024;25(4):439-54. PMID: 38547891
198. Li BT, Smit EF, Goto Y, et al. Primary data from DESTINY-Lung01: a phase II trial of trastuzumab deruxtecan (T-DXd) in patients (Pts) with HER2-mutated (HER2m) metastatic non-small cell lung cancer (NSCLC). *Ann Oncol.* 2021;32(Suppl 5):S1323-S4. PMID: none
199. Li BT, Smit EF, Goto Y, et al. Trastuzumab deruxtecan in HER2-mutant non-small-cell lung cancer. *N Engl J Med.* 2022;1(3):241-51. PMID: 34534430
200. Goto K, Goto Y, Kubo T, et al. Trastuzumab deruxtecan in patients with HER2-mutant metastatic non-small-cell lung cancer: primary results from the randomized, phase II DESTINY-Lung02 trial. *J Clin Oncol.* 2023;41(31):4852-63. PMID: 37694347
201. Planchard D, Smit EF, Groen HJM, et al. Dabrafenib plus trametinib in patients with previously untreated BRAFV600E-mutant metastatic non-small-cell lung cancer: an open-label, phase 2 trial. *Lancet Oncol.* 2017;18(10):1307-16. PMID: 28919011
202. Planchard D, Besse B, Groen HJM, et al. Dabrafenib plus trametinib in patients with previously treated BRAF(V600E)-mutant metastatic non-small cell lung cancer: an open-label, multicentre phase 2 trial. *Lancet Oncol.* 2016;17(7):984-93. PMID: 27283860
203. Planchard D, Besse B, Kim TM, et al. Updated survival of patients (pts) with previously treated BRAF V600E-mutant advanced non-small cell lung cancer (NSCLC) who received dabrafenib (D) or D + trametinib (T) in the phase II BRF113928 study. *J Clin Oncol.* 2017;35(15 Suppl):abstract 9075. PMID: none
204. Mazieres J, Cropet C, Montane L, et al. Vemurafenib in non-small-cell lung cancer patients with BRAFV600 and BRAFnonV600 mutations. *Ann Oncol.* 2020;31(2):289-94. PMID: 31959346
205. Gautschi O, Milia J, Cabarrou B, et al. Targeted therapy for patients with BRAF-mutant lung cancer: results from the european EURAF cohort. *J Thorac Oncol.* 2015;10(10):1451-7. PMID: 26200454
206. Riely GJ, Smit EF, Ahn MJ, et al. Phase II, open-label study of encorafenib plus binimetinib in patients with BRAFV600-mutant metastatic non-small-cell lung cancer. *J Clin Oncol.* 2023;41(21):3700-11. PMID: 37270692
207. Solomon BJ, Liu G, Felip E, et al. Lorlatinib versus crizotinib in patients with advanced ALK-positive non-small cell lung cancer: 5-year outcomes from the phase III CROWN study. *J Clin Oncol.* 2024;42(29):3400-9. PMID: 38819031

208. Camidge DR, Kim HR, Ahn MJ, et al. Brigatinib versus crizotinib in ALK-positive non-small-cell lung cancer. *N Engl J Med.* 2018;379(21):2027-39. PMID: 30280657
209. Camidge DR, Kim HR, Ahn MJ, et al. Brigatinib versus crizotinib in advanced ALK inhibitor-naïve ALK-positive non-small cell lung cancer: second interim analysis of the phase III ALTA-1L trial. *J Clin Oncol.* 2020;38(31):3592-603. PMID: 32780660
210. Soria JC, Tan DSW, Chiari R, et al. First-line ceritinib versus platinum-based chemotherapy in advanced ALK-rearranged non-small-cell lung cancer (ASCEND-4): a randomised, open-label, phase 3 study. *Lancet.* 2017;389(10072):917-29. PMID: 28126333
211. Horn L, Wang Z, Wu G, et al. Ensartanib vs crizotinib for patients with anaplastic lymphoma kinase-positive non-small cell lung cancer: a randomized clinical trial. *JAMA Oncol.* 2021;7(11):1617-25. PMID: 34473194
212. Janne PA, Planchard D, Kobayashi K, et al. CNS efficacy of osimertinib with or without chemotherapy in epidermal growth factor receptor-mutated advanced non-small-cell lung cancer. *J Clin Oncol.* 2023;42(7):808-20. PMID: 38042525
213. Yang JC, Wu YL, Schuler M, et al. Afatinib versus cisplatin-based chemotherapy for EGFR mutation-positive lung adenocarcinoma (LUX-Lung 3 and LUX-Lung 6): analysis of overall survival data from two randomised, phase 3 trials. *Lancet Oncol.* 2015;16(2):141-51. PMID: 25589191
214. Park K, Haura EB, Leighl NB, et al. Amivantamab in EGFR exon 20 insertion-mutated non-small-cell lung cancer progressing on platinum chemotherapy: initial results from the CHRYSTALIS phase I study. *J Clin Oncol.* 2021;39(30):3391-402 PMID: 34339292
215. Zhou C, Tang KJ, Cho BC, et al. Amivantamab plus chemotherapy in NSCLC with EGFR exon 20 insertions. *N Engl J Med.* 2023;389(22):2039-51. PMID: 37870976
216. Rosell R, Carcereny E, Gervais R, et al. Erlotinib versus standard chemotherapy as first-line treatment for European patients with advanced EGFR mutation-positive non-small-cell lung cancer (EURTAC): a multicentre, open-label, randomised phase 3 trial. *Lancet Oncol.* 2012;13(3):239-46. PMID: 22285168
217. Mok TS, Wu YL, Thongprasert S, et al. Gefitinib or carboplatin-paclitaxel in pulmonary adenocarcinoma. *N Engl J Med.* 2009;361(10):947-57. PMID: 19692680
218. Douillard JY, Ostoros G, Cobo M, et al. First-line gefitinib in caucasian EGFR mutation-positive NSCLC patients: a phase-IV, open-label, single-arm study. *British Journal of Cancer.* 2014;110(1):55-62. PMID: 24263064
219. Noronha V, Patil VM, Joshi A, et al. Gefitinib versus gefitinib plus pemetrexed and carboplatin chemotherapy in EGFR-mutated lung cancer. *J Clin Oncol.* 2019;38(2):124-36. PMID: 31411950
220. Wu YL, Cheng Y, Zhou X, et al. Dacomitinib versus gefitinib as first-line treatment for patients with EGFR-mutation-positive non-small-cell lung cancer (ARCHER 1050): a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2017;18(11):1454-66. PMID: 28958502
221. Mok TS, Cheng Y, Zhou X, et al. Improvement in overall survival in a randomized study that compared dacomitinib with gefitinib in patients with advanced non-small-cell lung cancer and EGFR-activating mutations. *J Clin Oncol.* 2018;36(22):2244-50. PMID: 29864379
222. Nakagawa K, Garon EB, Seto T, et al. Ramucirumab plus erlotinib in patients with untreated, EGFR-mutated, advanced non-small-cell lung cancer (RELAY): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2019;20(12):1655-69. PMID: 31591063
223. Cho BC, Lu S, Felipe E, et al. Amivantamab plus lazertinib in previously untreated EGFR-mutated advanced NSCLC. *N Engl J Med.* 2024;391(16):1486-98. PMID: 38924756
224. Felipe E, Cho BC, Gutierrez V, et al. Amivantamab plus lazertinib versus osimertinib in first-line EGFR-mutant advanced non-small-cell lung cancer with biomarkers of high-risk disease: a secondary analysis from MARIPOSA. *Ann Oncol.* 2024;35(9):805-16. PMID: 38942080
225. Lim SM, Kim HR, Lee JS, et al. Open-label, multicenter, phase II study of ceritinib in patients with non-small-cell lung cancer harboring ROS1 rearrangement. *J Clin Oncol.* 2017;35(23):2613-8. PMID: 28520527
226. Shaw AT, Ou SH, Bang YJ, et al. Crizotinib in ROS1-rearranged non-small-cell lung cancer. *N Engl J Med.* 2014;371(21):1963-71. PMID: 25264305
227. Drilon A, Siena S, Ou SI, et al. Safety and antitumor activity of the multitargeted pan-TRK, ROS1, and ALK inhibitor entrectinib: combined results from two phase I trials (ALKA-372-001 and STARTRK-1). *Cancer Discov.* 2017;7(4):400-9. PMID: 28183697
228. U.S. Food & Drug Administration (FDA). ROZLYTREK (entrectinib) capsules, for oral use; ROZLYTREK® (entrectinib) oral pellets 2019 [revised 2024 Jan]. Available from: [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2024/212725s011lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2024/212725s011lbl.pdf).
229. Drilon A, Siena S, Dziadziuszko R, et al. Entrectinib in ROS1 fusion-positive non-small-cell lung cancer: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):261-70. PMID: 31838015
230. Cho BC, Camidge DR, Lin JJ, et al. Repotrectinib in patients with ROS1 fusion-positive (ROS1+) NSCLC: update from the pivotal phase 1/2 TRIDENT-1 trial. *J Thorac Oncol.* 2023;18(11 Suppl):S50-S1. PMID: none
231. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
232. Demetri GD, Paz-Ares L, Farago AF, et al. Efficacy and safety of entrectinib in patients with NTRK fusion-positive (NTRK-fp) tumors: pooled analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol.* 2018;29(Suppl 8):vii713. PMID: none
233. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
234. Janjigian YY, Smit EF, Groen HJ, et al. Dual inhibition of EGFR with afatinib and cetuximab in kinase inhibitor-resistant EGFR-mutant lung cancer with and without T790M mutations. *Cancer Discov.* 2014;4(9):1036-45. PMID: 25074459
235. Shaw AT, Gandhi L, Gadgeel S, et al. Alectinib in ALK-positive, crizotinib-resistant, non-small-cell lung cancer: a single-group, multicentre, phase 2 trial. *Lancet Oncol.* 2016;17(2):234-42. PMID: 26708155
236. Kim DW, Tiseo M, Ahn MJ, et al. Brigatinib in patients with crizotinib-refractory anaplastic lymphoma kinase-positive non-small-cell lung cancer: a randomized, multicenter phase II trial. *J Clin Oncol.* 2017;35(22):2490-8. PMID: 28475456
237. Shaw AT, Kim TM, Crino L, et al. Ceritinib versus chemotherapy in patients with ALK-rearranged non-small-cell lung cancer previously given chemotherapy and crizotinib (ASCEND-5): a randomised, controlled, open-label, phase 3 trial. *Lancet Oncol.* 2017;18(7):874-86. PMID: 28602779
238. Solomon BJ, Besse B, Bauer TM, et al. Lorlatinib in patients with ALK-positive non-small-cell lung cancer: results from a global phase 2 study. *Lancet Oncol.* 2018;19(12):1654-67. PMID: 30413378
239. HARMONI-A Study Investigators: Fang W, Zhao Y, Luo Y, et al. Ivonescimab plus chemotherapy in non-small cell lung cancer with EGFR variant: a randomized clinical trial. *JAMA.* 2024;332(7):561-70. PMID: 38820549
240. Passaro A, Wang J, Wang Y, et al. Amivantamab plus chemotherapy with and without lazertinib in EGFR-mutant advanced NSCLC after disease progression on osimertinib: Primary results from the phase III MARIPOSA-2 study. *Ann Oncol.* 2024;35(1):77-90. PMID: 37879444
241. Schnipper LE, Smith TJ, Raghavan D, et al. American Society of Clinical Oncology identifies five key opportunities to improve care and reduce costs: the top five list for oncology. *J Clin Oncol.* 2012;30(14):1715-24. PMID: 22493340

242. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. *N Engl J Med.* 2010;363(8):733-42. PMID: 20818875
243. Grigorescu AC, Draghici IN, Nitipir C, et al. Gemcitabine (GEM) and carboplatin (CBDCA) versus cisplatin (CDDP) and vinblastine (VLB) in advanced non-small-cell lung cancer (NSCLC) stages III and IV: a phase III randomised trial. *Lung Cancer.* 2002;37(1):9-14. PMID: 12057861
244. Booton R, Lorigan P, Anderson H, et al. A phase III trial of docetaxel/carboplatin versus mitomycin C/ifosfamide/cisplatin (MIC) or mitomycin C/vinblastine/cisplatin (MVP) in patients with advanced non-small-cell lung cancer: a randomised multicentre trial of the British Thoracic Oncology Group (BTOG1). *Ann Oncol.* 2006;17(7):1111-9. PMID: 16603599
245. Kubota K, Watanabe K, Kunitoh H, et al. Phase III randomized trial of docetaxel plus cisplatin versus vindesine plus cisplatin in patients with stage IV non-small-cell lung cancer: the Japanese Taxotere Lung Cancer Study Group. *J Clin Oncol.* 2004;22(2):254-61. PMID: 14722033
246. Hirsh V, Paz-Ares L, Boyer M, et al. Randomized phase III trial of paclitaxel/carboplatin with or without PF-3512676 (toll-like receptor 9 agonist) as first-line treatment for advanced non-small-cell lung cancer. *J Clin Oncol.* 2011;29(19):2667-74. PMID: 21632509
247. Quoix E, Zalcman G, Oster JP, et al. Carboplatin and weekly paclitaxel doublet chemotherapy compared with monotherapy in elderly patients with advanced non-small-cell lung cancer: IFCT-0501 randomised, phase 3 trial. *Lancet.* 2011;378(9796):1079-88. PMID: 21831418
248. Lee SH, Lee JK, Ahn MJ, et al. Vandetanib in pretreated patients with advanced non-small cell lung cancer-harboring RET rearrangement: a phase II clinical trial. *Ann Oncol.* 2017;28(2):292-7. PMID: 27803005
249. Ramalingam SS, Zhou C, Kim TM, et al. Mobocertinib (TAK-788) in EGFR exon 20 insertion (ex20ins)+ metastatic NSCLC (mNSCLC): Additional results from platinum pretreated patients (pts) and EXCLAIM cohort of phase 1/2 study. *J Clin Oncol.* 2021;39(15 Suppl):abstract 9014. PMID: none

## Lung Cancer: Small Cell Lung Cancer Pathways

### Adjuvant Therapy

- Limited Stage
  - With or without concurrent radiation therapy
    - Carboplatin and etoposide<sup>1</sup>
    - Cisplatin and etoposide<sup>2-4</sup>

### Neoadjuvant Therapy, Primary Therapy, First Line Therapy

- Limited Stage
  - With or without concurrent radiation therapy
    - Carboplatin and etoposide<sup>1</sup>
    - Cisplatin and etoposide<sup>2-4</sup>
- Extensive Stage
  - Atezolizumab (Tecentriq), carboplatin, and etoposide<sup>5</sup>
  - Carboplatin and etoposide<sup>6</sup>

## Lung Cancer: Small Cell Lung Cancer References

### NCCN Clinical Practice Guidelines: *Small Cell Lung Cancer*. Version 4.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Skarlos DV, Samantas E, Briassoulis E, et al. Randomized comparison of early versus late hyperfractionated thoracic irradiation concurrently with chemotherapy in limited disease small-cell lung cancer: a randomized phase II study of the Hellenic Cooperative Oncology Group (HeCOG). *Ann Oncol.* 2001;12(9):1231-8. PMID: 11697833
2. Faivre-Finn C, Snee M, Ashcroft L, et al. Concurrent once-daily versus twice-daily chemoradiotherapy in patients with limited-stage small-cell lung cancer (CONVERT): an open-label, phase 3, randomised, superiority trial. *Lancet Oncol.* 2017;18(8):1116-25. PMID: 28642008
3. Saito H, Takada Y, Ichinose Y, et al. Phase II study of etoposide and cisplatin with concurrent twice-daily thoracic radiotherapy followed by irinotecan and cisplatin in patients with limited-disease small-cell lung cancer: West Japan Thoracic Oncology Group 9902. *J Clin Oncol.* 2006;24(33):5247-52. PMID: 17114657
4. Turrisi AT, 3rd, Kim K, Blum R, et al. Twice-daily compared with once-daily thoracic radiotherapy in limited small-cell lung cancer treated concurrently with cisplatin and etoposide. *N Engl J Med.* 1999;340(4):265-71. PMID: 9920950
5. Horn L, Mansfield AS, Szczesna A, et al. First-line atezolizumab plus chemotherapy in extensive-stage small-cell lung cancer. *N Engl J Med.* 2018;379(23):2220-9. PMID: 30280641
6. 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(11):3540-5. PMID: 10550152
7. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Small Cell Lung Cancer (Version 4.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
8. Schmittel A, Fischer von Weikersthal L, Sebastian M, et al. A randomized phase II trial of irinotecan plus carboplatin versus etoposide plus carboplatin treatment in patients with extended disease small-cell lung cancer. *Ann Oncol.* 2006;17(4):663-7. PMID: 16423848
9. Spigel DR, Townley PM, Waterhouse DM, et al. Randomized phase II study of bevacizumab in combination with chemotherapy in previously untreated extensive-stage small-cell lung cancer: results from the SALUTE trial. *J Clin Oncol.* 2011;29(16):2215-22. PMID: 21502556
10. Hanna N, Bunn PA, Jr., Langer C, et al. Randomized phase III trial comparing irinotecan/cisplatin with etoposide/cisplatin in patients with previously untreated extensive-stage disease small-cell lung cancer. *J Clin Oncol.* 2006;24(13):2038-43. PMID: 16648503
11. Noda K, Nishiwaki Y, Kawahara M, et al. Irinotecan plus cisplatin compared with etoposide plus cisplatin for extensive small-cell lung cancer. *N Engl J Med.* 2002;346(2):85-91. PMID: 11784874
12. Niell HB, Herndon JE, 2nd, Miller AA, et al. Randomized phase III intergroup trial of etoposide and cisplatin with or without paclitaxel and granulocyte colony-stimulating factor in patients with extensive-stage small-cell lung cancer: Cancer and Leukemia Group B Trial 9732. *J Clin Oncol.* 2005;23(16):3752-9. PMID: 15923572
13. Evans WK, Shepherd FA, Feld R, et al. VP-16 and cisplatin as first-line therapy for small-cell lung cancer. *J Clin Oncol.* 1985;3(11):1471-7. PMID: 2997406
14. von Pawel J, Schiller JH, Shepherd FA, et al. Topotecan versus cyclophosphamide, doxorubicin, and vincristine for the treatment of recurrent small-cell lung cancer. *J Clin Oncol.* 1999;17(2):658-67. PMID: 10080612
15. Johnson DH, Greco FA, Strupp J, et al. Prolonged administration of oral etoposide in patients with relapsed or refractory small-cell lung cancer: a phase II trial. *J Clin Oncol.* 1990;8(10):1613-7. PMID: 2170589
16. van der Lee I, Smit EF, van Putten JW, et al. Single-agent gemcitabine in patients with resistant small-cell lung cancer. *Ann Oncol.* 2001;12(4):557-61. PMID: 11398892
17. Masters GA, Declerck L, Blanke C, et al. Phase II trial of gemcitabine in refractory or relapsed small-cell lung cancer: Eastern Cooperative Oncology Group Trial 1597. *J Clin Oncol.* 2003;21(8):1550-5. PMID: 12697880
18. Masuda N, Fukuoka M, Kusunoki Y, et al. CPT-11: a new derivative of camptothecin for the treatment of refractory or relapsed small-cell lung cancer. *J Clin Oncol.* 1992;10(8):1225-9. PMID: 1321891
19. Antonia SJ, Lopez-Martin JA, Bendell J, et al. Nivolumab alone and nivolumab plus ipilimumab in recurrent small-cell lung cancer (CheckMate 032): a multicentre, open-label, phase 1/2 trial. *Lancet Oncol.* 2016;17(7):883-95. PMID: 27269741
20. Pietanza MC, Kadota K, Huberman K, et al. Phase II trial of temozolamide in patients with relapsed sensitive or refractory small cell lung cancer, with assessment of methylguanine-DNA methyltransferase as a potential biomarker. *Clin Cancer Res.* 2012;18(4):1138-45. PMID: 22228633

21. Zauderer MG, Drilon A, Kadota K, et al. Trial of a 5-day dosing regimen of temozolomide in patients with relapsed small cell lung cancers with assessment of methylguanine-DNA methyltransferase. *Lung Cancer*. 2014;86(2):237-40. PMID: 25194640
22. O'Brien ME, Cicleanu TE, Tsekov H, et al. Phase III trial comparing supportive care alone with supportive care with oral topotecan in patients with relapsed small-cell lung cancer. *J Clin Oncol*. 2006;24(34):5441-7. PMID: 17135646
23. Eckardt JR, von Pawel J, Pujol JL, et al. Phase III study of oral compared with intravenous topotecan as second-line therapy in small-cell lung cancer. *J Clin Oncol*. 2007;25(15):2086-92. PMID: 17513814
24. Cheng Y, Spigel DR, Cho BC, et al. Durvalumab after chemoradiotherapy in limited-stage small-cell lung cancer. *N Engl J Med*. 2024;391(14):1313-27. PMID: 39268857
25. Liu SV, Reck M, Mansfield AS, et al. Updated overall survival and PD-L1 subgroup analysis of patients with extensive-stage small-cell lung cancer treated with atezolizumab, carboplatin, and etoposide (IMpower133). *J Clin Oncol*. 2021;39(6):619-30. PMID: 33439693
26. Bria E, Morgillo F, Garassino MC, et al. Atezolizumab plus carboplatin and etoposide in patients with untreated extensive-stage small-cell lung cancer: interim results of the MAURIS phase IIb trial. *Oncologist*. 2024;29(5):e690-e8. PMID: 38377176
27. Burotto M, Zvirbule Z, Mochalova A, et al. IMscin001 part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications. *Ann Oncol*. 2023;34(8):693-702. PMID: 37268157
28. Burotto M, Zvirbule Z, Mochalova A, et al. Corrigendum to 'IMscin001 Part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications': [Annals of Oncology 34 (2023) p693-702]. *Ann Oncol*. 2024;35(5):482. PMID: 38195363
29. Paz-Ares L, Dvorkin M, Chen Y, et al. Durvalumab plus platinum-etoposide versus platinum-etoposide in first-line treatment of extensive-stage small-cell lung cancer (CASPIAN): a randomised, controlled, open-label, phase 3 trial. *Lancet*. 2019;394(10212):1929-39. PMID: 31590988
30. Goldman JW, Dvorkin M, Chen Y, et al. Durvalumab, with or without tremelimumab, plus platinum-etoposide versus platinum-etoposide alone in first-line treatment of extensive-stage small-cell lung cancer (CASPIAN): updated results from a randomised, controlled, open-label, phase 3 trial. *Lancet Oncol*. 2020;22(1):51-65. PMID: 33285097
31. Rudin CM, Awad MM, Navarro A, et al. Pembrolizumab or placebo plus etoposide and platinum as first-line therapy for extensive-stage small-cell lung cancer: randomized, double-blind, phase III KEYNOTE-604 study. *J Clin Oncol*. 2020;38(21):2369-79. PMID: 32468956
32. Wang J, Zhou C, Yao W, et al. Adebrelimab or placebo plus carboplatin and etoposide as first-line treatment for extensive-stage small-cell lung cancer (CAPSTONE-1): a multicentre, randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol*. 2022;23(6):739-47. PMID: 35576956
33. Cheng Y, Han L, Wu L, et al. Effect of first-line serplulimab vs placebo added to chemotherapy on survival in patients with extensive-stage small cell lung cancer: the ASTRUM-005 randomized clinical trial. *JAMA*. 2022;328(12):1223-32. PMID: 36166026
34. Cheng Y, Zhang W, Wu L, et al. Toripalimab plus chemotherapy as a first-line therapy for extensive-stage small cell lung cancer: the phase 3 EXTENTORCH randomized clinical trial. *JAMA Oncol*. 2024;11(1):16-25. PMID: 39541202
35. Baize N, Monnet I, Greillier L, et al. Carboplatin plus etoposide versus topotecan as second-line treatment for patients with sensitive relapsed small-cell lung cancer: an open-label, multicentre, randomised, phase 3 trial. *Lancet Oncol*. 2020;21(9):1224-33. PMID: 32888454
36. Giaccone G, Ferrati P, Donadio M, et al. Reinduction chemotherapy in small cell lung cancer. *Eur J Cancer Clin Oncol*. 1987;23(11):1697-9. PMID: 2828074
37. Postmus PE, Berendsen HH, van Zandwijk N, et al. Retreatment with the induction regimen in small cell lung cancer relapsing after an initial response to short term chemotherapy. *Eur J Cancer Clin Oncol*. 1987;23(9):1409-11. PMID: 2824211
38. Smyth JF, Smith IE, Sessa C, et al. Activity of docetaxel (Taxotere) in small cell lung cancer. The Early Clinical Trials Group of the EORTC. *Eur J Cancer*. 1994;30A(8):1058-60. PMID: 7654428
39. Einhorn LH, Pennington K, McClean J. Phase II trial of daily oral VP-16 in refractory small cell lung cancer: a Hoosier Oncology Group study. *Semin Oncol*. 1990;17(1 Suppl 2):32-5. PMID: 2154857
40. Hellmann MD, Ott PA, Zugazagoitia J, et al. Nivolumab (nivo) +/- ipilimumab (ipi) in advanced small-cell lung cancer (SCLC): first report of a randomized expansion cohort from CheckMate 032. *J Clin Oncol*. 2017;35(15 Suppl):abstract 8503. PMID: none
41. Ready NE, Ott PA, Hellmann MD, et al. Nivolumab monotherapy and nivolumab plus ipilimumab in recurrent small cell lung cancer: results from the CheckMate 032 randomized cohort. *J Thorac Oncol*. 2020;15(3):426-35. PMID: 31629915
42. Smit EF, Fokkema E, Biesma B, et al. A phase II study of paclitaxel in heavily pretreated patients with small-cell lung cancer. *British Journal of Cancer*. 1998;77(2):347-51. PMID: 9461009
43. Yamamoto N, Tsurutani J, Yoshimura N, et al. Phase II study of weekly paclitaxel for relapsed and refractory small cell lung cancer. *Anticancer Res*. 2006;26(1B):777-81. PMID: 16739353
44. Chung HC, Lopez-Martin JA, Kao SCH, et al. Phase 2 study of pembrolizumab in advanced small-cell lung cancer (SCLC): KEYNOTE-158. *J Clin Oncol*. 2018;36(15 Suppl):abstract 8506. PMID: none
45. Ott PA, Elez E, Hiret S, et al. Pembrolizumab in patients with extensive-stage small-cell lung cancer: results from the phase Ib KEYNOTE-028 study. *J Clin Oncol*. 2017;35(34):3823-9. PMID: 28813164
46. Chung HC, Piha-Paul SA, Lopez-Martin J, et al. Pembrolizumab after two or more lines of previous therapy in patients with recurrent or metastatic SCLC: results from the KEYNOTE-028 and KEYNOTE-158 studies. *J Thorac Oncol*. 2020;15(4):618-27. PMID: 31870883

47. Trigo J, Subbiah V, Besse B, et al. Lurbinectedin as second-line treatment for patients with small-cell lung cancer: a single-arm, open-label, phase 2 basket trial. *Lancet Oncol.* 2020;21(5):645-54. PMID: 32224306
48. Ahn MJ, Cho BC, Felip E, et al. Tarlatamab for patients with previously treated small-cell lung cancer. *N Engl J Med.* 2023;389(22):2063-75. PMID: 37861218
49. Cantwell BM, Bozzino JM, Corris P, et al. The multidrug resistant phenotype in clinical practice; evaluation of cross resistance to ifosfamide and mesna after VP16-213, doxorubicin and vincristine (VPAV) for small cell lung cancer. *Eur J Cancer Clin Oncol.* 1988;24(2):123-9. PMID: 2833398
50. Furuse K, Kubota K, Kawahara M, et al. Phase II study of vinorelbine in heavily previously treated small cell lung cancer. *Japan Lung Cancer Vinorelbine Study Group. Oncology.* 1996;53(2):169-72. PMID: 8604245
51. Jassem J, Karnicka-Mlodkowska H, van Pottelsbergh C, et al. Phase II study of vinorelbine (Navelbine) in previously treated small cell lung cancer patients. *EORTC Lung Cancer Cooperative Group. Eur J Cancer.* 1993;29A(12):1720-2. PMID: 8398301

## Melanoma (Cutaneous Melanoma) Pathways

### Neoadjuvant Therapy

- Stages IIIB-IV (resectable)
  - Pembrolizumab (Keytruda)<sup>1</sup>
  - Nivolumab (Opdivo) and ipilimumab (Yervoy)<sup>2</sup>

### Adjuvant Therapy

- Stages IIB-III
  - Resected
    - Pembrolizumab (Keytruda)<sup>1, 3, 4</sup>
    - Nivolumab (Opdivo)<sup>5, 6</sup>

### First Line of Therapy (1<sup>st</sup> Line)

- Stages IV and Recurrent
  - Any BRAF Status
    - Nivolumab (Opdivo)<sup>7-10</sup>
    - Nivolumab (Opdivo) and ipilimumab (Yervoy)<sup>11-19</sup>
    - Pembrolizumab (Keytruda)\*<sup>20-25</sup>
  - BRAF Mutated†
    - Encorafenib (Braftovi) and binimatinib (Mektovi)‡<sup>26</sup>

### Second and Subsequent Lines of Therapy (2<sup>nd</sup> Line+) – **Termed 7/14/2025**

- Stages IV and Recurrent – **Termed 7/14/2025**
  - BRAF Mutated† (and no prior BRAF targeted therapy) – **Termed 7/14/2025**
    - Encorafenib (Braftovi) and binimatinib (Mektovi) – **Termed 7/14/2025**

\* Administered at a dose of 200 mg every 3 weeks OR 400 mg every 6 weeks per the FDA label OR 2 mg/kg (up to a maximum of 200 mg) every 3 weeks, as clinically appropriate

† BRAF V600E or V600K mutations

‡ First line only if the patient is not considered a suitable candidate for immunotherapy.

## Melanoma: Cutaneous Melanoma References

### NCCN Clinical Practice Guidelines: Melanoma: Cutaneous V2.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Patel SP, Othus M, Chen Y, et al. Neoadjuvant-adjuvant or adjuvant-only pembrolizumab in advanced melanoma. *N Engl J Med.* 2023;388(9):813-23. PMID: 36856617
2. Blank CU, Lucas MW, Scolyer RA, et al. Neoadjuvant nivolumab and ipilimumab in resectable stage III melanoma. *N Engl J Med.* 2024;391(18):1696-708. PMID: 38828984
3. Eggermont AMM, Blank CU, Mandala M, et al. Adjuvant pembrolizumab versus placebo in resected stage III melanoma. *N Engl J Med.* 2018;378(19):1789-801. PMID: 29658430
4. Eggermont AMM, Blank CU, Mandala M, et al. Longer follow-up confirms recurrence-free survival benefit of adjuvant pembrolizumab in high-risk stage III melanoma: updated results from the EORTC 1325-MG/KEYNOTE-054 TRIAL. *J Clin Oncol.* 2020;38(33):3925-36. PMID: 32946353
5. Ascierto PA, Del Vecchio M, Mandala M, et al. Adjuvant nivolumab versus ipilimumab in resected stage IIIB-C and stage IV melanoma (CheckMate 238): 4-year results from a multicentre, double-blind, randomised, controlled, phase 3 trial. *Lancet Oncol.* 2020;21(11):1465-77. PMID: 32961119
6. Weber J, Mandala M, Del Vecchio M, et al. Adjuvant nivolumab versus ipilimumab in resected stage III or IV melanoma. *N Engl J Med.* 2017;377(19):1824-35. PMID: 28891423
7. Ascierto PA, Long GV, Robert C, et al. Survival outcomes in patients with previously untreated BRAF wild-type advanced melanoma treated with nivolumab therapy: three-year follow-up of a randomized phase 3 trial. *JAMA Oncol.* 2019;5(2):187-94. PMID: 30422243
8. Robert C, Long GV, Brady B, et al. Five-year outcomes with nivolumab in patients with wild-type BRAF advanced melanoma. *J Clin Oncol.* 2020;38(33):3937-46. PMID: 32997575
9. Robert C, Long GV, Brady B, et al. Nivolumab in previously untreated melanoma without BRAF mutation. *N Engl J Med.* 2015;372(4):320-30. PMID: 25399552
10. Weber JS, D'Angelo SP, Minor D, et al. Nivolumab versus chemotherapy in patients with advanced melanoma who progressed after anti-CTLA-4 treatment (CheckMate 037): a randomised, controlled, open-label, phase 3 trial. *Lancet Oncol.* 2015;16(4):375-84. PMID: 25795410
11. Hodi FS, Chesney J, Pavlick AC, et al. Combined nivolumab and ipilimumab versus ipilimumab alone in patients with advanced melanoma: 2-year overall survival outcomes in a multicentre, randomised, controlled, phase 2 trial. *Lancet Oncol.* 2016;17(11):1558-68. PMID: 27622997
12. Hodi FS, Chiarion-Sileni V, Gonzalez R, et al. Nivolumab plus ipilimumab or nivolumab alone versus ipilimumab alone in advanced melanoma (CheckMate 067): 4-year outcomes of a multicentre, randomised, phase 3 trial. *Lancet Oncol.* 2018;19(11):1480-92. PMID: 30361170
13. Larkin J, Chiarion-Sileni V, Gonzalez R, et al. Combined nivolumab and ipilimumab or monotherapy in untreated melanoma. *N Engl J Med.* 2015;373(1):23-34. PMID: 26027431
14. Long GV, Atkinson V, Lo S, et al. Combination nivolumab and ipilimumab or nivolumab alone in melanoma brain metastases: a multicentre randomised phase 2 study. *Lancet Oncol.* 2018;19(5):672-81. PMID: 29602646
15. Postow MA, Chesney J, Pavlick AC, et al. Nivolumab and ipilimumab versus ipilimumab in untreated melanoma. *N Engl J Med.* 2015;372(21):2006-17. PMID: 25891304
16. Regan MM, Werner L, Rao S, et al. Treatment-free survival: a novel outcome measure of the effects of immune checkpoint inhibition-a pooled analysis of patients with advanced melanoma. *J Clin Oncol.* 2019;37(35):3350-8. PMID: 31498030
17. Tawbi HA, Forsyth PA, Algazi A, et al. Combined nivolumab and ipilimumab in melanoma metastatic to the brain. *N Engl J Med.* 2018;379(8):722-30. PMID: 30134131
18. Wolchok JD, Kluger H, Callahan MK, et al. Nivolumab plus ipilimumab in advanced melanoma. *N Engl J Med.* 2013;369(2):122-33. PMID: 23724867
19. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Melanoma: Cutaneous (Version 2.2025). Available at: <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
20. Hamid O, Robert C, Daud A, et al. Five-year survival outcomes for patients with advanced melanoma treated with pembrolizumab in KEYNOTE-001. *Ann Oncol.* 2019;30(4):582-8. PMID: 30715153
21. Kluger HM, Chiang V, Mahajan A, et al. Long-term survival of patients with melanoma with active brain metastases treated with pembrolizumab on a phase II trial. *J Clin Oncol.* 2019;37(1):52-60. PMID: 30407895
22. Lala M, Akala O, Chartash E, et al. Pembrolizumab 400 mg Q6W dosing: first clinical outcomes data from Keynote-555 cohort B in metastatic melanoma patients. 2020. American Association for Cancer Research (AACR). Annual Meeting April 27-28, 2020. Abstract CT042. Available from: <https://www.abstractsonline.com/pp8/#/9045/presentation/10751>.
23. Ribas A, Hamid O, Daud A, et al. Association of pembrolizumab with tumor response and survival among patients with advanced melanoma. *JAMA.* 2016;315(15):1600-9. PMID: 27092830
24. Robert C, Ribas A, Schachter J, et al. Pembrolizumab versus ipilimumab in advanced melanoma (KEYNOTE-006): post-hoc 5-year results from an open-label, multicentre, randomised, controlled, phase 3 study. *Lancet Oncol.* 2019;20(9):1239-51. PMID: 31345627
25. Robert C, Schachter J, Long GV, et al. Pembrolizumab versus ipilimumab in advanced melanoma. *N Engl J Med.* 2015;372(26):2521-32. PMID: 25891173
26. Dummer R, Ascierto PA, Gogas HJ, et al. Overall survival in patients with BRAF-mutant melanoma receiving encorafenib plus binimatinib versus vemurafenib or encorafenib (COLUMBUS): a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2018;19(10):1315-27. PMID: 30219628

27. Eggermont AMM, Kicinski M, Blank CU, et al. Five-year analysis of adjuvant pembrolizumab or placebo in stage III melanoma. *NEJM Evid.* 2022;1(11):EVIDoa2200214. PMID: 38319852
28. Hauschild A, Grob JJ, Demidov LV, et al. An update on BREAK-3, a phase III, randomized trial: dabrafenib (DAB) versus dacarbazine (DTIC) in patients with BRAF V600E-positive mutation metastatic melanoma (MM). *J Clin Oncol.* 2013;31(15 Suppl):abstract 9013. PMID: none
29. Long GV, Stroyakovskiy D, Gogas H, et al. Dabrafenib and trametinib versus dabrafenib and placebo for V600 BRAF-mutant melanoma: a multicentre, double-blind, phase 3 randomised controlled trial. *Lancet.* 2015;386(9992):444-51. PMID: 26037941
30. Long GV, Stroyakovskiy D, Gogas H, et al. Combined BRAF and MEK inhibition versus BRAF inhibition alone in melanoma. *N Engl J Med.* 2014;371(20):1877-88. PMID: 25265492
31. Chesney JA, Ribas A, Long GV, et al. Randomized, double-blind, placebo-controlled, global phase III trial of talimogene laherparepvec combined with pembrolizumab for advanced melanoma. *J Clin Oncol.* 2023;41(3):528-40. PMID: 35998300
32. McArthur GA, Chapman PB, Robert C, et al. Safety and efficacy of vemurafenib in BRAF(V600E) and BRAF(V600K) mutation-positive melanoma (BRIM-3): extended follow-up of a phase 3, randomised, open-label study. *Lancet Oncol.* 2014;15(3):323-32. PMID: 24508103
33. Robert C, Karaszewska B, Schachter J, et al. Improved overall survival in melanoma with combined dabrafenib and trametinib. *N Engl J Med.* 2015;372(1):30-9. PMID: 25399551
34. Ribas A, Daud A, Pavlick AC, et al. Extended 5-year follow-up results of a phase Ib study (BRIM7) of vemurafenib and cobimetinib in BRAF-mutant melanoma. *Clin Cancer Res.* 2020;26(1):46-53. PMID: 31732523
35. Pavlick AC, Ribas A, Gonzalez R, et al. Extended follow-up results of phase Ib study (BRIM7) of vemurafenib (VEM) with cobimetinib (COBI) in BRAF-mutant melanoma. *J Clin Oncol.* 2015;33(15 Suppl):abstract 9020. PMID: none
36. Ribas A, Gonzalez R, Pavlick A, et al. Combination of vemurafenib and cobimetinib in patients with advanced BRAF(V600)-mutated melanoma: a phase 1b study. *Lancet Oncol.* 2014;15(9):954-65. PMID: 25037139
37. Atkins MB, Lee SJ, Chmielowski B, et al. Combination dabrafenib and trametinib versus combination nivolumab and ipilimumab for patients with advanced BRAF-mutant melanoma: the DREAMseq trial - ECOG-ACRIN EA6134. *J Clin Oncol.* 2023;41(2):186-97. PMID: 36166727
38. Hodi FS, O'Day SJ, McDermott DF, et al. Improved survival with ipilimumab in patients with metastatic melanoma. *N Engl J Med.* 2010;363(8):711-23. PMID: 20525992
39. Schachter J, Ribas A, Long GV, et al. Pembrolizumab versus ipilimumab for advanced melanoma: final overall survival results of a multicentre, randomised, open-label phase 3 study (KEYNOTE-006). *Lancet.* 2017;390(10105):1853-62. PMID: 28822576
40. Ives NJ, Stowe RL, Lorigan P, et al. Chemotherapy compared with biochemotherapy for the treatment of metastatic melanoma: a meta-analysis of 18 trials involving 2,621 patients. *J Clin Oncol.* 2007;25(34):5426-34. PMID: 18048825
41. Middleton MR, Grob JJ, Aaronson N, et al. Randomized phase III study of temozolomide versus dacarbazine in the treatment of patients with advanced metastatic malignant melanoma. *J Clin Oncol.* 2000;18(1):158-66. PMID: 10623706
42. Hersh EM, O'Day SJ, Ribas A, et al. A phase 2 clinical trial of nab-paclitaxel in previously treated and chemotherapy-naïve patients with metastatic melanoma. *Cancer.* 2010;116(1):155-63. PMID: 19877111
43. Hersh EM, Del Vecchio M, Brown MP, et al. A randomized, controlled phase III trial of nab-paclitaxel versus dacarbazine in chemotherapy-naïve patients with metastatic melanoma. *Ann Oncol.* 2015;26(11):2267-74. PMID: 26410620
44. Smith FO, Downey SG, Klapper JA, et al. Treatment of metastatic melanoma using interleukin-2 alone or in conjunction with vaccines. *Clin Cancer Res.* 2008;14(17):5610-8. PMID: 18765555
45. Topalian SL, Sznol M, McDermott DF, et al. Survival, durable tumor remission, and long-term safety in patients with advanced melanoma receiving nivolumab. *J Clin Oncol.* 2014;32(10):1020-30. PMID: 24590637
46. Carvajal RD, Antonescu CR, Wolchok JD, et al. KIT as a therapeutic target in metastatic melanoma. *JAMA.* 2011;305(22):2327-34. PMID: 21642685
47. Sharon CE, Tortorella GN, Ma KL, et al. Long-term outcomes to neoadjuvant pembrolizumab based on pathological response for patients with resectable stage III/IV cutaneous melanoma. *Ann Oncol.* 2023;34(9):806-12. PMID: 37414215
48. Olivier T, Prasad V. Neoadjuvant followed by adjuvant pembrolizumab in melanoma: time biases in the data analysis of the SWOG S1801 trial. *Transl Oncol.* 2024;45:101959. PMID: 38621314
49. Mangla A, Lee C, Mirsky MM, et al. Neoadjuvant dual checkpoint inhibitors vs anti-PD1 therapy in high-risk resectable melanoma: a pooled analysis. *JAMA Oncol.* 2024;10(5):612-20. PMID: 38546551
50. Versluis JM, Menzies AM, Sikorska K, et al. Survival update of neoadjuvant ipilimumab plus nivolumab in macroscopic stage III melanoma in the OpACIN and OpACIN-neo trials. *Ann Oncol.* 2023;34(4):420-30. PMID: 36681299
51. Weber JS, Schadendorf D, Del Vecchio M, et al. Adjuvant therapy of nivolumab combined with ipilimumab versus nivolumab alone in patients with resected stage IIIB-D or stage IV melanoma (CheckMate 915). *J Clin Oncol.* 2022;1(3):517-27. PMID: 36162037
52. Albiges L, Bourlon MT, Chacon M, et al. Subcutaneous versus intravenous nivolumab for renal cell carcinoma. *Ann Oncol.* 2025;36(1):99-107. PMID: 39288844
53. Kirkwood J, Del Vecchio M, Weber J, et al. Adjuvant nivolumab in resected stage IIB/C melanoma: primary results from the randomized, phase 3 CheckMate 76K trial. *Nat Med.* 2023;29(11):2835-43. PMID: 37845511
54. Augustin RC, Luke JJ. Progression/recurrence-free survival 2 in adjuvant melanoma. *NEJM Evid.* 2022;1(11):EVIDe2200240. PMID: 38319859
55. Buhrer E, Kicinski M, Mandala M, et al. Adjuvant pembrolizumab versus placebo in resected stage III melanoma (EORTC 1325-MG/KEYNOTE-054): long-term, health-related quality-of-life results from a double-blind, randomised, controlled, phase 3 trial. *Lancet Oncol.* 2024;25(9):1202-12. PMID: 39146951
56. Luke JJ, Rutkowski P, Queirolo P, et al. Pembrolizumab versus placebo as adjuvant therapy in completely resected stage IIB or IIC melanoma (KEYNOTE-716): a randomised, double-blind, phase 3 trial. *Lancet.* 2022;399(10336):1718-29. PMID: 35367007
57. Luke JJ, Ascierto PA, Khattak MA, et al. Pembrolizumab versus placebo as adjuvant therapy in resected stage IIB or IIC melanoma: final analysis of distant metastasis-free survival in the phase III KEYNOTE-716 study. *J Clin Oncol.* 2024;42(14):1619-24. PMID: 38452313
58. Weber JS, Carlino MS, Khattak A, et al. Individualised neoantigen therapy mRNA-4157 (V940) plus pembrolizumab versus pembrolizumab monotherapy in resected melanoma (KEYNOTE-942): a randomised, phase 2b study. *Lancet.* 2024;403(10427):632-44. PMID: 38246194
59. Long GV, Hauschild A, Santinami M, et al. Adjuvant dabrafenib plus trametinib in stage III BRAF-mutated melanoma. *N Engl J Med.* 2017;377(19):1813-23. PMID: 28891408
60. Hauschild A, Dummer R, Schadendorf D, et al. Longer follow-up confirms relapse-free survival benefit with adjuvant dabrafenib plus trametinib in patients with resected BRAF V600-mutant stage III melanoma. *J Clin Oncol.* 2018;36(35):3441-9. PMID: 30343620

61. Dummer R, Hauschild A, Santinami M, et al. Five-year analysis of adjuvant dabrafenib plus trametinib in stage III melanoma. *N Engl J Med.* 2020;383(12):1139-48. PMID: 32877599
62. Long GV, Hauschild A, Santinami M, et al. Final results for adjuvant dabrafenib plus trametinib in stage III melanoma. *N Engl J Med.* 2024;391(18):1709-20. PMID: 38899716
63. Zimmer L, Livingstone E, Hassel JC, et al. Adjuvant nivolumab plus ipilimumab or nivolumab monotherapy versus placebo in patients with resected stage IV melanoma with no evidence of disease (IMMUNED): a randomised, double-blind, placebo-controlled, phase 2 trial. *Lancet.* 2020;395(10236):1558-68. PMID: 32416781
64. Long GV, Lipson EJ, Hodi FS, et al. First-line nivolumab plus relatlimab versus nivolumab plus ipilimumab in advanced melanoma: an indirect treatment comparison using RELATIVITY-047 and CheckMate 067 trial data. *J Clin Oncol.* 2024;42(33):3926-34. PMID: 39137386
65. Wolchok JD, Chiarion-Sileni V, Rutkowski P, et al. Final, 10-year outcomes with nivolumab plus ipilimumab in advanced melanoma. *N Engl J Med.* 2024;392(1):11-22(1):11-22. PMID: 39282897
66. Larkin J, Chiarion-Sileni V, Gonzalez R, et al. Five-year survival with combined nivolumab and ipilimumab in advanced melanoma. *N Engl J Med.* 2019;381(16):1535-46. PMID: 31562797
67. Wolchok JD, Chiarion-Sileni V, Gonzalez R, et al. Long-term outcomes with nivolumab plus ipilimumab or nivolumab alone versus ipilimumab in patients with advanced melanoma. *J Clin Oncol.* 2021;40(2):127-37. PMID: 34818112
68. Robert C, Carlino MS, McNeil C, et al. Seven-year follow-up of the phase III KEYNOTE-006 study: pembrolizumab versus ipilimumab in advanced melanoma. *J Clin Oncol.* 2023;41(24):3998-4003. PMID: 37348035
69. Long GV, Arance A, Mortier L, et al. Antitumor activity of ipilimumab or BRAF +/- MEK inhibition after pembrolizumab treatment in patients with advanced melanoma: analysis from KEYNOTE-006. *Ann Oncol.* 2022;33(2):204-15. PMID: 34710571
70. Long GV, Carlino MS, McNeil C, et al. Pembrolizumab versus ipilimumab for advanced melanoma: 10-year follow-up of the phase III KEYNOTE-006 study. *Ann Oncol.* 2024;35(12):191-1199. PMID: 39306585
71. Tawbi HA, Schadendorf D, Lipson EJ, et al. Relatlimab and nivolumab versus nivolumab in untreated advanced melanoma. *N Engl J Med.* 2022;386(1):24-34. PMID: 34986285
72. Tawbi HA, Hodi FS, Lipson EJ, et al. Three-year overall survival with nivolumab plus relatlimab in advanced melanoma from RELATIVITY-047. *J Clin Oncol.* 2025;43(13):1546-52. PMID: 39671533
73. Dummer R, Ascierto PA, Gogas HJ, et al. Encorafenib plus binimetinib versus vemurafenib or encorafenib in patients with BRAF-mutant melanoma (COLUMBUS): a multicentre, open-label, randomised phase 3 trial. *Lancet Oncol.* 2018;19(5):603-15. PMID: 29573941
74. Dummer R, Flaherty KT, Robert C, et al. COLUMBUS 5-year update: a randomized, open-label, phase III trial of encorafenib plus binimetinib versus vemurafenib or encorafenib in patients with BRAF V600-mutant melanoma. *J Clin Oncol.* 2022;40(36):4178-88. PMID: 35862871
75. Ascierto PA, Mandala M, Ferrucci PF, et al. Sequencing of ipilimumab plus nivolumab and encorafenib plus binimetinib for untreated BRAF-mutated metastatic melanoma (SECOMBIT): a randomized, three-arm, open-label phase II trial. *J Clin Oncol.* 2023;41(2):212-21. PMID: 36049147
76. Hauschild A, Grob JJ, Demidov LV, et al. Dabrafenib in BRAF-mutated metastatic melanoma: a multicentre, open-label, phase 3 randomised controlled trial. *Lancet.* 2012;380(9839):358-65. PMID: 22735384
77. Long GV, Flaherty KT, Stroyakovskiy D, et al. Dabrafenib plus trametinib versus dabrafenib monotherapy in patients with metastatic BRAF V600E/K-mutant melanoma: long-term survival and safety analysis of a phase 3 study. *Ann Oncol.* 2017;28(7):1631-9. PMID: 28475671
78. Davies MA, Saig P, Robert C, et al. Dabrafenib plus trametinib in patients with BRAFV600-mutant melanoma brain metastases (COMBI-MB): a multicentre, multicohort, open-label, phase 2 trial. *Lancet Oncol.* 2017;18(7):863-73. PMID: 28592387
79. Robert C, Grob JJ, Stroyakovskiy D, et al. Five-year outcomes with dabrafenib plus trametinib in metastatic melanoma. *N Engl J Med.* 2019;381(7):626-36. PMID: 31166680
80. Daud A, Weber JS, Sosman JA, et al. Updated overall survival (OS) results for BRF113220, a phase I-II study of dabrafenib alone versus combined dabrafenib and trametinib in patients with BRAF V600 metastatic melanoma (MM). *J Clin Oncol.* 2015;33(15 Suppl):abstract 9036. PMID: none
81. Chapman PB, Hauschild A, Robert C, et al. Improved survival with vemurafenib in melanoma with BRAF V600E mutation. *N Engl J Med.* 2011;364(26):2507-16. PMID: 21639808
82. Chapman PB, Hauschild A, Robert C, et al. Updated overall survival (OS) results for BRIM-3, a phase III randomized, open-label, multicenter trial comparing BRAF inhibitor vemurafenib (vem) with dacarbazine (DTIC) in previously untreated patients with BRAFV600E-mutated melanoma. *J Clin Oncol.* 2012;30(15 Suppl):abstract 8502. PMID: none
83. Chapman PB, Robert C, Larkin J, et al. Vemurafenib in patients with BRAFV600 mutation-positive metastatic melanoma: final overall survival results of the randomized BRIM-3 study. *Ann Oncol.* 2017;28(10):2581-7. PMID: 28961848
84. McArthur GA, Maio M, Arance A, et al. Vemurafenib in metastatic melanoma patients with brain metastases: an open-label, single-arm, phase 2, multicentre study. *Ann Oncol.* 2017;28(3):634-41. PMID: 27993793
85. Larkin J, Ascierto PA, Dreno B, et al. Combined vemurafenib and cobimetinib in BRAF-mutated melanoma. *N Engl J Med.* 2014;371(20):1867-76. PMID: 25265494
86. Ascierto PA, McArthur GA, Dreno B, et al. Cobimetinib combined with vemurafenib in advanced BRAF(V600)-mutant melanoma (coBRIM): updated efficacy results from a randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2016;17(9):1248-60. PMID: 27480103
87. Gutzmer R, Stroyakovskiy D, Gogas H, et al. Atezolizumab, vemurafenib, and cobimetinib as first-line treatment for unresectable advanced BRAF V600 mutation-positive melanoma (IMspire150): primary analysis of the randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet.* 2020;395(10240):1835-44. PMID: 32534646
88. Ascierto PA, Robert C, Lewis KD, et al. Time to central nervous system (CNS) metastases (mets) with atezolizumab (A) or placebo (P) combined with cobimetinib (C) + vemurafenib (V) in the phase III IMspire150 study. *J Clin Oncol.* 2020;38(15 Suppl):abstract 10023. PMID: none
89. Ascierto PA, Stroyakovskiy D, Gogas H, et al. Overall survival with first-line atezolizumab in combination with vemurafenib and cobimetinib in BRAFV600 mutation-positive advanced melanoma (IMspire150): second interim analysis of a multicentre, randomised, phase 3 study. *Lancet Oncol.* 2022;24(1):33-44. PMID: 36460017
90. Buratto M, Zvirbule Z, Mochalova A, et al. IMscin001 part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications. *Ann Oncol.* 2023;34(8):693-702. PMID: 37268157
91. Buratto M, Zvirbule Z, Mochalova A, et al. Corrigendum to 'IMscin001 Part 2: a randomised phase III, open-label, multicentre study examining the pharmacokinetics, efficacy, immunogenicity, and safety of atezolizumab subcutaneous versus intravenous administration in previously treated

- locally advanced or metastatic non-small-cell lung cancer and pharmacokinetics comparison with other approved indications': [Annals of Oncology 34 (2023) p693-702]. Ann Oncol. 2024;35(5):482. PMID: 38195363
92. Ferrucci PF, Di Giacomo AM, Del Vecchio M, et al. KEYNOTE-022 part 3: a randomized, double-blind, phase 2 study of pembrolizumab, dabrafenib, and trametinib in BRAF-mutant melanoma. J Immunother Cancer. 2020;8(2):e001806. PMID: 33361337
93. Ascierto PA, Ferrucci PF, Fisher R, et al. Dabrafenib, trametinib and pembrolizumab or placebo in BRAF-mutant melanoma. Nat Med. 2019;25(6):941-6. PMID: 31171878
94. Atkins MB, Lee SJ, Chmielowski B, et al. DREAMseq (Doublet Randomized Evaluation in Advanced Melanoma Sequencing): phase III trial—ECOG-ACRIN EA6134. J Clin Oncol. 2021;39(36 Suppl):abstract 356154. PMID: none
95. Rao RD, Holtan SG, Ingle JN, et al. Combination of paclitaxel and carboplatin as second-line therapy for patients with metastatic melanoma. Cancer. 2006;106(2):375-82. PMID: 16342250
96. Flaherty KT, Lee SJ, Zhao F, et al. Phase III trial of carboplatin and paclitaxel with or without sorafenib in metastatic melanoma. J Clin Oncol. 2013;31(3):373-9. PMID: 23248256
97. Flaherty KT, Lee SJ, Schuchter LM, et al. Final results of E2603: A double-blind, randomized phase III trial comparing carboplatin (C)/paclitaxel (P) with or without sorafenib (S) in metastatic melanoma. J Clin Oncol. 2010;28(15 Suppl):abstract 8511. PMID: none
98. Hauschild A, Agarwala SS, Trefzer U, et al. Results of a phase III, randomized, placebo-controlled study of sorafenib in combination with carboplatin and paclitaxel as second-line treatment in patients with unresectable stage III or stage IV melanoma. J Clin Oncol. 2009;27(17):2823-30. PMID: 19349552
99. Agarwala S, Keilholz U, Hogg D, et al. Randomized phase III study of paclitaxel plus carboplatin with or without sorafenib as second-line treatment in patients with advanced melanoma. J Clin Oncol. 2007;25(18 Suppl):abstract 8510. PMID: none
100. Wiernik PH, Einzig AI. Taxol in malignant melanoma. J Natl Cancer Inst. 1993;Monographs.(15):185-7. PMID: 7912525
101. Kottschade LA, Suman VJ, Amatruda T, 3rd, et al. A phase II trial of nab-paclitaxel (ABI-007) and carboplatin in patients with unresectable stage IV melanoma : a North Central Cancer Treatment Group Study, N057E(1). Cancer. 2011;117(8):1704-10. PMID: 21472717
102. Kaufmann R, Spieth K, Leiter U, et al. Temozolomide in combination with interferon-alpha versus temozolomide alone in patients with advanced metastatic melanoma: a randomized, phase III, multicenter study from the Dermatologic Cooperative Oncology Group. J Clin Oncol. 2005;23(35):9001-7. PMID: 16260697
103. Rosenberg SA, Yang JC, Topalian SL, et al. Treatment of 283 consecutive patients with metastatic melanoma or renal cell cancer using high-dose bolus interleukin 2. JAMA. 1994;271(12):907-13. PMID: 8120958
104. Atkins MB, Lotze MT, Dutcher JP, et al. High-dose recombinant interleukin 2 therapy for patients with metastatic melanoma: analysis of 270 patients treated between 1985 and 1993. J Clin Oncol. 1999;17(7):2105-16. PMID: 10561265
105. Atkins MB, Kunkel L, Sznol M, et al. High-dose recombinant interleukin-2 therapy in patients with metastatic melanoma: long-term survival update. Cancer J Sci Am. 2000;6 Suppl 1:S11-4. PMID: 10685652
106. Margolin K, Ernstoff MS, Hamid O, et al. Ipilimumab in patients with melanoma and brain metastases: an open-label, phase 2 trial. Lancet Oncol. 2012;13(5):459-65. PMID: 22456429
107. Robert C, Thomas L, Bondarenko I, et al. Ipilimumab plus dacarbazine for previously untreated metastatic melanoma. N Engl J Med. 2011;364(26):2517-26. PMID: 21639810
108. Maio M, Grob JJ, Aamdal S, et al. Five-year survival rates for treatment-naive patients with advanced melanoma who received ipilimumab plus dacarbazine in a phase III trial. J Clin Oncol. 2015;33(10):1191-6. PMID: 25713437
109. McDermott D, Haanen J, Chen TT, et al. Efficacy and safety of ipilimumab in metastatic melanoma patients surviving more than 2 years following treatment in a phase III trial (MDX010-20). Ann Oncol. 2013;24(10):2694-8. PMID: 23942774
110. Robert C, Schadendorf D, Messina M, et al. Efficacy and safety of retreatment with ipilimumab in patients with pretreated advanced melanoma who progressed after initially achieving disease control. Clin Cancer Res. 2013;19(8):2232-9. PMID: 23444228
111. Bowyer S, Prithviraj P, Lorigan P, et al. Efficacy and toxicity of treatment with the anti-CTLA-4 antibody ipilimumab in patients with metastatic melanoma after prior anti-PD-1 therapy. British Journal of Cancer. 2016;114(10):1084-9. PMID: 27124339
112. Ascierto PA, Del Vecchio M, Robert C, et al. Ipilimumab 10 mg/kg versus ipilimumab 3 mg/kg in patients with unresectable or metastatic melanoma: a randomised, double-blind, multicentre, phase 3 trial. Lancet Oncol. 2017;18(5):611-22. PMID: 28359784
113. Larkin J, Minor D, D'Angelo S, et al. Overall survival in patients with advanced melanoma who received nivolumab versus investigator's choice chemotherapy in CheckMate 037: a randomized, controlled, open-label Phase III trial. J Clin Oncol. 2018;36(4):383-90. PMID: 28671856
114. Hamid O, Robert C, Daud A, et al. Safety and tumor responses with lambrolizumab (anti-PD-1) in melanoma. N Engl J Med. 2013;369(2):134-44. PMID: 23724846
115. Robert C, Ribas A, Wolchok JD, et al. Anti-programmed-death-receptor-1 treatment with pembrolizumab in ipilimumab-refractory advanced melanoma: a randomised dose-comparison cohort of a phase 1 trial. Lancet. 2014;384(9948):1109-17. PMID: 25034862
116. Schreuer M, Jansen Y, Planken S, et al. Combination of dabrafenib plus trametinib for BRAF and MEK inhibitor pretreated patients with advanced BRAFV600-mutant melanoma: an open-label, single arm, dual-centre, phase 2 clinical trial. Lancet Oncol. 2017;18(4):464-72. PMID: 28268064
117. Ribas A, Puzanov I, Dummer R, et al. Pembrolizumab versus investigator-choice chemotherapy for ipilimumab-refractory melanoma (KEYNOTE-002): a randomised, controlled, phase 2 trial. Lancet Oncol. 2015;16(8):908-18. PMID: 26115796
118. Hamid O, Puzanov I, Dummer R, et al. Final analysis of a randomised trial comparing pembrolizumab versus investigator-choice chemotherapy for ipilimumab-refractory advanced melanoma. Eur J Cancer. 2017;86:37-45. PMID: 28961465
119. Carlino MS, Menzies AM, Atkinson V, et al. Long-term follow-up of standard-dose pembrolizumab plus reduced-dose ipilimumab in patients with advanced melanoma: KEYNOTE-029 Part 1B. Clin Cancer Res. 2020;26(19):5086-91. PMID: 32605909
120. Olson D, Luke JJ, Poklepovic AS, et al. Significant antitumor activity for low-dose ipilimumab (IPI) with pembrolizumab (PEMBRO) immediately following progression on PD1 Ab in melanoma (MEL) in a phase II trial. J Clin Oncol. 2020;38(15 Suppl):abstract 10004. PMID: none
121. Flaherty KT, Infante JR, Daud A, et al. Combined BRAF and MEK inhibition in melanoma with BRAF V600 mutations. N Engl J Med. 2012;367(18):1694-703. PMID: 23020132
122. Johnson DB, Flaherty KT, Weber JS, et al. Combined BRAF (dabrafenib) and MEK inhibition (trametinib) in patients with BRAFV600-mutant melanoma experiencing progression with single-agent BRAF inhibitor. J Clin Oncol. 2014;32(33):3697-704. PMID: 25287827
123. Sosman JA, Kim KB, Schuchter L, et al. Survival in BRAF V600-mutant advanced melanoma treated with vemurafenib. N Engl J Med. 2012;366(8):707-14. PMID: 22356324

124. Chesney J, Lewis KD, Kluger H, et al. Efficacy and safety of lileucel, a one-time autologous tumor-infiltrating lymphocyte (TIL) cell therapy, in patients with advanced melanoma after progression on immune checkpoint inhibitors and targeted therapies: pooled analysis of consecutive cohorts of the C-144-01 study. *J Immunother Cancer.* 2022;10(12):e005755. PMID: 36600653
125. Medina T, Chesney JA, Whitman E, et al. Long-term efficacy and safety of lileucel tumor-infiltrating lymphocyte (Til) cell therapy in patients with advanced melanoma: a 4-year analysis of the C-144-01 study. *J Immunother Cancer.* 2023;11(Suppl 1):A873. PMID: none
126. Medina T, Chesney JA, Whitman E, et al. Long-term efficacy and patterns of response of lileucel tumor-infiltrating lymphocyte (TIL) cell therapy in patients with advanced melanoma: a 4-year analysis of the C-144-01 study. *Immuno-Oncology and Technology.* 2023;20(Suppl):abstract 1190. PMID: none
127. Hodi FS, Corless CL, Giobbie-Hurder A, et al. Imatinib for melanomas harboring mutationally activated or amplified KIT arising on mucosal, acral, and chronically sun-damaged skin. *J Clin Oncol.* 2013;31(26):3182-90. PMID: 23775962
128. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
129. Drilon A, Siena S, Ou SI, et al. Safety and antitumor activity of the multitargeted pan-TRK, ROS1, and ALK inhibitor entrectinib: combined results from two phase I trials (ALKA-372-001 and STARTRK-1). *Cancer Discov.* 2017;7(4):400-9. PMID: 28183697
130. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol.* 2020;21(2):271-82. PMID: 31838007
131. Eggermont AM, Chiarion-Sileni V, Grob JJ, et al. Prolonged survival in stage III melanoma with ipilimumab adjuvant therapy. *N Engl J Med.* 2016;375(19):1845-55. PMID: 27717298
132. Schuchter LM. Adjuvant melanoma therapy - head-spinning progress. *N Engl J Med.* 2017;377(19):1888-90. PMID: 29117487
133. Atkins MB, Hsu J, Lee S, et al. Phase III trial comparing concurrent biochemotherapy with cisplatin, vinblastine, dacarbazine, interleukin-2, and interferon alfa-2b with cisplatin, vinblastine, and dacarbazine alone in patients with metastatic malignant melanoma (E3695): a trial coordinated by the Eastern Cooperative Oncology Group. *J Clin Oncol.* 2008;26(35):5748-54. PMID: 19001327

## Multiple Myeloma Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- New Diagnosis
  - Transplant Candidates
    - **VRD/VDR:** bortezomib (Velcade), lenalidomide (Revlimid), and dexamethasone<sup>1-4</sup>
    - **D-VRd:** daratumumab (Darzalex), bortezomib (Velcade), lenalidomide (Revlimid), and dexamethasone<sup>5, 6</sup>
  - Non-Transplant Candidates
    - **CyBorD or VDC:** bortezomib (Velcade), cyclophosphamide, and dexamethasone<sup>2, 4, 7, 8</sup>
    - **DRd:** daratumumab (Darzalex), lenalidomide (Revlimid), and dexamethasone<sup>9, 10</sup>
    - **Rd:** lenalidomide (Revlimid) and low-dose dexamethasone<sup>11-13</sup>
    - **VRd:** bortezomib (Velcade), lenalidomide (Revlimid), and dexamethasone<sup>1-4, 14</sup>
    - **Isatuximab-VRd:** bortezomib (Velcade), lenalidomide (Revlimid), and dexamethasone with isatuximab (Sarclisa)<sup>15</sup>
    - **Vd:** bortezomib (Velcade) and dexamethasone<sup>16</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Early Relapsed Disease
  - **CRd or KRd:** carfilzomib (Kyprolis), lenalidomide (Revlimid), and dexamethasone<sup>17, 18</sup>
  - **DRd:** daratumumab (Darzalex), lenalidomide (Revlimid), and dexamethasone<sup>19</sup>
  - **DVd:** daratumumab (Darzalex), bortezomib (Velcade), and dexamethasone<sup>20</sup>
  - **PVd:** pomalidomide (Pomalyst), bortezomib (Velcade), and dexamethasone<sup>\*21</sup>

### Maintenance Therapy

- Post-Transplant, Standard Risk
  - **Lenalidomide (Revlimid)**<sup>22-27</sup>

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\* Eligible only if patient has received prior therapy with lenalidomide and proteasome inhibitor

## Multiple Myeloma References

### NCCN Clinical Practice Guidelines: *Multiple Myeloma*. Version 1.2025

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

The NCCN Guidelines® are a statement of consensus of its authors regarding their views of currently accepted approaches to treatment. Any clinician seeking to apply or consult any NCCN Guidelines® is expected to use independent medical judgment in the context of individual clinical circumstances to determine any patient's care or treatment. The National Comprehensive Cancer Network makes no warranties of any kind whatsoever regarding their content, use or application and disclaims any responsibility for their application or use in any way.

1. Durie BG, Hoering A, Abidi MH, et al. Bortezomib with lenalidomide and dexamethasone versus lenalidomide and dexamethasone alone in patients with newly diagnosed myeloma without intent for immediate autologous stem-cell transplant (SWOG S0777): a randomised, open-label, phase 3 trial. *Lancet*. 2017;389(10068):519-27. PMID: 28017406
2. Kumar S, Flinn I, Richardson PG, et al. Randomized, multicenter, phase 2 study (EVOLUTION) of combinations of bortezomib, dexamethasone, cyclophosphamide, and lenalidomide in previously untreated multiple myeloma. *Blood*. 2012;119(19):4375-82. PMID: 22422823
3. Roussel M, Lauwers-Cances V, Robillard N, et al. Front-line transplantation program with lenalidomide, bortezomib, and dexamethasone combination as induction and consolidation followed by lenalidomide maintenance in patients with multiple myeloma: a phase II study by the Intergroupe Francophone du Myelome. *J Clin Oncol*. 2014;32(25):2712-7. PMID: 25024076
4. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Multiple Myeloma (Version 1.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
5. Voorhees PM, Kaufman JL, Laubach J, et al. Daratumumab, lenalidomide, bortezomib, and dexamethasone for transplant-eligible newly diagnosed multiple myeloma: the GRIFFIN trial. *Blood*. 2020;136(8):936-45. PMID: 32325490
6. Voorhees PM, Sborov DW, Laubach J, et al. Addition of daratumumab to lenalidomide, bortezomib, and dexamethasone for transplantation-eligible patients with newly diagnosed multiple myeloma (GRIFFIN): final analysis of an open-label, randomised, phase 2 trial. *Lancet Haematol*. 2023;10(10):e825-e37. PMID: 37708911
7. Mai EK, Bertsch U, Durig J, et al. Phase III trial of bortezomib, cyclophosphamide and dexamethasone (VCD) versus bortezomib, doxorubicin and dexamethasone (PAD) in newly diagnosed myeloma. *Leukemia*. 2015;29(8):1721-9. PMID: 25787915
8. Reeder CB, Reece DE, Kukreti V, et al. Cyclophosphamide, bortezomib and dexamethasone induction for newly diagnosed multiple myeloma: high response rates in a phase II clinical trial. *Leukemia*. 2009;23(7):1337-41. PMID: 19225538
9. Facon T, Kumar S, Plesner T, et al. Daratumumab plus lenalidomide and dexamethasone for untreated myeloma. *N Engl J Med*. 2019;380(22):2104-15. PMID: 31141632
10. Perrot A, Facon T, Plesner T, et al. Health-related quality of life in transplant-ineligible patients with newly diagnosed multiple myeloma: findings from the phase III MAIA trial. *J Clin Oncol*. 2021;39(3):227-37. PMID: 33326255
11. Benboubker L, Dimopoulos MA, Dispenzieri A, et al. Lenalidomide and dexamethasone in transplant-ineligible patients with myeloma. *N Engl J Med*. 2014;371(10):906-17. PMID: 25184863
12. Gay F, Hayman SR, Lacy MQ, et al. Lenalidomide plus dexamethasone versus thalidomide plus dexamethasone in newly diagnosed multiple myeloma: a comparative analysis of 411 patients. *Blood*. 2010;115(7):1343-50. PMID: 20008302
13. Rajkumar SV, Jacobus S, Callander NS, et al. Lenalidomide plus high-dose dexamethasone versus lenalidomide plus low-dose dexamethasone as initial therapy for newly diagnosed multiple myeloma: an open-label randomised controlled trial. *Lancet Oncol*. 2010;11(1):29-37. PMID: 19853510
14. Kumar SK, Jacobus SJ, Cohen AD, et al. Carfilzomib or bortezomib in combination with lenalidomide and dexamethasone for patients with newly diagnosed multiple myeloma without intention for immediate autologous stem-cell transplantation (ENDURANCE): a multicentre, open-label, phase 3, randomised, controlled trial. *Lancet Oncol*. 2020;21(10):1317-30. PMID: 32866432
15. Facon T, Dimopoulos MA, Leleu XP, et al. Isatuximab, bortezomib, lenalidomide, and dexamethasone for multiple myeloma. *N Engl J Med*. 2024;39(17):1597-609. PMID: 38832972
16. Niesvizky R, Flinn IW, Rifkin R, et al. Community-based phase IIIB trial of three UPFRONT bortezomib-based myeloma regimens. *J Clin Oncol*. 2015;33(33):3921-9. PMID: 26056177
17. Siegel DS, Dimopoulos MA, Ludwig H, et al. Improvement in overall survival with carfilzomib, lenalidomide, and dexamethasone in patients with relapsed or refractory multiple myeloma. *J Clin Oncol*. 2018;36(8):728-34. PMID: 29341834
18. Stewart AK, Rajkumar SV, Dimopoulos MA, et al. Carfilzomib, lenalidomide, and dexamethasone for relapsed multiple myeloma. *N Engl J Med*. 2015;372(2):142-52. PMID: 25482145
19. Dimopoulos MA, Oriol A, Nahm H, et al. Daratumumab, Lenalidomide, and Dexamethasone for Multiple Myeloma. *N Engl J Med*. 2016;375(14):1319-31. PMID: 27705267
20. Palumbo A, Chanan-Khan A, Weisel K, et al. Daratumumab, bortezomib, and dexamethasone for multiple myeloma. *N Engl J Med*. 2016;375(8):754-66. PMID: 27557302

21. Richardson PG, Oriol A, Beksac M, et al. Pomalidomide, bortezomib, and dexamethasone for patients with relapsed or refractory multiple myeloma previously treated with lenalidomide (OPTIMISMM): a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2019;13:13. PMID: 31097405
22. Attal M, Lauwers-Cances V, Marit G, et al. Lenalidomide maintenance after stem-cell transplantation for multiple myeloma. *N Engl J Med.* 2012;366(19):1782-91. PMID: 22571202
23. Gay F, Oliva S, Petrucci MT, et al. Chemotherapy plus lenalidomide versus autologous transplantation, followed by lenalidomide plus prednisone versus lenalidomide maintenance, in patients with multiple myeloma: a randomised, multicentre, phase 3 trial. *Lancet Oncol.* 2015;16(16):1617-29. PMID: 26596670
24. Holstein SA, Jung SH, Richardson PG, et al. Updated analysis of CALGB (Alliance) 100104 assessing lenalidomide versus placebo maintenance after single autologous stem-cell transplantation for multiple myeloma: a randomised, double-blind, phase 3 trial. *Lancet Haematol.* 2017;4(9):e431-e42. PMID: 28826616
25. McCarthy PL, Holstein SA, Petrucci MT, et al. Lenalidomide maintenance after autologous stem-cell transplantation in newly diagnosed multiple myeloma: a meta-analysis. *J Clin Oncol.* 2017;35(29):3279-89. PMID: 28742454
26. McCarthy PL, Owzar K, Hofmeister CC, et al. Lenalidomide after stem-cell transplantation for multiple myeloma. *N Engl J Med.* 2012;366(19):1770-81. PMID: 22571201
27. Palumbo A, Cavallo F, Gay F, et al. Autologous transplantation and maintenance therapy in multiple myeloma. *N Engl J Med.* 2014;371(10):895-905. PMID: 25184862
28. Jakubowiak AJ, Dytfield D, Griffith KA, et al. A phase 1/2 study of carfilzomib in combination with lenalidomide and low-dose dexamethasone as a frontline treatment for multiple myeloma. *Blood.* 2012;120(9):1801-9. PMID: 22665938
29. Wang M, Martin T, Bensinger W, et al. Phase 2 dose-expansion study (PX-171-006) of carfilzomib, lenalidomide, and low-dose dexamethasone in relapsed or progressive multiple myeloma. *Blood.* 2013;122(18):3122-8. PMID: 24014245
30. Korde N, Roschewski M, Zingone A, et al. Treatment with carfilzomib-lenalidomide-dexamethasone with lenalidomide extension in patients with smoldering or newly diagnosed multiple myeloma. *JAMA Oncol.* 2015;1(6):746-54. PMID: 26181891
31. Harousseau JL, Attal M, Avet-Loiseau H, et al. Bortezomib plus dexamethasone is superior to vincristine plus doxorubicin plus dexamethasone as induction treatment prior to autologous stem-cell transplantation in newly diagnosed multiple myeloma: results of the IFM 2005-01 phase III trial. *J Clin Oncol.* 2010;28(30):4621-9. PMID: 20823406
32. Harousseau JL, Attal M, Leleu X, et al. Bortezomib plus dexamethasone as induction treatment prior to autologous stem cell transplantation in patients with newly diagnosed multiple myeloma: results of an IFM phase II study. *Haematologica.* 2006;91(11):1498-505. PMID: 17043025
33. Sonneveld P, Schmidt-Wolf IG, van der Holt B, et al. Bortezomib induction and maintenance treatment in patients with newly diagnosed multiple myeloma: results of the randomized phase III HOVON-65/ GMMG-HD4 trial. *J Clin Oncol.* 2012;30(24):2946-55. PMID: 22802322
34. Michael M, Bruns I, Bolke E, et al. Bendamustine in patients with relapsed or refractory multiple myeloma. *Eur J Med Res.* 2010;15(1):13-9. PMID: 20159666
35. Knop S, Straka C, Haen M, et al. The efficacy and toxicity of bendamustine in recurrent multiple myeloma after high-dose chemotherapy. *Haematologica.* 2005;90(9):1287-8. PMID: 16154860
36. Orlowski RZ, Nagler A, Sonneveld P, et al. Randomized phase III study of pegylated liposomal doxorubicin plus bortezomib compared with bortezomib alone in relapsed or refractory multiple myeloma: combination therapy improves time to progression. *J Clin Oncol.* 2007;25(25):3892-901. PMID: 17679727
37. Dimopoulos MA, Goldschmidt H, Niesvizky R, et al. Carfilzomib or bortezomib in relapsed or refractory multiple myeloma (ENDEAVOR): an interim overall survival analysis of an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2017;18(10):1327-37. PMID: 28843768
38. Lenhard RE, Jr., Oken MM, Barnes JM, et al. High-dose cyclophosphamide. An effective treatment for advanced refractory multiple myeloma. *Cancer.* 1984;53(7):1456-60. PMID: 6697291
39. Lentzsch S, O'Sullivan A, Kennedy RC, et al. Combination of bendamustine, lenalidomide, and dexamethasone (BLD) in patients with relapsed or refractory multiple myeloma is feasible and highly effective: results of phase 1/2 open-label, dose escalation study. *Blood.* 2012;119(20):4608-13. PMID: 22451423
40. Weber DM, Chen C, Niesvizky R, et al. Lenalidomide plus dexamethasone for relapsed multiple myeloma in North America. *N Engl J Med.* 2007;357(21):2133-42. PMID: 18032763
41. Reece DE, Rodriguez GP, Chen C, et al. Phase I-II trial of bortezomib plus oral cyclophosphamide and prednisone in relapsed and refractory multiple myeloma. *J Clin Oncol.* 2008;26(29):4777-83. PMID: 18645194
42. Kropff M, Bisping G, Schuck E, et al. Bortezomib in combination with intermediate-dose dexamethasone and continuous low-dose oral cyclophosphamide for relapsed multiple myeloma. *Br J Haematol.* 2007;138(3):330-7. PMID: 17614819
43. Davies FE, Wu P, Jenner M, et al. The combination of cyclophosphamide, velcade and dexamethasone induces high response rates with comparable toxicity to velcade alone and velcade plus dexamethasone. *Haematologica.* 2007;92(8):1149-50. PMID: 17650451
44. Arnulf B, Pylypenko H, Grosicki S, et al. Updated survival analysis of a randomised phase III study of subcutaneous versus intravenous bortezomib in patients with relapsed multiple myeloma. *Haematologica.* 2012;97(12):1925-8. PMID: 22689676
45. Dimopoulos MA, Moreau P, Palumbo A, et al. Carfilzomib and dexamethasone versus bortezomib and dexamethasone for patients with relapsed or refractory multiple myeloma (ENDEAVOR): a randomised, phase 3, open-label, multicentre study. *Lancet Oncol.* 2016;17(1):27-38. PMID: 26671818

46. Moreau P, Pylypenko H, Grosicki S, et al. Subcutaneous versus intravenous administration of bortezomib in patients with relapsed multiple myeloma: a randomised, phase 3, non-inferiority study. Lancet Oncol. 2011;12(5):431-40. PMID: 21507715
47. Barlogie B, Anassis E, van Rhee F, et al. Incorporating bortezomib into upfront treatment for multiple myeloma: early results of total therapy 3. Br J Haematol. 2007;138(2):176-85. PMID: 17593024
48. Richardson PG, Xie W, Jagannath S, et al. A phase 2 trial of lenalidomide, bortezomib, and dexamethasone in patients with relapsed and relapsed/refractory myeloma. Blood. 2014;123(10):1461-9. PMID: 24429336
49. Siegel DS, Martin T, Wang M, et al. A phase 2 study of single-agent carfilzomib (PX-171-003-A1) in patients with relapsed and refractory multiple myeloma. Blood. 2012;120(14):2817-25. PMID: 22833546
50. Richardson PG, Siegel DS, Vij R, et al. Pomalidomide alone or in combination with low-dose dexamethasone in relapsed and refractory multiple myeloma: a randomized phase 2 study. Blood. 2014;123(12):1826-32. PMID: 24421329
51. Dimopoulos MA, Weisel K, Song KW, et al. Final analysis, cytogenetics, long-term treatment, and long-term survival in MM-003, A phase 3 study comparing pomalidomide + low-dose dexamethasone (POM + LoDEX) vs high-dose dexamethasone (HiDEX) in relapsed/refractory multiple myeloma (RRMM). Blood. 2013;122(21):408. PMID: none
52. Dimopoulos MA, Palumbo A, Corradini P, et al. Safety and efficacy of pomalidomide plus low-dose dexamethasone in STRATUS (MM-010): a phase 3b study in refractory multiple myeloma. Blood. 2016;128(4):497-503. PMID: 27226434
53. Morgan G, Palumbo A, Dhanasiri S, et al. Overall survival of relapsed and refractory multiple myeloma patients after adjusting for crossover in the MM-003 trial for pomalidomide plus low-dose dexamethasone. Br J Haematol. 2015;168(6):820-3. PMID: 25403264
54. Richardson PG, Jacobus SJ, Weller EA, et al. Triplet therapy, transplantation, and maintenance until progression in myeloma. N Engl J Med. 2022;387(2):132-47. PMID: 35660812
55. Moreau P, Attal M, Hulin C, et al. Bortezomib, thalidomide, and dexamethasone with or without daratumumab before and after autologous stem-cell transplantation for newly diagnosed multiple myeloma (CASSIOPEIA): a randomised, open-label, phase 3 study. Lancet. 2019;394(10192):29-38. PMID: 31171419
56. Moreau P, Hulin C, Perrot A, et al. Bortezomib, thalidomide, and dexamethasone with or without daratumumab and followed by daratumumab maintenance or observation in transplant-eligible newly diagnosed multiple myeloma: long-term follow-up of the CASSIOPEIA randomised controlled phase 3 trial. Lancet Oncol. 2024;25(8):1003-14. PMID: 38889735
57. Sonneveld P, Dimopoulos MA, Boccadoro M, et al. Daratumumab, bortezomib, lenalidomide, and dexamethasone for multiple myeloma. N Engl J Med. 2024;390(4):301-13. PMID: 38084760
58. Gay F, Musto P, Rota-Scalabrini D, et al. Carfilzomib with cyclophosphamide and dexamethasone or lenalidomide and dexamethasone plus autologous transplantation or carfilzomib plus lenalidomide and dexamethasone, followed by maintenance with carfilzomib plus lenalidomide or lenalidomide alone for patients with newly diagnosed multiple myeloma (FORTE): a randomised, open-label, phase 2 trial. Lancet Oncol. 2021;22(12):1705-20. PMID: 34774221
59. Dytfield D, Jasielec J, Griffith KA, et al. Carfilzomib, lenalidomide, and low-dose dexamethasone in elderly patients with newly diagnosed multiple myeloma. Haematologica. 2014;99(9):e162-4. PMID: 24972772
60. Kumar SK, Lacy MQ, Hayman SR, et al. Lenalidomide, cyclophosphamide and dexamethasone (CRd) for newly diagnosed multiple myeloma: results from a phase 2 trial. Am J Hematol. 2011;86(8):640-5. PMID: 21630308
61. Reeder CB, Reece DE, Kukreti V, et al. Long-term survival with cyclophosphamide, bortezomib and dexamethasone induction therapy in patients with newly diagnosed multiple myeloma. Br J Haematol. 2014;167(4):563-5. PMID: 24974945
62. Yimer H, Melear J, Faber E, et al. Daratumumab, bortezomib, cyclophosphamide and dexamethasone in newly diagnosed and relapsed multiple myeloma: LYRA study. Br J Haematol. 2019;185(3):492-502. PMID: 30828799
63. Kaiser MF, Hall A, Walker K, et al. Daratumumab, cyclophosphamide, bortezomib, lenalidomide, and dexamethasone as induction and extended consolidation improves outcome in ultra-high-risk multiple myeloma. J Clin Oncol. 2023;41(23):3945-55. PMID: 37315268
64. Facon T, Venner CP, Bahlis NJ, et al. Oral ixazomib, lenalidomide, and dexamethasone for transplant-ineligible patients with newly diagnosed multiple myeloma. Blood. 2021;137(26):3616-28. PMID: 33763699
65. Facon T, Kumar SK, Plesner T, et al. Daratumumab, lenalidomide, and dexamethasone versus lenalidomide and dexamethasone alone in newly diagnosed multiple myeloma (MAIA): overall survival results from a randomised, open-label, phase 3 trial. Lancet Oncol. 2021;22(11):1582-96. PMID: 34655533
66. Bringhen S, Petrucci MT, Larocca A, et al. Carfilzomib, cyclophosphamide, and dexamethasone in patients with newly diagnosed multiple myeloma: a multicenter, phase 2 study. Blood. 2014;124(1):63-9. PMID: 24855212
67. Rosinol L, Oriol A, Rios R, et al. Lenalidomide and dexamethasone maintenance with or without ixazomib, tailored by residual disease status in myeloma. Blood. 2023;142(18):1518-28. PMID: 37506339
68. Rosinol L, Oriol A, Teruel AI, et al. Superiority of bortezomib, thalidomide, and dexamethasone (VTD) as induction pretransplantation therapy in multiple myeloma: a randomized phase 3 PETHEMA/GEM study. Blood. 2012;120(8):1589-96. PMID: 22791289
69. Straka C, Knop S, Vogel M, et al. Bortezomib consolidation following autologous transplant in younger and older patients with newly diagnosed multiple myeloma in two phase III trials. Eur J Haematol. 2019;103(3):255-67. PMID: 31231828
70. Dytfield D, Wrobel T, Jamroziak K, et al. Carfilzomib, lenalidomide, and dexamethasone or lenalidomide alone as maintenance therapy after autologous stem-cell transplantation in patients with multiple myeloma (ATLAS): interim analysis of a randomised, open-label, phase 3 trial. Lancet Oncol. 2023;24(2):139-50. PMID: 36642080
71. Dimopoulos MA, Gay F, Schjesvold F, et al. Oral ixazomib maintenance following autologous stem cell transplantation (TOURMALINE-MM3): a double-blind, randomised, placebo-controlled phase 3 trial. Lancet. 2019;393(10168):253-64. PMID: 30545780

72. Moreau P, Hulin C, Perrot A, et al. Maintenance with daratumumab or observation following treatment with bortezomib, thalidomide, and dexamethasone with or without daratumumab and autologous stem-cell transplant in patients with newly diagnosed multiple myeloma (CASSIOPEIA): an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2021;22(10):1378-90. PMID: 34529931
73. Badros AZ, Foster L, Anderson LD, Jr., et al. Daratumumab with lenalidomide as maintenance after transplant in newly diagnosed multiple myeloma: the AURIGA study. *Blood.* 2024;145(3):300-10. PMID: 39331724
74. Dimopoulos MA, Oriol A, Nahm H, et al. Overall survival with daratumumab, lenalidomide, and dexamethasone in previously treated multiple myeloma (POLLUX): a randomized, open-label, phase III trial. *J Clin Oncol.* 2023;41(8):1590-9. PMID: 36599114
75. Sonneveld P, Chanan-Khan A, Weisel K, et al. Overall survival with daratumumab, bortezomib, and dexamethasone in previously treated multiple myeloma (CASTOR): a randomized, open-label, phase III trial. *J Clin Oncol.* 2022;41(8):1600-9. PMID: 36413710
76. Dimopoulos M, Quach H, Mateos MV, et al. Carfilzomib, dexamethasone, and daratumumab versus carfilzomib and dexamethasone for patients with relapsed or refractory multiple myeloma (CANDOR): results from a randomised, multicentre, open-label, phase 3 study. *Lancet.* 2020;396(10245):186-97. PMID: 32682484
77. Usmani SZ, Quach H, Mateos MV, et al. Carfilzomib, dexamethasone, and daratumumab versus carfilzomib and dexamethasone for patients with relapsed or refractory multiple myeloma (CANDOR): updated outcomes from a randomised, multicentre, open-label, phase 3 study. *Lancet Oncol.* 2021;23(1):65-76. PMID: 34871550
78. Usmani SZ, Quach H, Mateos MV, et al. Final analysis of carfilzomib, dexamethasone, and daratumumab vs carfilzomib and dexamethasone in the CANDOR study. *Blood Adv.* 2023;7(14):3739-48. PMID: 37163358
79. Rajkumar SV. The ENDEAVOR trial: a case study in the interpretation of modern cancer trials. June 10, 2016. Available from: <https://www.ascopost.com/issues/june-10-2016/the-endeavor-trial-a-case-study-in-the-interpretation-of-modern-cancer-trials/>.
80. Grosicki S, Simonova M, Spicka I, et al. Once-per-week selinexor, bortezomib, and dexamethasone versus twice-per-week bortezomib and dexamethasone in patients with multiple myeloma (BOSTON): a randomised, open-label, phase 3 trial. *Lancet.* 2020;396(10262):1563-73. PMID: 33189178
81. Yong KL, Brown S, Hinsley S, et al. Carfilzomib, cyclophosphamide and dexamethasone is well tolerated in patients with relapsed/refractory multiple myeloma who have received one prior regimen. *Blood.* 2015;126 (23):1840. PMID: none
82. Moreau P, Mateos MV, Berenson JR, et al. Once weekly versus twice weekly carfilzomib dosing in patients with relapsed and refractory multiple myeloma (A.R.R.O.W.): interim analysis results of a randomised, phase 3 study. *Lancet Oncol.* 2018;19(7):953-64. PMID: 29866475
83. Morgan GJ, Schey SA, Wu P, et al. Lenalidomide (Revlimid), in combination with cyclophosphamide and dexamethasone (RCD), is an effective and tolerated regimen for myeloma patients. *Br J Haematol.* 2007;137(3):268-9. PMID: 17408469
84. Dadacardou M, Papanicolaou X, Maltesas D, et al. Dexamethasone, cyclophosphamide, etoposide and cisplatin (DCEP) for relapsed or refractory multiple myeloma patients. *J Balk Union Oncol.* 2007;12(1):41-4. PMID: 17436400
85. Lee CK, Barlogie B, Munshi N, et al. DTPACE: an effective, novel combination chemotherapy with thalidomide for previously treated patients with myeloma. *J Clin Oncol.* 2003;21(14):2732-9. PMID: 12860952
86. Moreau P, Masszi T, Grzasko N, et al. Oral ixazomib, lenalidomide, and dexamethasone for multiple myeloma. *N Engl J Med.* 2016;374(17):1621-34. PMID: 27119237
87. Kumar SK, Grzasko N, Delimpasi S, et al. Phase 2 study of all-oral ixazomib, cyclophosphamide and low-dose dexamethasone for relapsed/refractory multiple myeloma. *Br J Haematol.* 2019;184(4):536-46. PMID: 30460684
88. Rosenbaum CA, Stephens LA, Kukreti V, et al. Phase 1/2 study of carfilzomib, pomalidomide, and dexamethasone (KPd) in patients (Pts) with relapsed/refractory multiple myeloma (RRMM): A Multiple Myeloma Research Consortium multicenter study. *J Clin Oncol.* 2016;34(25 Suppl):abstract 8007. PMID: none
89. Dimopoulos M, Spencer A, Attal M, et al. Lenalidomide plus dexamethasone for relapsed or refractory multiple myeloma. *N Engl J Med.* 2007;357(21):2123-32. PMID: 18032762
90. Jagannath S, Barlogie B, Berenson J, et al. A phase 2 study of two doses of bortezomib in relapsed or refractory myeloma. *Br J Haematol.* 2004;127(2):165-72. PMID: 15461622
91. Jagannath S, Richardson PG, Barlogie B, et al. Bortezomib in combination with dexamethasone for the treatment of patients with relapsed and/or refractory multiple myeloma with less than optimal response to bortezomib alone. *Haematologica.* 2006;91(7):929-34. PMID: 16818280
92. Mikhael JR, Belch AR, Prince HM, et al. High response rate to bortezomib with or without dexamethasone in patients with relapsed or refractory multiple myeloma: results of a global phase 3b expanded access program. *Br J Haematol.* 2009;144(2):169-75. PMID: 19036114
93. Nair B, van Rhee F, Shaughnessy JD, Jr., et al. Superior results of Total Therapy 3 (2003-33) in gene expression profiling-defined low-risk multiple myeloma confirmed in subsequent trial 2006-66 with VRD maintenance. *Blood.* 2010;115(21):4168-73. PMID: 20124509
94. Moreau P, Dimopoulos MA, Mikhael J, et al. Isatuximab, carfilzomib, and dexamethasone in relapsed multiple myeloma (IKEMA): a multicentre, open-label, randomised phase 3 trial. *Lancet.* 2021;397(10292):2361-71. PMID: 34097854
95. Yong K, Martin T, Dimopoulos MA, et al. Isatuximab plus carfilzomib-dexamethasone versus carfilzomib-dexamethasone in patients with relapsed multiple myeloma (IKEMA): overall survival analysis of a phase 3, randomised, controlled trial. *Lancet Haematol.* 2024;11(10):e741-e50. PMID: 39067465
96. Hungria V, Robak P, Hus M, et al. Belantamab mafodotin, bortezomib, and dexamethasone for multiple myeloma. *N Engl J Med.* 2024;391(5):393-40. PMID: 38828933

97. Dimopoulos MA, Beksaç M, Pour L, et al. Belantamab mafodotin, pomalidomide, and dexamethasone in multiple myeloma. *N Engl J Med.* 2024;391(5):408-21. PMID: 38828951
98. Lonial S, Weiss BM, Usmani SZ, et al. Daratumumab monotherapy in patients with treatment-refractory multiple myeloma (SIRIUS): an open-label, randomised, phase 2 trial. *Lancet.* 2016;387(10027):1551-60. PMID: 26778538
99. Usmani SZ, Nahi H, Plesner T, et al. Daratumumab monotherapy in patients with heavily pretreated relapsed or refractory multiple myeloma: final results from the phase 2 GEN501 and SIRIUS trials. *Lancet Haematol.* 2020;7(6):e447-e55. PMID: 32470437
100. Attal M, Richardson PG, Rajkumar SV, et al. Isatuximab plus pomalidomide and low-dose dexamethasone versus pomalidomide and low-dose dexamethasone in patients with relapsed and refractory multiple myeloma (ICARIA-MM): a randomised, multicentre, open-label, phase 3 study. *Lancet.* 2019;394(10214):2096-107. PMID: 31735560
101. Richardson PG, Perrot A, San-Miguel J, et al. Isatuximab plus pomalidomide and low-dose dexamethasone versus pomalidomide and low-dose dexamethasone in patients with relapsed and refractory multiple myeloma (ICARIA-MM): follow-up analysis of a randomised, phase 3 study. *Lancet Oncol.* 2022;23(3):416-27. PMID: 35151415
102. Richardson PG, Perrot A, Miguel JS, et al. Isatuximab-pomalidomide-dexamethasone versus pomalidomide-dexamethasone in patients with relapsed and refractory multiple myeloma: final overall survival analysis. *Haematologica.* 2024;109(7):2239-49. PMID: 38299578
103. Offidani M, Corvatta L, Maracci L, et al. Efficacy and tolerability of bendamustine, bortezomib and dexamethasone in patients with relapsed-refractory multiple myeloma: a phase II study. *Blood Cancer J.* 2013;3:e162. PMID: 24270324
104. Chari A, Suvannasankha A, Fay JW, et al. Daratumumab plus pomalidomide and dexamethasone in relapsed and/or refractory multiple myeloma. *Blood.* 2017;130(8):974-81. PMID: 28637662
105. Dimopoulos MA, Terpos E, Boccadoro M, et al. Daratumumab plus pomalidomide and dexamethasone versus pomalidomide and dexamethasone alone in previously treated multiple myeloma (APOLLO): an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2021;22(6):801-12. PMID: 34087126
106. Dimopoulos MA, Terpos E, Boccadoro M, et al. Subcutaneous daratumumab plus pomalidomide and dexamethasone versus pomalidomide and dexamethasone in patients with relapsed or refractory multiple myeloma (APOLLO): extended follow up of an open-label, randomised, multicentre, phase 3 trial. *Lancet Haematol.* 2023;10(10):e813-e24. PMID: 37793772
107. Jakubowiak A, Offidani M, Pegourie B, et al. Randomized phase 2 study: elotuzumab plus bortezomib/dexamethasone vs bortezomib/dexamethasone for relapsed/refractory MM. *Blood.* 2016;127(23):2833-40. PMID: 27091875
108. Lonial S, Dimopoulos M, Palumbo A, et al. Elotuzumab therapy for relapsed or refractory multiple myeloma. *N Engl J Med.* 2015;373(7):621-31. PMID: 26035255
109. Dimopoulos MA, Dytfield D, Grosicki S, et al. Elotuzumab plus pomalidomide and dexamethasone for multiple myeloma. *N Engl J Med.* 2018;379(19):1811-22. PMID: 30403938
110. Dimopoulos MA, Dytfield D, Grosicki S, et al. Elotuzumab plus pomalidomide and dexamethasone for relapsed/refractory multiple myeloma: final overall survival analysis from the randomized phase II ELOQUENT-3 trial. *J Clin Oncol.* 2023;41(3):568-78. PMID: 35960908
111. Voorhees PM, Mulkey F, Hassoun H, et al. Alliance A061202. a phase I/II study of pomalidomide, dexamethasone and ixazomib versus pomalidomide and dexamethasone for patients with multiple myeloma refractory to lenalidomide and proteasome inhibitor based therapy: phase I results *Blood.* 2015;126(23):375.
112. Krishnan AY, Kapoor P, Palmer J, et al. A phase I/II study of ixazomib (Ix) pomalidomide (POM) dexamethasone (DEX) in relapsed refractory (R/R) multiple myeloma: initial results. *J Clin Oncol.* 2016;34(15 Suppl):abstract 8008. PMID: none
113. Krishnan A, Kapoor P, Palmer JM, et al. Phase I/II trial of the oral regimen ixazomib, pomalidomide, and dexamethasone in relapsed/refractory multiple myeloma. *Leukemia.* 2018;32(7):1567-74. PMID: 32082000
114. Baz RC, Martin TG, 3rd, Lin HY, et al. Randomized multicenter phase 2 study of pomalidomide, cyclophosphamide, and dexamethasone in relapsed refractory myeloma. *Blood.* 2016;127(21):2561-8. PMID: 26932802
115. Garderet L, Polge E, Gueye MS, et al. Pomalidomide, cyclophosphamide and dexamethasone for relapsed/refractory multiple myeloma: a retrospective single center experience. *Blood.* 2015;126(23):1858. PMID: none
116. Trudel S, Tessoulin B, Jullien M, et al. Pomalidomide, cyclophosphamide, and dexamethasone for relapsed/refractory multiple myeloma patients in a real-life setting: a single-center retrospective study. *Ann Hematol.* 2019;98(6):1441-7. PMID: 30874851
117. Garderet L, Iacobelli S, Moreau P, et al. Superiority of the triple combination of bortezomib-thalidomide-dexamethasone over the dual combination of thalidomide-dexamethasone in patients with multiple myeloma progressing or relapsing after autologous transplantation: the MMVAR/IFM 2005-04 randomized phase III trial from the Chronic Leukemia Working Party of the European Group for Blood and Marrow Transplantation. *J Clin Oncol.* 2012;30(20):2475-82. PMID: 22585692
118. Lonial S, Lee HC, Badros A, et al. Belantamab mafodotin for relapsed or refractory multiple myeloma (DREAMM-2): a two-arm, randomised, open-label, phase 2 study. *Lancet Oncol.* 2020;21(2):207-21. PMID: 31859245
119. Chari A, Vogl DT, Gavriatopoulou M, et al. Oral selinexor-dexamethasone for triple-class refractory multiple myeloma. *N Engl J Med.* 2019;381(8):727-38. PMID: 31433920
120. Mateos MV, Nahi H, Legier W, et al. Subcutaneous versus intravenous daratumumab in patients with relapsed or refractory multiple myeloma (COLUMBA): a multicentre, open-label, non-inferiority, randomised, phase 3 trial. *Lancet Haematol.* 2020;7(5):e370-e80. PMID: 32213342
121. Chari A, Goldschmidt H, San-Miguel J, et al. Subcutaneous (SC) daratumumab (DARA) in combination with standard multiple myeloma (MM) treatment regimens: an open-label, multicenter phase 2 study (PLEIADES). *Clin Lymphoma Myeloma Leuk.* 2019;19(10 Suppl):e16-e7. PMID: none

122. Moreau P, Chari A, Haenel M, et al. Subcutaneous daratumumab (DARA SC) plus standard-of-care (SOC) regimens in multiple myeloma (MM) across lines of therapy in the phase 2 pleiades study: Initial results of the DARA SC plus carfilzomib/dexamethasone (D-KD) cohort, and updated results for the DARA SC plus bortezomib/melphalan/prednisone (D-VMP) and DARA SC plus lenalidomide/dexamethasone (D-RD) cohorts. *Blood*. 2020;136(Suppl 1):28-30. PMID: none
123. Kumar S, Kaufman JL, Gasparetto C, et al. Efficacy of venetoclax as targeted therapy for relapsed/refractory t(11;14) multiple myeloma. *Blood*. 2017;130(22):2401-9. PMID: 29018077
124. Kaufman JL, Gasparetto C, Schjesvold FH, et al. Phase I/II study evaluating the safety and efficacy of venetoclax in combination with dexamethasone as targeted therapy for patients with t(11;14) relapsed/refractory multiple myeloma. *Blood*. 2019;134(Suppl 1):926. PMID: none
125. Munshi NC, Anderson LD, Jr., Shah N, et al. Idecabtagene vicleucel in relapsed and refractory multiple myeloma. *N Engl J Med*. 2021;384(8):705-16. PMID: 33626253
126. Ailawadhi S, Arnulf B, Patel KK, et al. Ide-cel vs standard regimens in triple-class-exposed relapsed and refractory multiple myeloma: updated KarMMa-3 analyses. *Blood*. 2024;144(23):2389-401. PMID: 39197072
127. Martin T, Usmani SZ, Berdeja JG, et al. Updated results from CARTITUDE-1: phase 1b/2 study of ciltacabtagene autoleucel, a B-cell maturation antigen-directed chimeric antigen receptor T cell therapy, in patients with relapsed/refractory multiple myeloma. *Blood*. 2021;138(Suppl 1):549. PMID: none
128. San-Miguel J, Dhakal B, Yong K, et al. Cilta-cel or standard care in lenalidomide-refractory multiple myeloma. *N Engl J Med*. 2023;389(4):335-47. PMID: 37272512
129. Moreau P, Garfall AL, van de Donk N, et al. Teclistamab in relapsed or refractory multiple myeloma. *N Engl J Med*. 2022;1(6):495-505. PMID: 35661166
130. Chari A, Minnema MC, Berdeja JG, et al. Talquetamab, a T-cell-redirecting GPRC5D bispecific antibody for multiple myeloma. *N Engl J Med*. 2022;387(24):2232-44. PMID: 36507686
131. Lesokhin AM, Tomasson MH, Arnulf B, et al. Elranatamab in relapsed or refractory multiple myeloma: phase 2 MagnetisMM-3 trial results. *Nat Med*. 2023;29(9):2259-67. PMID: 37582952
132. Richardson PG, Trudel S, Popat R, et al. Mezigdomide plus dexamethasone in relapsed and refractory multiple myeloma. *N Engl J Med*. 2023;389(11):1009-22. PMID: 37646702
133. Scheid C, Sonneveld P, Schmidt-Wolf IG, et al. Bortezomib before and after autologous stem cell transplantation overcomes the negative prognostic impact of renal impairment in newly diagnosed multiple myeloma: a subgroup analysis from the HOVON-65/GMMG-HD4 trial. *Haematologica*. 2014;99(1):148-54. PMID: 23996482
134. Cavo M, Tacchetti P, Patriarca F, et al. Bortezomib with thalidomide plus dexamethasone compared with thalidomide plus dexamethasone as induction therapy before, and consolidation therapy after, double autologous stem-cell transplantation in newly diagnosed multiple myeloma: a randomised phase 3 study. *Lancet*. 2010;376(9758):2075-85. PMID: 21146205
135. Leiba M, Kedmi M, Duek A, et al. Bortezomib-cyclophosphamide-dexamethasone (VCD) versus bortezomib-thalidomide-dexamethasone (VTD) -based regimens as induction therapies in newly diagnosed transplant eligible patients with multiple myeloma: a meta-analysis. *Br J Haematol*. 2014;166(5):702-10. PMID: 24861981
136. Cavo M, Pantani L, Petrucci MT, et al. Bortezomib-thalidomide-dexamethasone is superior to thalidomide-dexamethasone as consolidation therapy after autologous hematopoietic stem cell transplantation in patients with newly diagnosed multiple myeloma. *Blood*. 2012;120(1):9-19. PMID: 22498745
137. San Miguel JF, Schlag R, Khuageva NK, et al. Persistent overall survival benefit and no increased risk of second malignancies with bortezomib-melphalan-prednisone versus melphalan-prednisone in patients with previously untreated multiple myeloma. *J Clin Oncol*. 2013;31(4):448-55. PMID: 23233713
138. Mateos MV, Oriol A, Martinez-Lopez J, et al. GEM2005 trial update comparing VMP/VTP as induction in elderly multiple myeloma patients: do we still need alkylators? *Blood*. 2014;124(12):1887-93. PMID: 25102853
139. Palumbo A, Falco P, Corradini P, et al. Melphalan, prednisone, and lenalidomide treatment for newly diagnosed myeloma: a report from the GIMEMA--Italian Multiple Myeloma Network. *J Clin Oncol*. 2007;25(28):4459-65. PMID: 17785703
140. Stewart AK, Jacobus S, Fonseca R, et al. Melphalan, prednisone, and thalidomide vs melphalan, prednisone, and lenalidomide (ECOG E1A06) in untreated multiple myeloma. *Blood*. 2015;126(11):1294-301. PMID: 26157076
141. Wijermans P, Schaafsma M, Termorshuizen F, et al. Phase III study of the value of thalidomide added to melphalan plus prednisone in elderly patients with newly diagnosed multiple myeloma: the HOVON 49 Study. *J Clin Oncol*. 2010;28(19):3160-6. PMID: 20516439
142. Palumbo A, Bringhen S, Caravita T, et al. Oral melphalan and prednisone chemotherapy plus thalidomide compared with melphalan and prednisone alone in elderly patients with multiple myeloma: randomised controlled trial. *Lancet*. 2006;367(9513):825-31. PMID: 16530576
143. Palumbo A, Bringhen S, Liberati AM, et al. Oral melphalan, prednisone, and thalidomide in elderly patients with multiple myeloma: updated results of a randomized controlled trial. *Blood*. 2008;112(8):3107-14. PMID: 18505783
144. Hulin C, Facon T, Rodon P, et al. Efficacy of melphalan and prednisone plus thalidomide in patients older than 75 years with newly diagnosed multiple myeloma: IFM 01/01 trial. *J Clin Oncol*. 2009;27(22):3664-70. PMID: 19451428
145. Facon T, Mary JY, Pegourie B, et al. Dexamethasone-based regimens versus melphalan-prednisone for elderly multiple myeloma patients ineligible for high-dose therapy. *Blood*. 2006;107(4):1292-8. PMID: 16174762
146. San Miguel JF, Schlag R, Khuageva NK, et al. Bortezomib plus melphalan and prednisone for initial treatment of multiple myeloma. *N Engl J Med*. 2008;359(9):906-17. PMID: 18753647

147. Mateos MV, Dimopoulos MA, Cavo M, et al. Daratumumab plus bortezomib, melphalan, and prednisone for untreated myeloma. *N Engl J Med.* 2018;378(6):518-28. PMID: 29231133
148. Mateos MV, Cavo M, Blade J, et al. Overall survival with daratumumab, bortezomib, melphalan, and prednisone in newly diagnosed multiple myeloma (ALCYONE): a randomised, open-label, phase 3 trial. *Lancet.* 2020;395(10218):132-41. PMID: 31836199
149. Kumar SK, Berdeja JG, Niesvizky R, et al. Safety and tolerability of ixazomib, an oral proteasome inhibitor, in combination with lenalidomide and dexamethasone in patients with previously untreated multiple myeloma: an open-label phase 1/2 study. *Lancet Oncol.* 2014;15(13):1503-12. PMID: 25456369
150. Dimopoulos M, Siegel DS, Lonial S, et al. Vorinostat or placebo in combination with bortezomib in patients with multiple myeloma (VANTAGE 088): a multicentre, randomised, double-blind study. *Lancet Oncol.* 2013;14(11):1129-40. PMID: 24055414
151. Siegel DS, Dimopoulos M, Jagannath S, et al. VANTAGE 095: an international, multicenter, open-label study of vorinostat (MK-0683) in combination with bortezomib in patients with relapsed and refractory multiple myeloma. *Clin Lymphoma Myeloma Leuk.* 2016;16(6):329-34.e1. PMID: 27025160
152. Dimopoulos MA, Zervas K, Kouvatseas G, et al. Thalidomide and dexamethasone combination for refractory multiple myeloma. *Ann Oncol.* 2001;12(7):991-5. PMID: 11521808
153. Palumbo A, Bertola A, Falco P, et al. Efficacy of low-dose thalidomide and dexamethasone as first salvage regimen in multiple myeloma. *Hematol J.* 2004;5(4):318-24. PMID: 15297848
154. San-Miguel JF, Hungria VT, Yoon SS, et al. Panobinostat plus bortezomib and dexamethasone versus placebo plus bortezomib and dexamethasone in patients with relapsed or relapsed and refractory multiple myeloma: a multicentre, randomised, double-blind phase 3 trial. *Lancet Oncol.* 2014;15(11):1195-206. PMID: 25242045
155. San-Miguel JF, Hungria VT, Yoon SS, et al. Overall survival of patients with relapsed multiple myeloma treated with panobinostat or placebo plus bortezomib and dexamethasone (the PANORAMA 1 trial): a randomised, placebo-controlled, phase 3 trial. *Lancet Haematol.* 2016;3(11):e506-e15. PMID: 27751707
156. Richardson PG, Hungria VT, Yoon SS, et al. Panobinostat plus bortezomib and dexamethasone in previously treated multiple myeloma: outcomes by prior treatment. *Blood.* 2016;127(6):713-21. PMID: 26631116
157. Laubach JP, Schjesvold F, Mariz M, et al. Efficacy and safety of oral panobinostat plus subcutaneous bortezomib and oral dexamethasone in patients with relapsed or relapsed and refractory multiple myeloma (PANORAMA 3): an open-label, randomised, phase 2 study. *Lancet Oncol.* 2021;22(1):142-54. PMID: 33301738
158. Berdeja JG, Hart LL, Mace JR, et al. Phase I/II study of the combination of panobinostat and carfilzomib in patients with relapsed/refractory multiple myeloma. *Haematologica.* 2015;100(5):670-6. PMID: 25710456
159. Chari A, Cho HJ, Dhadwal A, et al. A phase 2 study of panobinostat with lenalidomide and weekly dexamethasone in myeloma. *Blood Adv.* 2017;1(19):1575-83. PMID: 29296798
160. Kumar SK, LaPlant BR, Reeder CB, et al. Randomized phase 2 trial of ixazomib and dexamethasone in relapsed multiple myeloma not refractory to bortezomib. *Blood.* 2016;128(20):2415-22. PMID: 27702799
161. Kumar SK, LaPlant B, Roy V, et al. Phase 2 trial of ixazomib in patients with relapsed multiple myeloma not refractory to bortezomib. *Blood Cancer J.* 2015;5:e338. PMID: 26275080
162. Schjesvold FH, Dimopoulos MA, Delimpasi S, et al. Melflufen or pomalidomide plus dexamethasone for patients with multiple myeloma refractory to lenalidomide (OCEAN): a randomised, head-to-head, open-label, phase 3 study. *Lancet Haematol.* 2022;S2352-3026(21):00381-1. PMID: 35032434
163. Dimopoulos MA, Schjesvold F, Doronin V, et al. Oral ixazomib-dexamethasone vs oral pomalidomide-dexamethasone for lenalidomide-refractory, proteasome inhibitor-exposed multiple myeloma: a randomized phase 2 trial. *Blood Cancer J.* 2022;12(1):9. PMID: 35075109

## NHL: Diffuse Large B-Cell Lymphoma Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- Stages I-IV
    - **R-CHOP (21)**: cyclophosphamide, doxorubicin (Adriamycin), vincristine (Vincasar), prednisone, and rituximab<sup>1-3</sup>
    - When there is a contraindication to anthracycline
      - **R-CEOP**: cyclophosphamide, etoposide, vincristine (Vincasar), prednisone, and rituximab<sup>4-6</sup>
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## NHL: Diffuse Large B Cell Lymphoma References

### NCCN Clinical Practice Guidelines for B-Cell Lymphomas. Version 2.2025

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1. Coiffier B, Lepage E, Briere J, et al. CHOP chemotherapy plus rituximab compared with CHOP alone in elderly patients with diffuse large-B-cell lymphoma. *N Engl J Med.* 2002;346(4):235-42. PMID: 11807147
2. Coiffier B, Thieblemont C, Van Den Neste E, et al. Long-term outcome of patients in the LNH-98.5 trial, the first randomized study comparing rituximab-CHOP to standard CHOP chemotherapy in DLBCL patients: a study by the Groupe d'Etudes des Lymphomes de l'Adulte. *Blood.* 2010;116(12):2040-5. PMID: 20548096
3. Pfreundschuh M, Trumper L, Osterborg A, et al. CHOP-like chemotherapy plus rituximab versus CHOP-like chemotherapy alone in young patients with good-prognosis diffuse large-B-cell lymphoma: a randomised controlled trial by the MabThera International Trial (MInT) Group. *Lancet Oncol.* 2006;7(5):379-91. PMID: 16648042
4. Economopoulos T, Dimopoulos MA, Mellou S, et al. Treatment of intermediate- and high-grade non-Hodgkin's lymphoma using CEOP versus CNOP. *Eur J Haematol.* 2002;68(3):135-43. PMID: 12068793
5. Li Y, Yimam M, Wang X, et al. Addition of rituximab to a CEOP regimen improved the outcome in the treatment of non-germinal center immunophenotype diffuse large B cell lymphoma cells with high Bcl-2 expression. *Int J Hematol.* 2014;99(1):79-86. PMID: 24258714
6. Moccia AA, Schaff K, Hoskins P, et al. R-CHOP with etoposide substituted for doxorubicin (R-CEOP): excellent outcome in diffuse large B cell lymphoma for patients with a contraindication to anthracyclines. *Blood.* 2009;114(22):abstract 408. PMID: none
7. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for B-Cell Lymphomas (Version 2.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
8. Wilson WH, Jung SH, Porcu P, et al. A Cancer and Leukemia Group B multi-center study of DA-EPOCH-rituximab in untreated diffuse large B-cell lymphoma with analysis of outcome by molecular subtype. *Haematologica.* 2012;97(5):758-65. PMID: 22133772
9. Wilson WH, Dunleavy K, Pittaluga S, et al. Phase II study of dose-adjusted EPOCH and rituximab in untreated diffuse large B-cell lymphoma with analysis of germinal center and post-germinal center biomarkers. *J Clin Oncol.* 2008;26(16):2717-24. PMID: 18378569
10. Zaja F, Tomadini V, Zaccaria A, et al. CHOP-rituximab with pegylated liposomal doxorubicin for the treatment of elderly patients with diffuse large B-cell lymphoma. *Leuk Lymphoma.* 2006;47(10):2174-80. PMID: 17071492
11. Martino R, Perea G, Caballero MD, et al. Cyclophosphamide, pegylated liposomal doxorubicin (Caelyx), vincristine and prednisone (CCOP) in elderly patients with diffuse large B-cell lymphoma: results from a prospective phase II study. *Haematologica.* 2002;87(8):822-7. PMID: 12161358
12. Peyrade F, Jardin F, Thieblemont C, et al. Attenuated immunochemotherapy regimen (R-miniCHOP) in elderly patients older than 80 years with diffuse large B-cell lymphoma: a multicentre, single-arm, phase 2 trial. *Lancet Oncol.* 2011;12(5):460-8. PMID: 21482186
13. Howlett C, Snedecor SJ, Landsburg DJ, et al. Front-line, dose-escalated immunochemotherapy is associated with a significant progression-free survival advantage in patients with double-hit lymphomas: a systematic review and meta-analysis. *Br J Haematol.* 2015;170(4):504-14. PMID: 25907897
14. Hou Y, Wang HQ, Ba Y. Rituximab, gemcitabine, cisplatin, and dexamethasone in patients with refractory or relapsed aggressive B-cell lymphoma. *Med Oncol.* 2012;29(4):2409-16. PMID: 22476761
15. Gopal AK, Press OW, Shustov AR, et al. Efficacy and safety of gemcitabine, carboplatin, dexamethasone, and rituximab in patients with relapsed/refractory lymphoma: a prospective multi-center phase II study by the Puget Sound Oncology Consortium. *Leuk Lymphoma.* 2010;51(8):1523-9. PMID: 20578815
16. Crump M, Kuruvilla J, Couban S, et al. Randomized comparison of gemcitabine, dexamethasone, and cisplatin versus dexamethasone, cytarabine, and cisplatin chemotherapy before autologous stem-cell transplantation for relapsed and refractory aggressive lymphomas: NCIC-CTG LY.12. *J Clin Oncol.* 2014;32(31):3490-6. PMID: 25267740
17. Mey UJ, Orlopp KS, Flieger D, et al. Dexamethasone, high-dose cytarabine, and cisplatin in combination with rituximab as salvage treatment for patients with relapsed or refractory aggressive non-Hodgkin's lymphoma. *Cancer Invest.* 2006;24(6):593-600. PMID: 16982464
18. Kewalramani T, Zelenetz AD, Nimer SD, et al. Rituximab and ICE as second-line therapy before autologous stem cell transplantation for relapsed or primary refractory diffuse large B-cell lymphoma. *Blood.* 2004;103(10):3684-8. PMID: 14739217
19. Gisselbrecht C, Glass B, Mounier N, et al. Salvage regimens with autologous transplantation for relapsed large B-cell lymphoma in the rituximab era. *J Clin Oncol.* 2010;28(27):4184-90. PMID: 20660832

20. Philip T, Guglielmi C, Hagenbeek A, et al. Autologous bone marrow transplantation as compared with salvage chemotherapy in relapses of chemotherapy-sensitive non-Hodgkin's lymphoma. *N Engl J Med.* 1995;333(23):1540-5. PMID: 7477169
21. Velasquez WS, Cabanillas F, Salvador P, et al. Effective salvage therapy for lymphoma with cisplatin in combination with high-dose Ara-C and dexamethasone (DHAP). *Blood.* 1988;71(1):117-22. PMID: 3334893
22. Velasquez WS, McLaughlin P, Tucker S, et al. ESHAP--an effective chemotherapy regimen in refractory and relapsing lymphoma: a 4-year follow-up study. *J Clin Oncol.* 1994;12(6):1169-76. PMID: 8201379
23. Zelenetz AD, Hamlin P, Kewalramani T, et al. Ifosfamide, carboplatin, etoposide (ICE)-based second-line chemotherapy for the management of relapsed and refractory aggressive non-Hodgkin's lymphoma. *Ann Oncol.* 2003;14 Suppl 1:i5-10. PMID: 12736224
24. Rodriguez MA, Cabanillas FC, Hagemeyer FB, et al. A phase II trial of mesna/ifosfamide, mitoxantrone and etoposide for refractory lymphomas. *Ann Oncol.* 1995;6(6):609-11. PMID: 8573542
25. Martin A, Conde E, Arnan M, et al. R-ESHAP as salvage therapy for patients with relapsed or refractory diffuse large B-cell lymphoma: the influence of prior exposure to rituximab on outcome. *A GEL/TAMO study. Haematologica.* 2008;93(12):1829-36. PMID: 18945747
26. Lopez A, Gutierrez A, Palacios A, et al. GEMOX-R regimen is a highly effective salvage regimen in patients with refractory/relapsing diffuse large-cell lymphoma: a phase II study. *Eur J Haematol.* 2008;80(2):127-32. PMID: 18005385
27. El Gnaoui T, Dupuis J, Belhadj K, et al. Rituximab, gemcitabine and oxaliplatin: an effective salvage regimen for patients with relapsed or refractory B-cell lymphoma not candidates for high-dose therapy. *Ann Oncol.* 2007;18(8):1363-8. PMID: 17496309
28. Corazzelli G, Capobianco G, Arcamone M, et al. Long-term results of gemcitabine plus oxaliplatin with and without rituximab as salvage treatment for transplant-ineligible patients with refractory/relapsing B-cell lymphoma. *Cancer Chemother Pharmacol.* 2009;64(5):907-16. PMID: 19219604
29. Lambertenghi Deliliers G, Butti C, Baldini L, et al. A cooperative study of epirubicin with cyclophosphamide, vincristine and prednisone (CEOP) in non-Hodgkin's lymphoma. *Haematologica.* 1995;80(4):318-24. PMID: 7590500
30. Gutierrez M, Chabner BA, Pearson D, et al. Role of a doxorubicin-containing regimen in relapsed and resistant lymphomas: an 8-year follow-up study of EPOCH. *J Clin Oncol.* 2000;18(21):3633-42. PMID: 11054436
31. Crump M, Baetz T, Couban S, et al. Gemcitabine, dexamethasone, and cisplatin in patients with recurrent or refractory aggressive histology B-cell non-Hodgkin lymphoma: a Phase II study by the National Cancer Institute of Canada Clinical Trials Group (NCIC-CTG). *Cancer.* 2004;101(8):1835-42. PMID: 15386331
32. Wiernik PH, Lossos IS, Tuscano JM, et al. Lenalidomide monotherapy in relapsed or refractory aggressive non-Hodgkin's lymphoma. *J Clin Oncol.* 2008;26(30):4952-7. PMID: 18606983
33. Witzig TE, Vose JM, Zinzani PL, et al. An international phase II trial of single-agent lenalidomide for relapsed or refractory aggressive B-cell non-Hodgkin's lymphoma. *Ann Oncol.* 2011;22(7):1622-7. PMID: 21228334
34. Coiffier B, Haioun C, Ketterer N, et al. Rituximab (anti-CD20 monoclonal antibody) for the treatment of patients with relapsing or refractory aggressive lymphoma: a multicenter phase II study. *Blood.* 1998;92(6):1927-32. PMID: 9731049
35. Jermann M, Jost LM, Taverna C, et al. Rituximab-EPOCH, an effective salvage therapy for relapsed, refractory or transformed B-cell lymphomas: results of a phase II study. *Ann Oncol.* 2004;15(3):511-6. PMID: 14998858
36. Feugier P, Van Hoof A, Sebban C, et al. Long-term results of the R-CHOP study in the treatment of elderly patients with diffuse large B-cell lymphoma: a study by the Groupe d'Etude des Lymphomes de l'Adulte. *J Clin Oncol.* 2005;23(18):4117-26. PMID: 15867204
37. Lamy T, Damaj G, Soubeyran P, et al. R-CHOP 14 with or without radiotherapy in nonbulky limited-stage diffuse large B-cell lymphoma. *Blood.* 2018;131(2):174-81. PMID: 29061568
38. Bartlett NL, Wilson WH, Jung SH, et al. Dose-adjusted EPOCH-R compared with R-CHOP as frontline therapy for diffuse large B-cell lymphoma: clinical outcomes of the phase III Intergroup Trial Alliance/CALGB 50303. *J Clin Oncol.* 2019;37(21):1790-9. PMID: 30939090
39. Poeschel V, Held G, Ziepert M, et al. Four versus six cycles of CHOP chemotherapy in combination with six applications of rituximab in patients with aggressive B-cell lymphoma with favourable prognosis (FLYER): a randomised, phase 3, non-inferiority trial. *Lancet.* 2020;394(10216):2271-81. PMID: 31868632
40. Purroy N, Bergua J, Gallur L, et al. Long-term follow-up of dose-adjusted EPOCH plus rituximab (DA-EPOCH-R) in untreated patients with poor prognosis large B-cell lymphoma. A phase II study conducted by the Spanish PETHEMA Group. *Br J Haematol.* 2015;169(2):188-98. PMID: 25521006
41. Tilly H, Morschhauser F, Sehn LH, et al. Polatuzumab vedotin in previously untreated diffuse large B-cell lymphoma. *N Engl J Med.* 2021;386(4):351-63. PMID: 34904799
42. Palmer AC, Kurtz DM, Alizadeh AA. Cell-of-origin subtypes and therapeutic benefit from polatuzumab vedotin. *N Engl J Med.* 2023;389(8):764-6. PMID: 37611128
43. Vijenthira A, Kuruvilla J, Crump M, et al. Cost-effectiveness analysis of frontline polatuzumab-rituximab, cyclophosphamide, doxorubicin, and prednisone and/or second-line chimeric antigen receptor T-cell therapy versus standard of care for treatment of patients with intermediate- to high-risk diffuse large B-cell lymphoma. *J Clin Oncol.* 2023;41(8):1577-89. PMID: 36315922
44. Chao NJ, Rosenberg SA, Horning SJ. CEP(B): an effective and well-tolerated regimen in poor-risk, aggressive non-Hodgkin's lymphoma. *Blood.* 1990;76(7):1293-8. PMID: 2207307
45. Fields PA, Townsend W, Webb A, et al. De novo treatment of diffuse large B-cell lymphoma with rituximab, cyclophosphamide, vincristine, gemcitabine, and prednisolone in patients with cardiac comorbidity: a United Kingdom National Cancer Research Institute trial. *J Clin Oncol.* 2014;32(4):282-7. PMID: 24220559

46. Peyrade F, Fain O, Fabiani B, et al. Long-term follow-up of the GELA LNH 03-7B study: a prospective phase II study of 150 patients over 80 years with diffuse large B-cell lymphoma (DLBCL) treated with RminiCHOP. *J Clin Oncol.* 2013;31(15 Suppl ):abstract 8536. PMID: none
47. Petrich AM, Gandhi M, Jovanovic B, et al. Impact of induction regimen and stem cell transplantation on outcomes in double-hit lymphoma: a multicenter retrospective analysis. *Blood.* 2014;124(15):2354-61. PMID: 25161267
48. Lignon J, Sibon D, Madelaine I, et al. Rituximab, dexamethasone, cytarabine, and oxaliplatin (R-DHAX) is an effective and safe salvage regimen in relapsed/refractory B-cell non-Hodgkin lymphoma. *Clin Lymphoma Myeloma Leuk.* 2010;10(4):262-9. PMID: 20709662
49. Rigacci L, Fabbri A, Puccini B, et al. Oxaliplatin-based chemotherapy (dexamethasone, high-dose cytarabine, and oxaliplatin)+/-rituximab is an effective salvage regimen in patients with relapsed or refractory lymphoma. *Cancer.* 2010;116(19):4573-9. PMID: 20572029
50. Locke FL, Miklos DB, Jacobson CA, et al. Axicabtagene ciloleucel as second-line therapy for large B-cell lymphoma. *N Engl J Med.* 2022;386(7):640-54. PMID: 34891224
51. Mounier N, El Gnaoui T, Tilly H, et al. Rituximab plus gemcitabine and oxaliplatin in patients with refractory/relapsed diffuse large B-cell lymphoma who are not candidates for high-dose therapy. A phase II Lymphoma Study Association trial. *Haematologica.* 2013;98(11):1726-31. PMID: 23753028
52. Jacobsen ED, Sharman JP, Oki Y, et al. Brentuximab vedotin demonstrates objective responses in a phase 2 study of relapsed/refractory DLBCL with variable CD30 expression. *Blood.* 2015;125(9):1394-402. PMID: 25573987
53. Wilson WH, Young RM, Schmitz R, et al. Targeting B cell receptor signaling with ibrutinib in diffuse large B cell lymphoma. *Nat Med.* 2015;21(8):922-6. PMID: 26193343
54. Wang M, Fowler N, Wagner-Bartak N, et al. Oral lenalidomide with rituximab in relapsed or refractory diffuse large cell, follicular and transformed lymphoma: a phase II clinical trial. *Leukemia.* 2013;27(9):1902-9. PMID: 23545991
55. Czuczman MS, Trneny M, Davies A, et al. A phase 2/3 multicenter, randomized, open-label study to compare the efficacy and safety of lenalidomide versus investigator's choice in patients with relapsed or refractory diffuse large B-cell lymphoma. *Clin Cancer Res.* 2017;23(15):4127-37. PMID: 28381416
56. Neelapu SS, Locke FL, Bartlett NL, et al. Axicabtagene ciloleucel CAR T-cell therapy in refractory large B-cell lymphoma. *N Engl J Med.* 2017;377(26):2531-44. PMID: 29226797
57. Locke FL, Ghobadi A, Jacobson CA, et al. Long-term safety and activity of axicabtagene ciloleucel in refractory large B-cell lymphoma (ZUMA-1): a single-arm, multicentre, phase 1-2 trial. *Lancet Oncol.* 2019;20(1):31-42. PMID: 30518502
58. Schuster SJ, Bishop MR, Tam CS, et al. Tisagenlecleucel in adult relapsed or refractory diffuse large B-cell lymphoma. *N Engl J Med.* 2019;380(1):45-56. PMID: 30501490
59. Abramson JS, Palomba ML, Gordon LI, et al. Lisocabtagene maraleucel for patients with relapsed or refractory large B-cell lymphomas (TRANSCEND NHL 001): a multicentre seamless design study. *Lancet.* 2020;396(10254):839-52. PMID: 32888407
60. Caimi PF, Ai W, Alderuccio JP, et al. Loncastuximab tesirine in relapsed or refractory diffuse large B-cell lymphoma (LOTIS-2): a multicentre, open-label, single-arm, phase 2 trial. *Lancet Oncol.* 2021;22(6):790-800. PMID: 33989558
61. Caimi PF, Ai WZ, Alderuccio JP, et al. Loncastuximab tesirine in relapsed/refractory diffuse large B-cell lymphoma: long-term efficacy and safety from the phase II LOTIS-2 study. *Haematologica.* 2024;109(4):1184-93. PMID: 37646659
62. Morschhauser F, Flinn IW, Advani R, et al. Polatuzumab vedotin or pinatumumab vedotin plus rituximab in patients with relapsed or refractory non-Hodgkin lymphoma: final results from a phase 2 randomised study (ROMULUS). *Lancet Haematol.* 2019;6(5):e254-e65. PMID: 30935953
63. Sehn LH, Herrera AF, Flowers CR, et al. Polatuzumab vedotin in relapsed or refractory diffuse large B-cell lymphoma. *J Clin Oncol.* 2020;38(2):155-65. PMID: 31693429
64. Kalakonda N, Maerevoet M, Cavallo F, et al. Selinexor in patients with relapsed or refractory diffuse large B-cell lymphoma (SADAL): a single-arm, multinational, multicentre, open-label, phase 2 trial. *Lancet Haematol.* 2020;7(7):e511-e22. PMID: 32589977
65. Salles G, Duell J, Gonzalez Barca E, et al. Tafasitamab plus lenalidomide in relapsed or refractory diffuse large B-cell lymphoma (L-MIND): a multicentre, prospective, single-arm, phase 2 study. *Lancet Oncol.* 2020;21(7):978-88. PMID: 32511983
66. Qualls DA, Lambert N, Caimi PF, et al. Tafasitamab and lenalidomide in large B-cell lymphoma: real-world outcomes in a multicenter retrospective study. *Blood.* 2023;142(26):2327-31. PMID: 37738563
67. Thieblemont C, Phillips T, Ghesquieres H, et al. Epcoritamab, a novel, subcutaneous CD3xCD20 bispecific T-cell-engaging antibody, in relapsed or refractory large B-cell lymphoma: dose expansion in a phase I/II trial. *J Clin Oncol.* 2023;41(12):2238-47. PMID: 36548927
68. Dickinson MJ, Carlo-Stella C, Morschhauser F, et al. Golfitamab for relapsed or refractory diffuse large B-cell lymphoma. *N Engl J Med.* 2022;386(1):2220-31. PMID: 36507690
69. Abramson JS, Ku M, Hertzberg M, et al. Golfitamab plus gemcitabine and oxaliplatin (GemOx) versus rituximab-GemOx for relapsed or refractory diffuse large B-cell lymphoma (STARGLO): a global phase 3, randomised, open-label trial. *Lancet.* 2024;404(10466):1940-54. PMID: 39550172
70. Melani C, Lakhotia R, Pittaluga S, et al. Combination targeted therapy in relapsed diffuse large B-cell lymphoma. *N Engl J Med.* 2024;390(23):2143-55. PMID: 38899693
71. Vitolo U, Trneny M, Belada D, et al. Obinutuzumab or rituximab plus cyclophosphamide, doxorubicin, vincristine, and prednisone in previously untreated diffuse large B-cell lymphoma. *J Clin Oncol.* 2017;35(31):3529-37. PMID: 28796588
72. Nowakowski GS, Hong F, Scott DW, et al. Addition of lenalidomide to R-CHOP improves outcomes in newly diagnosed diffuse large B-cell lymphoma in a randomized phase II US intergroup study ECOG-ACRIN E1412. *J Clin Oncol.* 2021;39(12):1329-38. PMID: 33555941

73. Nowakowski GS, Chiappella A, Gascoyne RD, et al. ROBUST: a phase III study of lenalidomide plus R-CHOP versus placebo plus R-CHOP in previously untreated patients with ABC-type diffuse large B-cell lymphoma. *J Clin Oncol.* 2021;39(12):1317-28. PMID: 33621109
74. Vacirca JL, Acs PI, Tabbara IA, et al. Bendamustine combined with rituximab for patients with relapsed or refractory diffuse large B-cell lymphoma. *Ann Hematol.* 2014;93(3):403-9. PMID: 23955074
75. Weidmann E, Kim SZ, Rost A, et al. Bendamustine is effective in relapsed or refractory aggressive non-Hodgkin's lymphoma. *Ann Oncol.* 2002;13(8):1285-9. PMID: 12181253
76. Ohmachi K, Niitsu N, Uchida T, et al. Multicenter phase II study of bendamustine plus rituximab in patients with relapsed or refractory diffuse large B-cell lymphoma. *J Clin Oncol.* 2013;31(17):2103-9. PMID: 23650408

## NHL: Follicular and Marginal Zone Lymphoma Pathways

### First Line of Therapy

- Stages\* I-II
  - Gastric MALT<sup>†</sup> Lymphoma when *H. pylori* positive
    - Antibiotic therapy for *H. pylori* eradication<sup>‡1, 2</sup>
- Stages\* I-IV
  - Gastric MALT or Splenic Marginal Zone<sup>§</sup>
    - Rituximab<sup>3-8</sup>
  - Follicular (Grade 1-3a) and Other Marginal Zone Lymphomas
    - **BR:** Bendamustine (Bendeka, Treanda) and rituximab<sup>9-12</sup>
    - **R-CHOP(21):** Cyclophosphamide, doxorubicin (Adriamycin), vincristine (Vincasar), prednisone, and rituximab<sup>11, 13-16</sup>
    - **R-CVP:** Cyclophosphamide, vincristine (Vincasar), prednisone, and rituximab<sup>14, 17</sup>
    - Rituximab<sup>3-8, 18-20</sup>
  - Follicular Large B-cell Lymphoma (Follicular Lymphoma Grade 3b)
    - **R-CHOP(21):** Cyclophosphamide, doxorubicin (Adriamycin), vincristine (Vincasar), prednisone, and rituximab<sup>11, 13-16</sup>
    - **R-CEOP:** Cyclophosphamide, etoposide, vincristine (Vincasar), prednisone, and rituximab<sup>21-24</sup>

\* Lugano Staging System for GI lymphomas

† Gastric MALT with translocation 11;18 (t11;18) (q21;q21) predicts a lower response rate to anti-*H.pylori* treatment. Radiation therapy or other local intervention may be indicated.

‡ Only generic antibiotics are considered pathway options for *H. pylori* eradication. Clarithromycin and either amoxicillin OR metronidazole are sample regimens that may be selected to maintain pathway adherence. The actual regimen prescribed should be based on current guidelines, local antibiotic resistance patterns, and the most affordable choices.

§ Splenectomy is also a recommended option for splenic marginal zone lymphoma

## NHL: Follicular and Marginal Zone Lymphoma References

### NCCN Practice Guidelines for B-Cell Lymphomas. V2.2025

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1. Andriani A, Medico A, Tedeschi L, et al. Management and long-term follow-up of early stage H. pylori-associated gastric MALT-lymphoma in clinical practice: an Italian, multicentre study. *Dig Liver Dis.* 2009;41(7):467-73. PMID: 18945654
2. Wundisch T, Thiede C, Morgner A, et al. Long-term follow-up of gastric MALT lymphoma after Helicobacter pylori eradication. *J Clin Oncol.* 2005;23(31):8018-24. PMID: 16204012
3. Hochster H, Weller E, Gascogne RD, et al. Maintenance rituximab after cyclophosphamide, vincristine, and prednisone prolongs progression-free survival in advanced indolent lymphoma: results of the randomized phase III ECOG1496 Study. *J Clin Oncol.* 2009;27(10):1607-14. PMID: 19255334
4. Kahl BS, Hong F, Williams ME, et al. Rituximab extended schedule or re-treatment trial for low-tumor burden follicular lymphoma: Eastern Cooperative Oncology Group protocol e4402. *J Clin Oncol.* 2014;32(28):3096-102. PMID: 25154829
5. Kalpadakis C, Pangalis GA, Angelopoulou MK, et al. Treatment of splenic marginal zone lymphoma with rituximab monotherapy: progress report and comparison with splenectomy. *Oncologist.* 2013;18(2):190-7. PMID: 23345547
6. Martinelli G, Schmitz SF, Utiger U, et al. Long-term follow-up of patients with follicular lymphoma receiving single-agent rituximab at two different schedules in trial SAKK 35/98. *J Clin Oncol.* 2010;28(29):4480-4. PMID: 20697092
7. Tsimerman AM, Catovsky D, Schlette E, et al. Outcomes in patients with splenic marginal zone lymphoma and marginal zone lymphoma treated with rituximab with or without chemotherapy or chemotherapy alone. *Cancer.* 2006;107(1):125-35. PMID: 16700034
8. Zucca E, Conconi A, Martinelli G, et al. Final results of the IELSG-19 randomized trial of mucosa-associated lymphoid tissue lymphoma: improved event-free and progression-free survival with rituximab plus chlorambucil versus either chlorambucil or rituximab monotherapy. *J Clin Oncol.* 2017;35(17):1905-12. PMID: 28355112
9. Flinn IW, van der Jagt R, Kahl BS, et al. Randomized trial of bendamustine-rituximab or R-CHOP/R-CVP in first-line treatment of indolent NHL or MCL: the BRIGHT study. *Blood.* 2014;123(19):2944-52. PMID: 24591201
10. Robinson KS, Williams ME, van der Jagt RH, et al. Phase II multicenter study of bendamustine plus rituximab in patients with relapsed indolent B-cell and mantle cell non-Hodgkin's lymphoma. *J Clin Oncol.* 2008;26(27):4473-9. PMID: 18626004
11. Rummel MJ, Niederle N, Maschmeyer G, et al. Bendamustine plus rituximab versus CHOP plus rituximab as first-line treatment for patients with indolent and mantle-cell lymphomas: an open-label, multicentre, randomised, phase 3 non-inferiority trial. *Lancet.* 2013;381(9873):1203-10. PMID: 23433739
12. Salar A, Domingo-Domenech E, Panizo C, et al. Long-term results of a phase 2 study of rituximab and bendamustine for mucosa-associated lymphoid tissue lymphoma. *Blood.* 2017;130(15):1772-4. PMID: 28801448
13. Czuczmar MS, Weaver R, Alkuzweny B, et al. Prolonged clinical and molecular remission in patients with low-grade or follicular non-Hodgkin's lymphoma treated with rituximab plus CHOP chemotherapy: 9-year follow-up. *J Clin Oncol.* 2004;22(23):4711-6. PMID: 15483015
14. Federico M, Luminari S, Dondi A, et al. R-CVP versus R-CHOP versus R-FM for the initial treatment of patients with advanced-stage follicular lymphoma: results of the FOLL05 trial conducted by the Fondazione Italiana Linfomi. *J Clin Oncol.* 2013;31(12):1506-13. PMID: 23530110
15. Hiddemann W, Kneba M, Dreyling M, et al. Frontline therapy with rituximab added to the combination of cyclophosphamide, doxorubicin, vincristine, and prednisone (CHOP) significantly improves the outcome for patients with advanced-stage follicular lymphoma compared with therapy with CHOP alone: results of a prospective randomized study of the German Low-Grade Lymphoma Study Group. *Blood.* 2005;106(12):3725-32. PMID: 16123223
16. Press OW, Unger JM, Rimsza LM, et al. Phase III randomized intergroup trial of CHOP plus rituximab compared with CHOP chemotherapy plus (131)iodine-tositumomab for previously untreated follicular non-Hodgkin lymphoma: SWOG S0016. *J Clin Oncol.* 2013;31(3):314-20. PMID: 23233710
17. Marcus R, Imrie K, Solal-Celigny P, et al. Phase III study of R-CVP compared with cyclophosphamide, vincristine, and prednisone alone in patients with previously untreated advanced follicular lymphoma. *J Clin Oncol.* 2008;26(28):4579-86. PMID: 18662969
18. Ardeshta KM, Qian W, Smith P, et al. Rituximab versus a watch-and-wait approach in patients with advanced-stage, asymptomatic, non-bulky follicular lymphoma: an open-label randomised phase 3 trial. *Lancet Oncol.* 2014;15(4):424-35. PMID: 24602760
19. Colombat P, Salles G, Brousse N, et al. Rituximab (anti-CD20 monoclonal antibody) as single first-line therapy for patients with follicular lymphoma with a low tumor burden: clinical and molecular evaluation. *Blood.* 2001;97(1):101-6. PMID: 11133748

20. Hainsworth JD, Litchy S, Shaffer DW, et al. Maximizing therapeutic benefit of rituximab: maintenance therapy versus re-treatment at progression in patients with indolent non-Hodgkin's lymphoma--a randomized phase II trial of the Minnie Pearl Cancer Research Network. *J Clin Oncol.* 2005;23(6):1088-95. PMID: 15657401
21. Economopoulos T, Dimopoulos MA, Mellou S, et al. Treatment of intermediate- and high-grade non-Hodgkin's lymphoma using CEOP versus CNOP. *Eur J Haematol.* 2002;68(3):135-43. PMID: 12068793
22. Horning SJ. Something old, something few, something subjective, something *deja vu*. *J Clin Oncol.* 2003;21(1):1-2. PMID: 12506161
23. Li Y, Yimamu M, Wang X, et al. Addition of rituximab to a CEOP regimen improved the outcome in the treatment of non-germinal center immunophenotype diffuse large B cell lymphoma cells with high Bcl-2 expression. *Int J Hematol.* 2014;99(1):79-86. PMID: 24258714
24. Moccia AA, Schaff K, Hoskins P, et al. R-CHOP with etoposide substituted for doxorubicin (R-CEOP): excellent outcome in diffuse large B cell lymphoma for patients with a contraindication to anthracyclines. *Blood.* 2009;114(22):abstract 408. PMID: none
25. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for B-Cell Lymphomas (Version 2.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
26. Zucca E, Conconi A, Laszlo D, et al. Addition of rituximab to chlorambucil produces superior event-free survival in the treatment of patients with extranodal marginal-zone B-cell lymphoma: 5-year analysis of the IELSG-19 Randomized Study. *J Clin Oncol.* 2013;31(5):565-72. PMID: 23295789
27. Martinelli G, Laszlo D, Bertolini F, et al. Chlorambucil in combination with induction and maintenance rituximab is feasible and active in indolent non-Hodgkin's lymphoma. *Br J Haematol.* 2003;123(2):271-7. PMID: 14531908
28. Leonard JP, Jung SH, Johnson J, et al. Randomized trial of lenalidomide alone versus lenalidomide plus rituximab in patients with recurrent follicular lymphoma: CALGB 50401 (Alliance). *J Clin Oncol.* 2015;33(31):3635-40. PMID: 26304886
29. Witzig TE, Wiernik PH, Moore T, et al. Lenalidomide oral monotherapy produces durable responses in relapsed or refractory indolent non-Hodgkin's Lymphoma. *J Clin Oncol.* 2009;27(32):5404-9. PMID: 19805688
30. Tuscano JM, Dutia M, Chee K, et al. Lenalidomide plus rituximab can produce durable clinical responses in patients with relapsed or refractory, indolent non-Hodgkin lymphoma. *Br J Haematol.* 2014;165(3):375-81. PMID: 24606326
31. Witzig TE, Gordon LI, Cabanillas F, et al. Randomized controlled trial of yttrium-90-labeled ibritumomab tiuxetan radioimmunotherapy versus rituximab immunotherapy for patients with relapsed or refractory low-grade, follicular, or transformed B-cell non-Hodgkin's lymphoma. *J Clin Oncol.* 2002;20(10):2453-63. PMID: 12011122
32. Ghielmini M, Schmitz SF, Cogliatti SB, et al. Prolonged treatment with rituximab in patients with follicular lymphoma significantly increases event-free survival and response duration compared with the standard weekly x 4 schedule. *Blood.* 2004;103(12):4416-23. PMID: 14976046
33. Sehn LH, Chua N, Mayer J, et al. Obinutuzumab plus bendamustine versus bendamustine monotherapy in patients with rituximab-refractory indolent non-Hodgkin lymphoma (GADOLIN): a randomised, controlled, open-label, multicentre, phase 3 trial. *Lancet Oncol.* 2016;17(8):1081-93. PMID: 27345636
34. Marcus RE, Davies AJ, Ando K, et al. Obinutuzumab-based induction and maintenance prolongs progression-free survival (PFS) in patients with previously untreated follicular lymphoma: primary results of the randomized phase 3 GALLIUM study. *Blood.* 2016;128(22):6. PMID: none
35. Salles G, Seymour JF, Offner F, et al. Rituximab maintenance for 2 years in patients with high tumour burden follicular lymphoma responding to rituximab plus chemotherapy (PRIMA): a phase 3, randomised controlled trial. *Lancet.* 2011;377(9759):42-51. PMID: 21176949
36. van Oers MH, Klasa R, Marcus RE, et al. Rituximab maintenance improves clinical outcome of relapsed/resistant follicular non-Hodgkin lymphoma in patients both with and without rituximab during induction: results of a prospective randomized phase 3 intergroup trial. *Blood.* 2006;108(10):3295-301. PMID: 16873669
37. Budde LE, Sehn LH, Matasar M, et al. Safety and efficacy of mosunetuzumab, a bispecific antibody, in patients with relapsed or refractory follicular lymphoma: a single-arm, multicentre, phase 2 study. *Lancet Oncol.* 2022;23(8):1055-65. PMID: 35803286
38. Cartron G, Bachy E, Tilly H, et al. Randomized phase III trial evaluating subcutaneous rituximab for the first-line treatment of low-tumor burden follicular lymphoma: results of a LYSA study. *J Clin Oncol.* 2023;41(19):3523-33. PMID: 37071836
39. Erratum: randomized phase III trial evaluating subcutaneous rituximab for the first-line treatment of low-tumor burden follicular lymphoma: results of a LYSA study. *J Clin Oncol.* 2023;41(25):4187. PMID: 37450783
40. Hiddemann W, Barbui AM, Canales MA, et al. Immunochemotherapy with obinutuzumab or rituximab for previously untreated follicular lymphoma in the GALLIUM study: influence of chemotherapy on efficacy and safety. *J Clin Oncol.* 2018;36(23):2395-404. PMID: 29856692
41. Martin P, Jung SH, Pitcher B, et al. A phase II trial of lenalidomide plus rituximab in previously untreated follicular non-Hodgkin's lymphoma (NHL): CALGB 50803 (Alliance). *Ann Oncol.* 2017;28(11):2806-12. PMID: 28945884
42. Fowler NH, Davis RE, Rawal S, et al. Safety and activity of lenalidomide and rituximab in untreated indolent lymphoma: an open-label, phase 2 trial. *Lancet Oncol.* 2014;15(12):1311-8. PMID: 25439689
43. Morschhauser F, Fowler NH, Feugier P, et al. Rituximab plus lenalidomide in advanced untreated follicular lymphoma. *N Engl J Med.* 2018;379(10):934-47. PMID: 30184451
44. Peterson BA, Petroni GR, Frizzera G, et al. Prolonged single-agent versus combination chemotherapy in indolent follicular lymphomas: a study of the cancer and leukemia group B. *J Clin Oncol.* 2003;21(1):5-15. PMID: 12506163
45. Noy A, de Vos S, Thieblemont C, et al. Targeting Bruton tyrosine kinase with ibrutinib in relapsed/refractory marginal zone lymphoma. *Blood.* 2017;129(16):2224-32. PMID: 28167659

46. Andorsky DJ, Yacoub A, Bitran JD, et al. MAGNIFY: phase IIb randomized study of lenalidomide plus rituximab (R) followed by lenalidomide vs. rituximab maintenance in subjects with relapsed/refractory follicular, marginal zone, or mantle cell lymphoma. *Blood.* 2016;128(22):1798. PMID: none
47. Andorsky DJ, Yacoub A, Melear JM, et al. Phase IIb randomized study of lenalidomide plus rituximab (R2) followed by maintenance in relapsed/refractory NHL: analysis of patients with double-refractory or early relapsed follicular lymphoma (FL). *J Clin Oncol.* 2017;35(15 Suppl):abstract 7502. PMID: none
48. Leonard JP, Trneny M, Izutsu K, et al. AUGMENT: a phase III study of lenalidomide plus rituximab versus placebo plus rituximab in relapsed or refractory indolent lymphoma. *J Clin Oncol.* 2019;37(14):1188-99. PMID: 30897038
49. Opat S, Tedeschi A, Linton K, et al. The MAGNOLIA trial: zanubrutinib, a next-generation Bruton tyrosine kinase inhibitor, demonstrates safety and efficacy in relapsed/refractory marginal zone lymphoma. *Clin Cancer Res.* 2021;27(23):6323-32. PMID: 34526366
50. Bachy E, Seymour JF, Feugier P, et al. Sustained progression-free survival benefit of rituximab maintenance in patients with follicular lymphoma: long-term results of the PRIMA study. *J Clin Oncol.* 2019;37(31):2815-24. PMID: 31339826
51. van Oers MH, Van Glabbeke M, Giurega L, et al. Rituximab maintenance treatment of relapsed/resistant follicular non-Hodgkin's lymphoma: long-term outcome of the EORTC 20981 phase III randomized intergroup study. *J Clin Oncol.* 2010;28(17):2853-8. PMID: 20439641
52. Cheson BD, Chua N, Mayer J, et al. Overall survival benefit in patients with rituximab-refractory indolent non-Hodgkin lymphoma who received obinutuzumab plus bendamustine induction and obinutuzumab maintenance in the GADOLIN study. *J Clin Oncol.* 2018;36(22):2259-66. PMID: 29584548
53. Andorsky DJ, Coleman M, Yacoub A, et al. MAGNIFY: phase IIb interim analysis of induction R<sup>2</sup> followed by maintenance in relapsed/refractory indolent non-Hodgkin lymphoma. *J Clin Oncol.* 2019;37(15 Suppl):abstract 7513. PMID: none
54. Morschhauser F, Tilly H, Chaidos A, et al. Tazemetostat for patients with relapsed or refractory follicular lymphoma: an open-label, single-arm, multicentre, phase 2 trial. *Lancet Oncol.* 2020;21(11):1433-42. PMID: 33035457
55. Zinzani PL, Mayer J, Flowers CR, et al. ROSEWOOD: a phase II randomized study of zanubrutinib plus obinutuzumab versus obinutuzumab monotherapy in patients with relapsed or refractory follicular lymphoma. *J Clin Oncol.* 2023;41(33):5107-17. PMID: 37506346
56. Linton KM, Vitolo U, Jurczak W, et al. Epcoritamab monotherapy in patients with relapsed or refractory follicular lymphoma (EPCORE NHL-1): a phase 2 cohort of a single-arm, multicentre study. *Lancet Haematol.* 2024;11(8):e593-e605. PMID: 38889737
57. Morschhauser F, Dahiya S, Palomba ML, et al. Lisocabtagene maraleucel in follicular lymphoma: the phase 2 TRANSCEND FL study. *Nat Med.* 2024;30(8):2199-207. PMID: 38830991
58. Lossos IS, Fabregas JC, Koru-Sengul T, et al. Phase II study of (90)Y ibritumomab tiuxetan (Zevalin) in patients with previously untreated marginal zone lymphoma. *Leuk Lymphoma.* 2015;56(6):1750-5. PMID: 25315074
59. McLaughlin P, Estey E, Glassman A, et al. Myelodysplasia and acute myeloid leukemia following therapy for indolent lymphoma with fludarabine, mitoxantrone, and dexamethasone (FND) plus rituximab and interferon alpha. *Blood.* 2005;105(12):4573-5. PMID: 15741224
60. Gopal AK, Kahl BS, de Vos S, et al. PI3Kδ inhibition by idelalisib in patients with relapsed indolent lymphoma. *N Engl J Med.* 2014;370(11):1008-18. PMID: 24450858
61. Zinzani PL, Samaniego F, Jurczak W, et al. Umbralisib, the once daily dual inhibitor of PI3Kδ and casein kinase-1ε demonstrates clinical activity in patients with relapsed or refractory indolent non-hodgkin lymphoma: results from the phase 2 global Unity-NHL trial. *Blood.* 2020;136(Suppl):34-5. PMID: none
62. Dreyling M, Panayiotidis P, Egyed M, et al. Efficacy of copanlisib monotherapy in patients with relapsed or refractory marginal zone lymphoma: subset analysis from the CHRONOS-1 trial. *Blood.* 2017;130(Suppl 1):4053. PMID: none
63. Vanazzi A, Grana C, Crosta C, et al. Efficacy of 90Yttrium-ibritumomab tiuxetan in relapsed/refractory extranodal marginal-zone lymphoma. *Hematol Oncol.* 2014;32(1):10-5. PMID: 23696416
64. Morschhauser F, Radford J, Van Hoof A, et al. Phase III trial of consolidation therapy with yttrium-90-ibritumomab tiuxetan compared with no additional therapy after first remission in advanced follicular lymphoma. *J Clin Oncol.* 2008;26(32):5156-64. PMID: 18854568
65. Morschhauser F, Radford J, Van Hoof A, et al. 90Yttrium-ibritumomab tiuxetan consolidation of first remission in advanced-stage follicular non-Hodgkin lymphoma: updated results after a median follow-up of 7.3 years from the International, Randomized, Phase III First-LineIndolent trial. *J Clin Oncol.* 2013;31(16):1977-83. PMID: 23547079
66. Salles G, Schuster SJ, de Vos S, et al. Efficacy and safety of idelalisib in patients with relapsed, rituximab- and alkylating agent-refractory follicular lymphoma: a subgroup analysis of a phase 2 study. *Haematologica.* 2017;102(4):e156-e9. PMID: 27979923
67. Flinn IW, Miller CB, Ardeshta KM, et al. DYNAMO: a phase II study of duvelisib (IPI-145) in patients with refractory indolent non-Hodgkin lymphoma. *J Clin Oncol.* 2019;37(11):912-22. PMID: 30742566
68. Dreyling M, Santoro A, Mollica L, et al. Long-term efficacy and safety from the copanlisib CHRONOS-1 study in patients with relapsed or refractory indolent B-cell lymphoma. *Blood.* 2018;132(Suppl 1):1595. PMID: none
69. Witzig TE, Flinn IW, Gordon LI, et al. Treatment with ibritumomab tiuxetan radioimmunotherapy in patients with rituximab-refractory follicular non-Hodgkin's lymphoma. *J Clin Oncol.* 2002;20(15):3262-9. PMID: 12149300

## NHL: Mantle Cell Lymphoma Pathways

### First Line of Therapy (1<sup>st</sup> Line)

- Stages I-IV
  - Candidates for Autologous Stem Cell Transplant (ASCT)
    - **Alternating R-CHOP/R-DHAP:** cyclophosphamide (Cytoxin), doxorubicin (Adriamycin), vincristine (Vincasar), prednisone, rituximab alternating with dexamethasone, cisplatin, cytarabine (Ara-C), and rituximab<sup>1-6</sup>
    - **Nordic Regimen:** dose intense rituximab, cyclophosphamide, vincristine (Vincasar), doxorubicin (Adriamycin), prednisone alternating with rituximab and high dose cytarabine (Ara-C)<sup>7, 8</sup>
  - Non-Candidates for Autologous Stem Cell Transplant (ASCT)
    - **BR:** bendamustine (Bendeka, Treanda) and rituximab<sup>9-13</sup>

### Second Line of Therapy (2<sup>nd</sup> Line)

- Recurrent\*
  - Acalabrutinib (Calquence)<sup>14</sup>
  - **BR:** bendamustine (Bendeka, Treanda) and rituximab<sup>15, 16</sup>
  - Bortezomib (Velcade)<sup>17</sup>
  - Lenalidomide (Revlimid)<sup>18-23</sup>

\* Includes recurrent, progressive and refractory disease

## NHL: Mantle Cell Lymphoma References

### NCCN Practice Guidelines: Non-Hodgkin Lymphomas: B-Cell Lymphomas Version 3.2024.

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1. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for B-Cell Lymphomas (Version 3.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
2. Coleman M, Martin P, Ruan J, et al. Low-dose metronomic, multidrug therapy with the PEP-C oral combination chemotherapy regimen for mantle cell lymphoma. *Leuk Lymphoma*. 2008;49(3):447-50. PMID: 18297520
3. Delarue R, Haioun C, Ribrag V, et al. CHOP and DHAP plus rituximab followed by autologous stem cell transplantation in mantle cell lymphoma: a phase 2 study from the Groupe d'Etude des Lymphomes de l'Adulte. *Blood*. 2013;121(1):48-53. PMID: 22718839
4. Hermine O, Hoster E, Walewski J, et al. Addition of high-dose cytarabine to immunochemotherapy before autologous stem-cell transplantation in patients aged 65 years or younger with mantle cell lymphoma (MCL Younger): a randomised, open-label, phase 3 trial of the European Mantle Cell Lymphoma Network. *Lancet*. 2016;388(10044):565-75. PMID: 27313086
5. Pott C, Hoster E, Delfau-Larue MH, et al. Molecular remission is an independent predictor of clinical outcome in patients with mantle cell lymphoma after combined immunochemotherapy: a European MCL intergroup study. *Blood*. 2010;115(16):3215-23. PMID: 20032498
6. Hermine O, Jiang L, Walewski J, et al. High-dose cytarabine and autologous stem-cell transplantation in mantle cell lymphoma: long-term follow-up of the randomized mantle cell lymphoma younger trial of the European Mantle Cell Lymphoma Network. *J Clin Oncol*. 2023;41(3):479-84. PMID: 36469833
7. Eskelund CW, Kolstad A, Jerkeman M, et al. 15-year follow-up of the Second Nordic Mantle Cell Lymphoma trial (MCL2): prolonged remissions without survival plateau. *Br J Haematol*. 2016;175(3):410-8. PMID: 27378674
8. Geisler CH, Kolstad A, Laurell A, et al. Long-term progression-free survival of mantle cell lymphoma after intensive front-line immunochemotherapy with in vivo-purged stem cell rescue: a nonrandomized phase 2 multicenter study by the Nordic Lymphoma Group. *Blood*. 2008;112(7):2687-93. PMID: 18625886
9. Flinn IW, van der Jagt R, Kahl B, et al. First-Line treatment of patients with indolent non-Hodgkin lymphoma or mantle-cell lymphoma with bendamustine plus rituximab versus R-CHOP or R-CVP: results of the BRIGHT 5-year follow-up study. *J Clin Oncol*. 2019;37(12):984-91. PMID: 30811293
10. Flinn IW, van der Jagt R, Kahl BS, et al. Randomized trial of bendamustine-rituximab or R-CHOP/R-CVP in first-line treatment of indolent NHL or MCL: the BRIGHT study. *Blood*. 2014;123(19):2944-52. PMID: 24591201
11. Rummel MJ, Knauf W, Goerner M, et al. Two years rituximab maintenance vs. observation after first-line treatment with bendamustine plus rituximab (B-R) in patients with mantle cell lymphoma: first results of a prospective, randomized, multicenter phase II study (a subgroup study of the StiL NHL7-2008 MAINTAIN trial). *J Clin Oncol*. 2016;34(Suppl 15):abstract 7503. PMID: none
12. Rummel MJ, Koenigsmann M, Chow KU, et al. Two years rituximab maintenance vs. observation after first line treatment with bendamustine plus rituximab (B-R) in patients with marginal zone lymphoma (MZL): results of a prospective, randomized, multicenter phase 2 study (the StiL NHL7-2008 MAINTAIN trial). *J Clin Oncol*. 2018;36(15 Suppl):abstract 7515. PMID: none
13. Rummel MJ, Niederle N, Maschmeyer G, et al. Bendamustine plus rituximab versus CHOP plus rituximab as first-line treatment for patients with indolent and mantle-cell lymphomas: an open-label, multicentre, randomised, phase 3 non-inferiority trial. *Lancet*. 2013;381(9873):1203-10. PMID: 23433739
14. Wang M, Rule S, Zinzani PL, et al. Acalabrutinib in relapsed or refractory mantle cell lymphoma (ACE-LY-004): a single-arm, multicentre, phase 2 trial. *Lancet*. 2018;391(10121):659-67. PMID: 29241979
15. Robinson KS, Williams ME, van der Jagt RH, et al. Phase II multicenter study of bendamustine plus rituximab in patients with relapsed indolent B-cell and mantle cell non-Hodgkin's lymphoma. *J Clin Oncol*. 2008;26(27):4473-9. PMID: 18626004
16. Rummel MJ, Al-Batran SE, Kim SZ, et al. Bendamustine plus rituximab is effective and has a favorable toxicity profile in the treatment of mantle cell and low-grade non-Hodgkin's lymphoma. *J Clin Oncol*. 2005;23(15):3383-9. PMID: 15908650
17. Goy A, Bernstein SH, Kahl BS, et al. Bortezomib in patients with relapsed or refractory mantle cell lymphoma: updated time-to-event analyses of the multicenter phase 2 PINNACLE study. *Ann Oncol*. 2009;20(3):520-5. PMID: 19074748
18. Goy A, Sinha R, Williams ME, et al. Single-agent lenalidomide in patients with mantle-cell lymphoma who relapsed or progressed after or were refractory to bortezomib: phase II MCL-001 (EMERGE) study. *J Clin Oncol*. 2013;31(29):3688-95. PMID: 24002500
19. Habermann TM, Lossos IS, Justice G, et al. Lenalidomide oral monotherapy produces a high response rate in patients with relapsed or refractory mantle cell lymphoma. *Br J Haematol*. 2009;145(3):344-9. PMID: 19245430
20. Trneny M, Lamy T, Walewski J, et al. Lenalidomide versus investigator's choice in relapsed or refractory mantle cell lymphoma (MCL-002; SPRINT): a phase 2, randomised, multicentre trial. *Lancet Oncol*. 2016;17(3):319-31. PMID: 26899778
21. Wang M, Fayad L, Wagner-Bartak N, et al. Lenalidomide in combination with rituximab for patients with relapsed or refractory mantle-cell lymphoma: a phase 1/2 clinical trial. *Lancet Oncol*. 2012;13(7):716-23. PMID: 22677155
22. Witzig TE, Vose JM, Zinzani PL, et al. An international phase II trial of single-agent lenalidomide for relapsed or refractory aggressive B-cell non-Hodgkin's lymphoma. *Ann Oncol*. 2011;22(7):1622-7. PMID: 21228334
23. Zinzani PL, Vose JM, Czuczman MS, et al. Long-term follow-up of lenalidomide in relapsed/refractory mantle cell lymphoma: subset analysis of the NHL-003 study. *Ann Oncol*. 2013;24(11):2892-7. PMID: 24030098
24. Wang ML, Rule S, Martin P, et al. Targeting BTK with ibrutinib in relapsed or refractory mantle-cell lymphoma. *N Engl J Med*. 2013;369(6):507-16. PMID: 23782157
25. Wang ML, Blum KA, Martin P, et al. Long-term follow-up of MCL patients treated with single-agent ibrutinib: updated safety and efficacy results. *Blood*. 2015;126(6):739-45. PMID: 26059948

26. Merli F, Luminari S, Ilariucci F, et al. Rituximab plus HyperCVAD alternating with high dose cytarabine and methotrexate for the initial treatment of patients with mantle cell lymphoma, a multicentre trial from Gruppo Italiano Studio Linfomi. *Br J Haematol.* 2012;156(3):346-53. PMID: 22145911
27. Romaguera JE, Fayad L, Rodriguez MA, et al. High rate of durable remissions after treatment of newly diagnosed aggressive mantle-cell lymphoma with rituximab plus hyper-CVAD alternating with rituximab plus high-dose methotrexate and cytarabine. *J Clin Oncol.* 2005;23(28):7013-23. PMID: 16145068
28. Kluin-Nelemans HC, Hoster E, Hermine O, et al. Treatment of older patients with mantle-cell lymphoma. *N Engl J Med.* 2012;367(6):520-31. PMID: 22873532
29. Robak T, Huang H, Jin J, et al. Bortezomib-based therapy for newly diagnosed mantle-cell lymphoma. *N Engl J Med.* 2015;372(10):944-53. PMID: 25738670
30. Kahl BS, Longo WL, Eickhoff JC, et al. Maintenance rituximab following induction chemoimmunotherapy may prolong progression-free survival in mantle cell lymphoma: a pilot study from the Wisconsin Oncology Network. *Ann Oncol.* 2006;17(9):1418-23. PMID: 16766582
31. Graf SA, Stevenson PA, Holmberg LA, et al. Maintenance rituximab after autologous stem cell transplantation in patients with mantle cell lymphoma. *Ann Oncol.* 2015;26(11):2323-8. PMID: 26347113
32. Baiocchi RA, Alinari L, Lustberg ME, et al. Phase 2 trial of rituximab and bortezomib in patients with relapsed or refractory mantle cell and follicular lymphoma. *Cancer.* 2011;117(11):2442-51. PMID: 24048792
33. Le Gouill S, Thieblemont C, Oberic L, et al. Rituximab after autologous stem-cell transplantation in mantle-cell lymphoma. *N Engl J Med.* 2017;377(13):1250-60. PMID: 28953447
34. Le Gouill SL, Thieblemont C, Oberic L, et al. R-DHA-oxaliplatin before autologous stem cell transplantation prolongs PFS and OS as compared to R-DHA-carboplatin and R-DHA-cisplatin in patients with mantle cell lymphoma, a subgroup analysis of the LyMa trial. *Blood.* 2017;130(Suppl 1):1496. PMID: none
35. Wang ML, Lee H, Chuang H, et al. Ibrutinib in combination with rituximab in relapsed or refractory mantle cell lymphoma: a single-centre, open-label, phase 2 trial. *Lancet Oncol.* 2016;17(1):48-56. PMID: 26640039
36. Wang ML, Lee H, Thirumurthi S, et al. Ibrutinib-rituximab followed by reduced chemo-immunotherapy consolidation in young, newly diagnosed mantle cell lymphoma patients: a window of opportunity to reduce chemo. *Hematol Oncol.* 2017;35 (Suppl 2):142-3. PMID: none
37. Dreyling M, Doorduijn J, Gine E, et al. Ibrutinib combined with immunochemotherapy with or without autologous stem-cell transplantation versus immunochemotherapy and autologous stem-cell transplantation in previously untreated patients with mantle cell lymphoma (TRIANGLE): a three-arm, randomised, open-label, phase 3 superiority trial of the European Mantle Cell Lymphoma Network. *Lancet.* 2024;403(10441):2293-306. PMID: 38705160
38. Ruan J, Martin P, Shah B, et al. Lenalidomide plus rituximab as initial treatment for mantle-cell lymphoma. *N Engl J Med.* 2015;373(19):1835-44. PMID: 26535512
39. Ruan J, Martin P, Christos P, et al. Five-year follow-up of lenalidomide plus rituximab as initial treatment of mantle cell lymphoma. *Blood.* 2018;132(19):2016-25. PMID: 30181173
40. Lenz G, Dreyling M, Hoster E, et al. Immunochemotherapy with rituximab and cyclophosphamide, doxorubicin, vincristine, and prednisone significantly improves response and time to treatment failure, but not long-term outcome in patients with previously untreated mantle cell lymphoma: results of a prospective randomized trial of the German Low Grade Lymphoma Study Group (GLSG). *J Clin Oncol.* 2005;23(9):1984-92. PMID: 15668467
41. Robak T, Jin J, Pylypenko H, et al. Frontline bortezomib, rituximab, cyclophosphamide, doxorubicin, and prednisone (VR-CAP) versus rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone (R-CHOP) in transplantation-ineligible patients with newly diagnosed mantle cell lymphoma: final overall survival results of a randomised, open-label, phase 3 study. *Lancet Oncol.* 2018;19(11):1449-58. PMID: 30348538
42. Visco C, Finotto S, Zambello R, et al. Combination of rituximab, bendamustine, and cytarabine for patients with mantle-cell non-Hodgkin lymphoma ineligible for intensive regimens or autologous transplantation. *J Clin Oncol.* 2013;31(11):1442-9. PMID: 23401442
43. Visco C, Chiappella A, Nassi L, et al. Rituximab, bendamustine, and low-dose cytarabine as induction therapy in elderly patients with mantle cell lymphoma: a multicentre, phase 2 trial from Fondazione Italiana Linfomi. *Lancet Haematol.* 2017;4(1):e15-e23. PMID: 27927586
44. Wang M, Mayer J, Belada D, et al. Acalabrutinib plus bendamustine and rituximab in untreatedmantle cell lymphoma: results from the phase 3, double-blind,placebo-controlled ECHO trial. 2024. EHA2024. Madrid (ES): European Hematology Association (EHA). abstract LB3439. Available from: <https://library.ehaweb.org/eha/2024/eha2024-congress/4136515/>.
45. Hoster E, Kluin-Nelemans H, Hermine O, et al. Rituximab maintenance after first-line immunochemotherapy in mantle cell lymphoma: long-term follow-up of the randomized European MCL Elderly trial. *Blood.* 2017;130(Suppl 1):153. PMID: none
46. Kluin-Nelemans HC, Hoster E, Hermine O, et al. Treatment of older patients with mantle cell lymphoma (MCL): long-term follow-up of the randomized European MCL Elderly trial. *J Clin Oncol.* 2020;38(3):248-56. PMID: 31804876
47. Lamm W, Kaufmann H, Raderer M, et al. Bortezomib combined with rituximab and dexamethasone is an active regimen for patients with relapsed and chemotherapy-refractory mantle cell lymphoma. *Haematologica.* 2011;96(7):1008-14. PMID: 21486866
48. Dreyling M, Jurczak W, Jerkeman M, et al. Ibrutinib versus temsirolimus in patients with relapsed or refractory mantle-cell lymphoma: an international, randomised, open-label, phase 3 study. *Lancet.* 2016;387(10020):770-8. PMID: 26673811
49. Rule S, Jurczak W, Jerkeman M, et al. Ibrutinib versus temsirolimus: 3-year follow-up of patients with previously treated mantle cell lymphoma from the phase 3, international, randomized, open-label RAY study. *Leukemia.* 2018;32(8):1799-803. PMID: 29572505
50. Davids MS, Roberts AW, Seymour JF, et al. Phase I first-in-human study of venetoclax in patients with relapsed or refractory non-Hodgkin lymphoma. *J Clin Oncol.* 2017;35(8):826-33. PMID: 28095146
51. Davids MS, von Keudell G, Portell CA, et al. Revised dose ramp-up to mitigate the risk of tumor lysis syndrome when initiating venetoclax in patients with mantle cell lymphoma. *J Clin Oncol.* 2018;36(35):3525-7. PMID: 30359156
52. Tam CS, Wang M, Simpson D, et al. Updated safety and efficacy data in the phase 1 trial of patients with mantle cell lymphoma (MCL) treated with Bruton tyrosine kinase (BTK) inhibitor zanubrutinib (BGB-3111). *Hematol Oncol.* 2019;37(Suppl 2):245-7. PMID: none
53. Song Y, Zhou K, Zou D, et al. Treatment of patients with relapsed or refractory mantle-cell lymphoma with zanubrutinib, a selective inhibitor of Bruton's tyrosine kinase. *Clin Cancer Res.* 2020;26(16):4216-24. PMID: 32461234
54. Tam CS, Trotman J, Opat S, et al. Phase 1 study of the selective BTK inhibitor zanubrutinib in B-cell malignancies and safety and efficacy evaluation in CLL. *Blood.* 2019;134(11):851-9. PMID: 31340982
55. Wang M, Munoz J, Goy A, et al. KTE-X19 CAR T-cell therapy in relapsed or refractory mantle-cell lymphoma. *N Engl J Med.* 2020;382(14):1331-42. PMID: 32242358

56. Shah NN, Alencar AJ, Gerson JN, et al. Pirtobrutinib, a next generation, highly selective, non-covalent BTK inhibitor in previously treated mantle cell lymphoma: updated results from the phase 1/2 BRUIN study. *Oncol Res Treat.* 2022;45(Suppl 1):169-70. PMID: none
57. Cohen JB, Shah NN, Alencar AJ, et al. Pirtobrutinib, a highly selective, non-covalent (reversible) BTK inhibitor in previously treated mantle cell lymphoma: updated results from the phase 1/2 BRUIN study. *Clin Lymphoma Myeloma Leuk.* 2022;22 Suppl 2:S394-S5. PMID: none
58. Mato AR, Shah NN, Jurczak W, et al. Pirtobrutinib in relapsed or refractory B-cell malignancies (BRUIN): a phase 1/2 study. *Lancet.* 2021;397(10277):892-901. PMID: 33676628
59. Wang ML, Jurczak W, Zinzani PL, et al. Pirtobrutinib in covalent bruton tyrosine kinase inhibitor pretreated mantle-cell lymphoma. *J Clin Oncol.* 2023;41(24):3988-97. PMID: 37192437
60. Wang M, Siddiqi T, Gordon LI, et al. Lisocabtagene maraleucel in relapsed/refractory mantle cell lymphoma: primary analysis of the mantle cell lymphoma cohort from TRANSCEND NHL 001, a phase I multicenter seamless design study. *J Clin Oncol.* 2024;42(10):1146-57. PMID: 38072625
61. Damon LE, Johnson JL, Niedzwiecki D, et al. Immunotherapy and autologous stem-cell transplantation for untreated patients with mantle-cell lymphoma: CALGB 59909. *J Clin Oncol.* 2009;27(36):6101-8. PMID: 19917845
62. Schaffel R, Hedvat CV, Teruya-Feldstein J, et al. Prognostic impact of proliferative index determined by quantitative image analysis and the International Prognostic Index in patients with mantle cell lymphoma. *Ann Oncol.* 2010;21(1):133-9. PMID: 20019090
63. Kahl BS, Hong F, Williams ME, et al. Rituximab extended schedule or re-treatment trial for low-tumor burden follicular lymphoma: Eastern Cooperative Oncology Group protocol e4402. *J Clin Oncol.* 2014;32(28):3096-102. PMID: 25154829
64. Wang ML, Jurczak W, Jerkeman M, et al. Ibrutinib plus bendamustine and rituximab in untreated mantle-cell lymphoma. *N Engl J Med.* 2022;386(26):2482-94. PMID: 35657079

## Ovarian Cancer (Epithelial) Pathways

### Adjuvant Therapy

- Stages IA/IB (Grade 2 or 3), and IC (Grade 1-3)
  - Carboplatin and paclitaxel<sup>1-5</sup>

### Adjuvant, Neoadjuvant, or Primary Therapy

- Stages II-IV
  - Carboplatin and paclitaxel (**Administered weekly or every 3 weeks**)<sup>1-9</sup>

### Initial Treatment for Metastatic or Recurrent Disease

- Platinum Sensitive\*
  - Carboplatin<sup>10-12</sup>
  - Carboplatin and gemcitabine (Gemzar)<sup>12-14</sup>
  - Carboplatin and paclitaxel<sup>10, 11, 15</sup>
  - Carboplatin and weekly paclitaxel<sup>16</sup>
- Platinum Resistant
  - Bevacizumab monotherapy<sup>17, 18</sup>
  - Docetaxel (Taxotere)<sup>19</sup>
  - Gemcitabine (Gemzar)<sup>20, 21</sup>
  - Liposomal doxorubicin (Doxil)<sup>20-22</sup>
  - Paclitaxel (weekly)<sup>23-25</sup>
  - Paclitaxel and bevacizumab<sup>26-29</sup>

### Maintenance Therapy

- After response to initial treatment for platinum-sensitive disease
  - Sensitive\* to platinum-based therapies
    - Niraparib (Zejula)<sup>30-34</sup>
    - Olaparib (Lynparza)<sup>35-42</sup>
    - Rucaparib (Rubraca)<sup>43-48</sup>

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\* Platinum sensitive disease is defined as recurrence of greater than 6 months after prior platinum-based therapy

## Ovarian Cancer (Epithelial) References

### NCCN Clinical Practice Guidelines: Ovarian Cancer, Including Fallopian Tube Cancer and Primary Peritoneal Cancer V3.2024

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1. Bell J, Brady MF, Young RC, et al. Randomized phase III trial of three versus six cycles of adjuvant carboplatin and paclitaxel in early stage epithelial ovarian carcinoma: a Gynecologic Oncology Group study. *Gynecol Oncol*. 2006;102(3):432-9. PMID: 16860852
2. Bookman MA, Brady MF, McGuire WP, et al. Evaluation of new platinum-based treatment regimens in advanced-stage ovarian cancer: a phase III Trial of the Gynecologic Cancer Intergroup. *J Clin Oncol*. 2009;27(9):1419-25. PMID: 19224846
3. Chan JK, Tian C, Fleming GF, et al. The potential benefit of 6 vs. 3 cycles of chemotherapy in subsets of women with early-stage high-risk epithelial ovarian cancer: an exploratory analysis of a Gynecologic Oncology Group study. *Gynecol Oncol*. 2010;116(3):301-6. PMID: 19945740
4. Katsumata N, Yasuda M, Isonishi S, et al. Long-term results of dose-dense paclitaxel and carboplatin versus conventional paclitaxel and carboplatin for treatment of advanced epithelial ovarian, fallopian tube, or primary peritoneal cancer (JGOG 3016): a randomised, controlled, open-label trial. *Lancet Oncol*. 2013;14(10):1020-6. PMID: 23948349
5. Vasey PA, Jayson GC, Gordon A, et al. Phase III randomized trial of docetaxel-carboplatin versus paclitaxel-carboplatin as first-line chemotherapy for ovarian carcinoma. *J Natl Cancer Inst*. 2004;96(22):1682-91. PMID: 15547181
6. Armstrong DK, Bundy B, Wenzel L, et al. Intraperitoneal cisplatin and paclitaxel in ovarian cancer. *N Engl J Med*. 2006;354(1):34-43. PMID: 16394300
7. Ngoi NY, Syn NL, Goh RM, et al. Weekly versus tri-weekly paclitaxel with carboplatin for first-line treatment in women with epithelial ovarian cancer. *Cochrane Database Syst Rev*. 2022(2):article no. CD012007. PMID: 35188221
8. Ozols RF, Bundy BN, Greer BE, et al. Phase III trial of carboplatin and paclitaxel compared with cisplatin and paclitaxel in patients with optimally resected stage III ovarian cancer: a Gynecologic Oncology Group study. *J Clin Oncol*. 2003;21(17):3194-200. PMID: 12860964
9. Pignata S, Scambia G, Ferrandina G, et al. Carboplatin plus paclitaxel versus carboplatin plus pegylated liposomal doxorubicin as first-line treatment for patients with ovarian cancer: the MITO-2 randomized phase III trial. *J Clin Oncol*. 2011;29(27):3628-35. PMID: 21844495
10. Gonzalez-Martin AJ, Calvo E, Bover I, et al. Randomized phase II trial of carboplatin versus paclitaxel and carboplatin in platinum-sensitive recurrent advanced ovarian carcinoma: a GEICO (Grupo Espanol de Investigacion en Cancer de Ovario) study. *Ann Oncol*. 2005;16(5):749-55. PMID: 15817604
11. Parmar MK, Ledermann JA, Colombo N, et al. Paclitaxel plus platinum-based chemotherapy versus conventional platinum-based chemotherapy in women with relapsed ovarian cancer: the ICON4/AGO-OVAR-2.2 trial. *Lancet*. 2003;361(9375):2099-106. PMID: 12826431
12. Pfisterer J, Plante M, Vergote I, et al. Gemcitabine plus carboplatin compared with carboplatin in patients with platinum-sensitive recurrent ovarian cancer: an intergroup trial of the AGO-OVAR, the NCIC CTG, and the EORTC GCG. *J Clin Oncol*. 2006;24(29):4699-707. PMID: 16966687
13. Aghajanian C, Blank SV, Goff BA, et al. OCEANS: a randomized, double-blind, placebo-controlled phase III trial of chemotherapy with or without bevacizumab in patients with platinum-sensitive recurrent epithelial ovarian, primary peritoneal, or fallopian tube cancer. *J Clin Oncol*. 2012;30(17):2039-45. PMID: 22529265
14. Aghajanian C, Goff B, Nycum LR, et al. Final overall survival and safety analysis of OCEANS, a phase 3 trial of chemotherapy with or without bevacizumab in patients with platinum-sensitive recurrent ovarian cancer. *Gynecol Oncol*. 2015;139(1):10-6. PMID: 26271155
15. Wagner U, Marth C, Largillier R, et al. Final overall survival results of phase III GCIG CALYPSO trial of pegylated liposomal doxorubicin and carboplatin vs paclitaxel and carboplatin in platinum-sensitive ovarian cancer patients. *British Journal of Cancer*. 2012;107(4):588-91. PMID: 22836511
16. Katsumata N, Yasuda M, Takahashi F, et al. Dose-dense paclitaxel once a week in combination with carboplatin every 3 weeks for advanced ovarian cancer: a phase 3, open-label, randomised controlled trial. *Lancet*. 2009;374(9698):1331-8. PMID: 19767092
17. Burger RA, Sill MW, Monk BJ, et al. Phase II trial of bevacizumab in persistent or recurrent epithelial ovarian cancer or primary peritoneal cancer: a Gynecologic Oncology Group study. *J Clin Oncol*. 2007;25(33):5165-71. PMID: 18024863
18. Cannistra SA, Matulonis UA, Penson RT, et al. Phase II study of bevacizumab in patients with platinum-resistant ovarian cancer or peritoneal serous cancer. *J Clin Oncol*. 2007;25(33):5180-6. PMID: 18024865
19. Rose PG, Blessing JA, Ball HG, et al. A phase II study of docetaxel in paclitaxel-resistant ovarian and peritoneal carcinoma: a Gynecologic Oncology Group study. *Gynecol Oncol*. 2003;88(2):130-5. PMID: 12586591
20. Ferrandina G, Ludovisi M, Lorusso D, et al. Phase III trial of gemcitabine compared with pegylated liposomal doxorubicin in progressive or recurrent ovarian cancer. *J Clin Oncol*. 2008;26(6):890-6. PMID: 18281662
21. Mutch DG, Orlando M, Goss T, et al. Randomized phase III trial of gemcitabine compared with pegylated liposomal doxorubicin in patients with platinum-resistant ovarian cancer. *J Clin Oncol*. 2007;25(19):2811-8. PMID: 17602086
22. Gordon AN, Tonda M, Sun S, et al. Long-term survival advantage for women treated with pegylated liposomal doxorubicin compared with topotecan in a phase 3 randomized study of recurrent and refractory epithelial ovarian cancer. *Gynecol Oncol*. 2004;95(1):1-8. PMID: 15385103
23. Markman M, Blessing J, Rubin SC, et al. Phase II trial of weekly paclitaxel (80 mg/m<sup>2</sup>) in platinum and paclitaxel-resistant ovarian and primary peritoneal cancers: a Gynecologic Oncology Group study. *Gynecol Oncol*. 2006;101(3):436-40. PMID: 16325893
24. Le T, Hopkins L, Baines KA, et al. Prospective evaluations of continuous weekly paclitaxel regimen in recurrent platinum-resistant epithelial ovarian cancer. *Gynecol Oncol*. 2006;102(1):49-53. PMID: 16375951

25. Patel A, Kalachand R, Busschots S, et al. Taxane monotherapy regimens for the treatment of recurrent epithelial ovarian cancer. *Cochrane Database Syst Rev.* 2022(7):article no. CD008766. PMID: 35866378
26. O'Malley DM, Richardson DL, Rheaume PS, et al. Addition of bevacizumab to weekly paclitaxel significantly improves progression-free survival in heavily pretreated recurrent epithelial ovarian cancer. *Gynecol Oncol.* 2011;121(2):269-72. PMID: 21315428
27. Poveda AM, Selle F, Hilpert F, et al. Bevacizumab combined with weekly paclitaxel, pegylated liposomal doxorubicin, or topotecan in platinum-resistant recurrent ovarian cancer: analysis by chemotherapy cohort of the randomized phase III AURELIA trial. *J Clin Oncol.* 2015;33(32):3836-8. PMID: 26282651
28. Pujade-Lauraine E, Hilpert F, Weber B, et al. Bevacizumab combined with chemotherapy for platinum-resistant recurrent ovarian cancer: the AURELIA open-label randomized phase III trial. *J Clin Oncol.* 2014;32(13):1302-8. PMID: 24637997
29. Stockler MR, Hilpert F, Friedlander M, et al. Patient-reported outcome results from the open-label phase III AURELIA trial evaluating bevacizumab-containing therapy for platinum-resistant ovarian cancer. *J Clin Oncol.* 2014;32(13):1309-16. PMID: 24687829
30. Del Campo JM, Matulonis UA, Malander S, et al. Niraparib maintenance therapy in patients with recurrent ovarian cancer after a partial response to the last platinum-based chemotherapy in the ENGOT-OV16/NOVA trial. *J Clin Oncol.* 2019;37(32):2968-73. PMID: 31173551
31. Matulonis UA, Walder L, Nottrup TJ, et al. Niraparib maintenance treatment improves time without symptoms or toxicity (TWiST) versus routine surveillance in recurrent ovarian cancer: a TWiST analysis of the ENGOT-OV16/NOVA trial. *J Clin Oncol.* 2019;37(34):3183-91. PMID: 31518175
32. Mirza MR, Monk BJ, Herrstedt J, et al. Niraparib maintenance therapy in platinum-sensitive, recurrent ovarian cancer. *N Engl J Med.* 2016;375(22):2154-64. PMID: 27717299
33. Wu XH, Zhu JQ, Yin RT, et al. Niraparib maintenance therapy in patients with platinum-sensitive recurrent ovarian cancer using an individualized starting dose (NORA): a randomized, double-blind, placebo-controlled phase 3 trial. *Ann Oncol.* 2021;32(4):512-21. PMID: 33453391
34. Li N, Zhu J, Yin R, et al. Treatment with niraparib maintenance therapy in patients with newly diagnosed advanced ovarian cancer: a phase 3 randomized clinical trial. *JAMA Oncol.* 2023;9(9):1230-7. PMID: 37440217
35. Friedlander M, Matulonis U, Gourley C, et al. Long-term efficacy, tolerability and overall survival in patients with platinum-sensitive, recurrent high-grade serous ovarian cancer treated with maintenance olaparib capsules following response to chemotherapy. *British Journal of Cancer.* 2018;119(9):1075-85. PMID: 30353045
36. Ledermann J, Harter P, Gourley C, et al. Olaparib maintenance therapy in platinum-sensitive relapsed ovarian cancer. *N Engl J Med.* 2012;366(15):1382-92. PMID: 22452356
37. Ledermann JA, Harter P, Gourley C, et al. Overall survival in patients with platinum-sensitive recurrent serous ovarian cancer receiving olaparib maintenance monotherapy: an updated analysis from a randomised, placebo-controlled, double-blind, phase 2 trial. *Lancet Oncol.* 2016;17(11):1579-89. PMID: 27617661
38. Penson RT, Valencia RV, Cibula D, et al. Olaparib versus nonplatinum chemotherapy in patients with platinum-sensitive relapsed ovarian cancer and a germline BRCA1/2 mutation (SOLO3): a randomized phase III trial. *J Clin Oncol.* 2020;38(11):1164-74. PMID: 32073956
39. Poveda A, Floquet A, Ledermann JA, et al. Olaparib tablets as maintenance therapy in patients with platinum-sensitive relapsed ovarian cancer and a BRCA1/2 mutation (SOLO2/ENGOT-Ov21): a final analysis of a double-blind, randomised, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2021;22(5):620-31. PMID: 33743851
40. Pujade-Lauraine E, Ledermann JA, Selle F, et al. Olaparib tablets as maintenance therapy in patients with platinum-sensitive, relapsed ovarian cancer and a BRCA1/2 mutation (SOLO2/ENGOT-Ov21): a double-blind, randomised, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2017;18(9):1274-84. PMID: 28754483
41. Frenel JS, Kim JW, Aryal N, et al. Efficacy of subsequent chemotherapy for patients with BRCA1/2-mutated recurrent epithelial ovarian cancer progressing on olaparib versus placebo maintenance: post-hoc analyses of the SOLO2/ENGOT Ov-21 trial. *Ann Oncol.* 2022;33(10):1021-8. PMID: 35772665
42. Kaufman B, Shapira-Frommer R, Schmutzler RK, et al. Olaparib monotherapy in patients with advanced cancer and a germline BRCA1/2 mutation. *J Clin Oncol.* 2015;33(3):244-50. PMID: 25366685
43. Coleman RL, Oza AM, Lorusso D, et al. Rucaparib maintenance treatment for recurrent ovarian carcinoma after response to platinum therapy (ARIEL3): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet.* 2017;390(10106):1949-61. PMID: 28916367
44. Kristeleit R, Shapiro GI, Burris HA, et al. A phase I-II study of the oral PARP inhibitor rucaparib in patients with germline BRCA1/2-mutated ovarian carcinoma or other solid tumors. *Clin Cancer Res.* 2017;23(15):4095-106. PMID: 28264872
45. Ledermann JA, Oza AM, Lorusso D, et al. Rucaparib for patients with platinum-sensitive, recurrent ovarian carcinoma (ARIEL3): post-progression outcomes and updated safety results from a randomised, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2020;21(5):710-22. PMID: 32359490
46. Oza AM, Lorusso D, Aghajanian C, et al. Patient-centered outcomes in ARIEL3, a phase III, randomized, placebo-controlled trial of rucaparib maintenance treatment in patients with recurrent ovarian carcinoma. *J Clin Oncol.* 2020;38(30):3494-505. PMID: 32840418
47. Swisher EM, Lin KK, Oza AM, et al. Rucaparib in relapsed, platinum-sensitive high-grade ovarian carcinoma (ARIEL2 part 1): an international, multicentre, open-label, phase 2 trial. *Lancet Oncol.* 2017;18(1):75-87. PMID: 27908594
48. Monk BJ, Parkinson C, Lim MC, et al. A randomized, phase III trial to evaluate rucaparib monotherapy as maintenance treatment in patients with newly diagnosed ovarian cancer (ATHENA-MONO/GOG-3020/ENGOT-ov45). *J Clin Oncol.* 2022;40(34):3952-64. PMID: 35658487
49. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Ovarian Cancer Including Fallopian Tube Cancer and Primary Peritoneal Cancer (Version 3.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
50. Pignata S, Scambia G, Katsaros D, et al. Carboplatin plus paclitaxel once a week versus every 3 weeks in patients with advanced ovarian cancer (MITO-7): a randomised, multicentre, open-label, phase 3 trial. *Lancet Oncol.* 2014;15(4):396-405. PMID: 24582486
51. Strauss HG, Henze A, Teichmann A, et al. Phase II trial of docetaxel and carboplatin in recurrent platinum-sensitive ovarian, peritoneal and tubal cancer. *Gynecol Oncol.* 2007;104(3):612-6. PMID: 17069876
52. Rothenberg ML, Liu PY, Wilczynski S, et al. Phase II trial of vinorelbine for relapsed ovarian cancer: a Southwest Oncology Group study. *Gynecol Oncol.* 2004;95(3):506-12. PMID: 15581954
53. Banerjee S, Moore KN, Colombo N, et al. Maintenance olaparib for patients with newly diagnosed advanced ovarian cancer and a BRCA mutation (SOLO1/GOG 3004): 5-year follow-up of a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2021;22(12):1721-31. PMID: 34715071
54. Bajetta E, Di Leo A, Biganzoli L, et al. Phase II study of vinorelbine in patients with pretreated advanced ovarian cancer: activity in platinum-resistant disease. *J Clin Oncol.* 1996;14(9):2546-51. PMID: 8823334

55. Garcia AA, Hirte H, Fleming G, et al. Phase II clinical trial of bevacizumab and low-dose metronomic oral cyclophosphamide in recurrent ovarian cancer: a trial of the California, Chicago, and Princess Margaret Hospital Phase II Consortia. *J Clin Oncol.* 2008;26(1):76-82. PMID: 18165643
56. Verschraegen CF, Czok S, Muller CY, et al. Phase II study of bevacizumab with liposomal doxorubicin for patients with platinum- and taxane-resistant ovarian cancer. *Ann Oncol.* 2012;23(12):3104-10. PMID: 22851407
57. Wolf JK, Bodurka DC, Verschraegen C, et al. A phase II trial of oral capecitabine in patients with platinum--and taxane--refractory ovarian, fallopian tube, or peritoneal cancer. *Gynecol Oncol.* 2006;102(3):468-74. PMID: 16516276
58. Rose PG, Blessing JA, Mayer AR, et al. Prolonged oral etoposide as second-line therapy for platinum-resistant and platinum-sensitive ovarian carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 1998;16(2):405-10. PMID: 9469322
59. Markman M, Hakes T, Reichman B, et al. Ifosfamide and mesna in previously treated advanced epithelial ovarian cancer: activity in platinum-resistant disease. *J Clin Oncol.* 1992;10(2):243-8. PMID: 1732425
60. Matsumoto K, Katsumata N, Yamanaka Y, et al. The safety and efficacy of the weekly dosing of irinotecan for platinum- and taxanes-resistant epithelial ovarian cancer. *Gynecol Oncol.* 2006;100(2):412-6. PMID: 16298422
61. Miller DS, Blessing JA, Krasner CN, et al. Phase II evaluation of pemetrexed in the treatment of recurrent or persistent platinum-resistant ovarian or primary peritoneal carcinoma: a study of the Gynecologic Oncology Group. *J Clin Oncol.* 2009;27(16):2686-91. PMID: 19332726
62. Clamp AR, McNeish I, Dean A, et al. ICON8: a GCIG phase III randomised trial evaluating weekly dose-dense chemotherapy integration in first-line epithelial ovarian/fallopian tube/primary peritoneal carcinoma (EOC) treatment: results of primary progression-free survival (PFS) analysis. *Ann Oncol.* 2017;28(Suppl 5):627. PMID: none
63. Clamp AR, James EC, McNeish IA, et al. Weekly dose-dense chemotherapy in first-line epithelial ovarian, fallopian tube, or primary peritoneal carcinoma treatment (ICON8): primary progression free survival analysis results from a GCIG phase 3 randomised controlled trial. *Lancet.* 2019;394(10214):2084-95. PMID: 31791688
64. Blagden SP, Cook AD, Poole C, et al. Weekly platinum-based chemotherapy versus 3-weekly platinum-based chemotherapy for newly diagnosed ovarian cancer (ICON8): quality-of-life results of a phase 3, randomised, controlled trial. *Lancet Oncol.* 2020;21(7):969-77. PMID: 32615110
65. Clamp AR, James EC, McNeish IA, et al. Weekly dose-dense chemotherapy in first-line epithelial ovarian, fallopian tube, or primary peritoneal cancer treatment (ICON8): overall survival results from an open-label, randomised, controlled, phase 3 trial. *Lancet Oncol.* 2022;23(7):919-30. PMID: 35690073
66. Wright AA, Cronin A, Milne DE, et al. Use and effectiveness of intraperitoneal chemotherapy for treatment of ovarian cancer. *J Clin Oncol.* 2015;33(26):2841-7. PMID: 26240233
67. Tewari D, Java JJ, Salani R, et al. Long-term survival advantage and prognostic factors associated with intraperitoneal chemotherapy treatment in advanced ovarian cancer: a Gynecologic Oncology Group study. *J Clin Oncol.* 2015;33(13):1460-6. PMID: 25800756
68. Jaaback K, Johnson N, Lawrie TA. Intraperitoneal chemotherapy for the initial management of primary epithelial ovarian cancer. *Cochrane Database Syst Rev.* 2016(1):article no. CD005340. PMID: 26755441
69. Nagao S, Fujiwara K, Yamamoto K, et al. Intraperitoneal carboplatin for ovarian cancer - a phase 2/3 trial. *NEJM Evid.* 2023;2(5):EVIDoaa2200225. PMID: 38320049
70. Hirte H, Poon R, Yao X, et al. Neoadjuvant and adjuvant systemic therapy for newly diagnosed stage II- IV epithelial ovary, fallopian tube, or primary peritoneal carcinoma: A systematic review. *Crit Rev Oncol Hematol.* 2021;162:103324. PMID: 33862245
71. Aronson SL, Lopez-Yurda M, Koole SN, et al. Cytoreductive surgery with or without hyperthermic intraperitoneal chemotherapy in patients with advanced ovarian cancer (OVIPIEC-1): final survival analysis of a randomised, controlled, phase 3 trial. *Lancet Oncol.* 2023;24(10):1109-18. PMID: 37708912
72. Monk BJ, Colombo N, Oza AM, et al. Chemotherapy with or without avelumab followed by avelumab maintenance versus chemotherapy alone in patients with previously untreated epithelial ovarian cancer (JAVELIN Ovarian 100): an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2021;22(9):1275-89. PMID: 34363762
73. Perren TJ, Swart AM, Pfisterer J, et al. A phase 3 trial of bevacizumab in ovarian cancer. *N Engl J Med.* 2011;365(26):2484-96. PMID: 22204725
74. Oza AM, Cook AD, Pfisterer J, et al. Standard chemotherapy with or without bevacizumab for women with newly diagnosed ovarian cancer (ICON7): overall survival results of a phase 3 randomised trial. *Lancet Oncol.* 2015;16(8):928-36. PMID: 26115797
75. Tewari KS, Burger RA, Enserro D, et al. Final overall survival of a randomized trial of bevacizumab for primary treatment of ovarian cancer. *J Clin Oncol.* 2019;37(26):2317-28. PMID: 31216226
76. Kushner DM, Connor JP, Sanchez F, et al. Weekly docetaxel and carboplatin for recurrent ovarian and peritoneal cancer: a phase II trial. *Gynecol Oncol.* 2007;105(2):358-64. PMID: 17258800
77. Pujade-Lauraine E, Wagner U, Avall-Lundqvist E, et al. Pegylated liposomal doxorubicin and carboplatin compared with paclitaxel and carboplatin for patients with platinum-sensitive ovarian cancer in late relapse. *J Clin Oncol.* 2010;28(20):3323-9. PMID: 20498395
78. Pfisterer J, Dean AP, Baumann K, et al. Carboplatin/pegylated liposomal doxorubicin/bevacizumab (CD-BEV) vs. carboplatin/gemcitabine/bevacizumab (CG-BEV) in patients with recurrent ovarian cancer: a prospective randomized phase III ENGOT/GCIG-Intergroup study (AGO study group, AGO-Austria, ANZGOG, GINECO, SGCTG). *Ann Oncol.* 2018;29 (Suppl 8):vii332-vii3. PMID: none
79. Pfisterer J, Shannon CM, Baumann K, et al. Bevacizumab and platinum-based combinations for recurrent ovarian cancer: a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2020;21(5):699-709. PMID: 32305099
80. Coleman RL, Brady MF, Herzog TJ, et al. Bevacizumab and paclitaxel-carboplatin chemotherapy and secondary cytoreduction in recurrent, platinum-sensitive ovarian cancer (NRG Oncology/Gynecologic Oncology Group study GOG-0213): a multicentre, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2017;18(6):779-91. PMID: 28438473
81. Nagourney RA, Brewer CA, Radecki S, et al. Phase II trial of gemcitabine plus cisplatin repeating doublet therapy in previously treated, relapsed ovarian cancer patients. *Gynecol Oncol.* 2003;88(1):35-9. PMID: 12504624
82. Rose PG. Gemcitabine reverses platinum resistance in platinum-resistant ovarian and peritoneal carcinoma. *Int J Gynecol Cancer.* 2005;15 Suppl 1:18-22. PMID: 15839954
83. Bolis G, D'Incalci M, Gramellini F, et al. Adriamycin in ovarian cancer patients resistant to cyclophosphamide. *European Journal of Cancer (Oxford).* 1978;14(12):1401-2. PMID: 738344
84. Hubbard SM, Barkes P, Young RC. Adriamycin therapy for advanced ovarian carcinoma recurrent after chemotherapy. *Cancer Treat Rep.* 1978;62(9):1375-7. PMID: 688281
85. Demetri GD, Paz-Ares L, Farago AF, et al. Efficacy and safety of entrectinib in patients with NTRK fusion-positive (NTRK-fp) tumors: pooled analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol.* 2018;29(Suppl 8):vii713. PMID: none

86. Rolfo C, Dziadziuszko R, Doebele RC, et al. Updated efficacy and safety of entrectinib in patients with NTRK fusion-positive tumors: integrated analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol.* 2019;30(Suppl 5):v180. PMID: none
87. de Palo GM, de Lena M, Di Re F, et al. Melphalan versus adriamycin in the treatment of advanced carcinoma of the ovary. *Surg Gynecol Obstet.* 1975;141(6):899-902. PMID: 1103333
88. Wadler S, Yeap B, Vogl S, et al. Randomized trial of initial therapy with melphalan versus cisplatin-based combination chemotherapy in patients with advanced ovarian carcinoma: initial and long term results--Eastern Cooperative Oncology Group study E2878. *Cancer.* 1996;77(4):733-42. PMID: 8616766
89. Mirza MR, Avall Lundqvist E, Birrer MJ, et al. Niraparib plus bevacizumab versus niraparib alone for platinum-sensitive recurrent ovarian cancer (NSGO-AVANOVA2/ENGOT-ov24): a randomised, phase 2, superiority trial. *Lancet Oncol.* 2019;20(10):1409-19. PMID: 31474354
90. Dieras V, Bougnoux P, Petit T, et al. Multicentre phase II study of oxaliplatin as a single-agent in cisplatin/carboplatin +/- taxane-pretreated ovarian cancer patients. *Ann Oncol.* 2002;13(2):258-66. PMID: 11886003
91. Teneriello MG, Tseng PC, Crozier M, et al. Phase II evaluation of nanoparticle albumin-bound paclitaxel in platinum-sensitive patients with recurrent ovarian, peritoneal, or fallopian tube cancer. *J Clin Oncol.* 2009;27(9):1426-31. PMID: 19224848
92. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science.* 2017;357(6349):409-13. PMID: 28596308
93. Burger RA, Brady MF, Bookman MA, et al. Incorporation of bevacizumab in the primary treatment of ovarian cancer. *N Engl J Med.* 2011;365(26):2473-83. PMID: 22204724
94. Gonzalez-Martin A, Pothuri B, Vergote I, et al. Niraparib in patients with newly diagnosed advanced ovarian cancer. *N Engl J Med.* 2019;381(25):2391-402. PMID: 31562799
95. Moore K, Colombo N, Scambia G, et al. Maintenance olaparib in patients with newly diagnosed advanced ovarian cancer. *N Engl J Med.* 2018;379(26):2495-505. PMID: 30345884
96. Friedlander M, Moore KN, Colombo N, et al. Patient-centred outcomes and effect of disease progression on health status in patients with newly diagnosed advanced ovarian cancer and a BRCA mutation receiving maintenance olaparib or placebo (SOLO1): a randomised, phase 3 trial. *Lancet Oncol.* 2021;22(5):632-42. PMID: 33862001
97. DiSilvestro P, Banerjee S, Colombo N, et al. Overall survival with maintenance olaparib at a 7-year follow-up in patients with newly diagnosed advanced ovarian cancer and a BRCA mutation: the SOLO1/GOG 3004 trial. *J Clin Oncol.* 2023;41(3):609-17. PMID: 36082969
98. Ray-Coquard I, Pautier P, Pignata S, et al. Olaparib plus bevacizumab as first-line maintenance in ovarian cancer. *N Engl J Med.* 2019;381(25):2416-28. PMID: 31851799
99. Ray-Coquard I, Leary A, Pignata S, et al. Olaparib plus bevacizumab first-line maintenance in ovarian cancer: final overall survival results from the PAOLA-1/ENGOT-ov25 trial. *Ann Oncol.* 2023;34(8):681-92. PMID: 37211045
100. Gershenson DM, Miller A, Brady WE, et al. Trametinib versus standard of care in patients with recurrent low-grade serous ovarian cancer (GOG 281/LOGS): an international, randomised, open-label, multicentre, phase 2/3 trial. *Lancet.* 2022;399(10324):541-53. PMID: 35123694
101. Lindemann K, Gibbs E, Avall-Lundqvist E, et al. Chemotherapy vs tamoxifen in platinum-resistant ovarian cancer: a phase III, randomised, multicentre trial (Ovaresist). *British Journal of Cancer.* 2017;116(4):455-63. PMID: 28118323
102. Abushahin F, Singh DK, Lurain JR, et al. Weekly topotecan for recurrent platinum resistant ovarian cancer. *Gynecol Oncol.* 2008;108(1):53-7. PMID: 17904208
103. Sehouli J, Stengel D, Harter P, et al. Topotecan weekly versus conventional 5-day schedule in patients with platinum-resistant ovarian cancer: a randomized multicenter phase II trial of the North-Eastern German Society of Gynecological Oncology Ovarian Cancer Study Group. *J Clin Oncol.* 2011;29(2):242-8. PMID: 21115872
104. Wang T, Tang J, Yang H, et al. Effect of apatinib plus pegylated liposomal doxorubicin vs pegylated liposomal doxorubicin alone on platinum-resistant recurrent ovarian cancer: the APPROVE randomized clinical trial. *JAMA Oncol.* 2022;8(8):1169-76. PMID: 35771546
105. Barber EL, Zsiros E, Lurain JR, et al. The combination of intravenous bevacizumab and metronomic oral cyclophosphamide is an effective regimen for platinum-resistant recurrent ovarian cancer. *J Gynecol Oncol.* 2013;24(3):258-64. PMID: 23875076
106. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med.* 2018;378(8):731-9. PMID: 29466156
107. Matulonis UA, Lorusso D, Oaknin A, et al. Efficacy and safety of mirvetuximab soravtansine in patients with platinum-resistant ovarian cancer with high folate receptor alpha expression: results from the SORAYA study. *J Clin Oncol.* 2023;41(13):2436-45. PMID: 36716407
108. Moore KN, Angelergues A, Konecny GE, et al. Mirvetuximab soravtansine in FRalpha-positive, platinum-resistant ovarian cancer. *N Engl J Med.* 2023;389(23):2162-74. PMID: 38055253
109. Markert S, Lassmann S, Gabriel B, et al. Alpha-folate receptor expression in epithelial ovarian carcinoma and non-neoplastic ovarian tissue. *Anticancer Res.* 2008;28(6A):3567-72. PMID: 19189636
110. Moore KN, Secord AA, Geller MA, et al. Niraparib monotherapy for late-line treatment of ovarian cancer (QUADRA): a multicentre, open-label, single-arm, phase 2 trial. *Lancet Oncol.* 2019;20(5):636-48. PMID: 30948273
111. Balasubramanian S, Beaver JA, Horton S, et al. FDA approval summary: rucaparib for the treatment of patients with deleterious BRCA mutation-associated advanced ovarian cancer. *Clin Cancer Res.* 2017;23(23):7165-70. PMID: 28751443
112. Chekerov R, Hilpert F, Mahner S, et al. Sorafenib plus topotecan versus placebo plus topotecan for platinum-resistant ovarian cancer (TRIAS): a multicentre, randomised, double-blind, placebo-controlled, phase 2 trial. *Lancet Oncol.* 2018;19(9):1247-58. PMID: 30100379
113. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan in patients with HER2-expressing solid tumors: primary results from the DESTINY-PanTumor02 phase II trial. *J Clin Oncol.* 2024;42(1):47-58. PMID: 37870536
114. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2-expressing solid tumors: DESTINY-PanTumor02 (DP-02) interim results. *J Clin Oncol.* 2023;41(17 Suppl):abstract LBA3000. PMID: none
115. von Gruenigen VE, Huang HQ, Beumer JH, et al. Chemotherapy completion in elderly women with ovarian, primary peritoneal or fallopian tube cancer - an NRG Oncology/Gynecologic Oncology Group study. *Gynecol Oncol.* 2017;144(3):459-67. PMID: 28089376
116. Vergote I, Trope CG, Amant F, et al. Neoadjuvant chemotherapy or primary surgery in stage IIIC or IV ovarian cancer. *N Engl J Med.* 2010;363(10):943-53. PMID: 20818904
117. Kehoe S, Hook J, Nankivell M, et al. Primary chemotherapy versus primary surgery for newly diagnosed advanced ovarian cancer (CHORUS): an open-label, randomised, controlled, non-inferiority trial. *Lancet.* 2015;386(9990):249-57. PMID: 26002111
118. Rouzier R, Gouy S, Selle F, et al. Efficacy and safety of bevacizumab-containing neoadjuvant therapy followed by interval debulking surgery in advanced ovarian cancer: results from the ANTHALYA trial. *Eur J Cancer.* 2017;70:133-42. PMID: 27914243

119. Coleman RL, Fleming GF, Brady MF, et al. Veliparib with first-line chemotherapy and as maintenance therapy in ovarian cancer. *N Engl J Med.* 2019;381(25):2403-15. PMID: 31562800
120. Alberts DS, Jiang C, Liu PY, et al. Long-term follow-up of a phase II trial of oral altretamine for consolidation of clinical complete remission in women with stage III epithelial ovarian cancer in the Southwest Oncology Group. *Int J Gynecol Cancer.* 2004;14(2):224-8. PMID: 15086720
121. Benigno BB, Burrell MO, Daugherty P, et al. A phase II nonrandomized study of nab-paclitaxel plus carboplatin in patients with recurrent platinum-sensitive ovarian or primary peritoneal cancer. *J Clin Oncol.* 2010;28(15 Suppl):abstract 5011. PMID: none
122. Maurer K, Michener C, Mahdi H, et al. Universal tolerance of nab-paclitaxel for gynecologic malignancies in patients with prior taxane hypersensitivity reactions. *J Gynecol Oncol.* 2017;28(4):e38. PMID: 28541630
123. Sugiyama T, Okamoto A, Enomoto T, et al. Randomized phase III trial of irinotecan plus cisplatin compared with paclitaxel plus carboplatin as first-line chemotherapy for ovarian clear cell carcinoma: JGOG3017/GCIG Trial. *J Clin Oncol.* 2016;34(24):2881-7. PMID: 27400948
124. Wenham RM, Lapolla J, Lin HY, et al. A phase II trial of docetaxel and bevacizumab in recurrent ovarian cancer within 12 months of prior platinum-based chemotherapy. *Gynecol Oncol.* 2013;130(1):19-24. PMID: 23623830
125. Tillmanns TD, Lowe MP, Walker MS, et al. Phase II clinical trial of bevacizumab with albumin-bound paclitaxel in patients with recurrent, platinum-resistant primary epithelial ovarian or primary peritoneal carcinoma. *Gynecol Oncol.* 2013;128(2):221-8. PMID: 22960352
126. Hagemann AR, Novetsky AP, Zighelboim I, et al. Phase II study of bevacizumab and pemetrexed for recurrent or persistent epithelial ovarian, fallopian tube or primary peritoneal cancer. *Gynecol Oncol.* 2013;131(3):535-40. PMID: 24096113
127. Pignata S, Lorusso D, Scambia G, et al. Pazopanib plus weekly paclitaxel versus weekly paclitaxel alone for platinum-resistant or platinum-refractory advanced ovarian cancer (MITO 11): a randomised, open-label, phase 2 trial. *Lancet Oncol.* 2015;16(5):561-8. PMID: 25882986
128. Markman M, Blessing JA, Moore D, et al. Altretamine (hexamethylmelamine) in platinum-resistant and platinum-refractory ovarian cancer: a Gynecologic Oncology Group phase II trial. *Gynecol Oncol.* 1998;69(3):226-9. PMID: 9648592

## Pancreatic Adenocarcinoma Pathways

### Neoadjuvant Therapy

- Stage III
  - **FOLFIRINOX:** fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>1, 2</sup>
  - **mFOLFIRINOX\***: fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>3</sup>
  - Gemcitabine (Gemzar) and albumin-bound paclitaxel (Abraxane)<sup>4-6</sup>

### Adjuvant Therapy

- Stages I, IA, IB, II, IIA, IIB, and III
  - Capecitabine (Xeloda) and gemcitabine (Gemzar)<sup>7-9</sup>
  - **FULV:** fluorouracil (5FU) and leucovorin<sup>10-12</sup>
  - Gemcitabine (Gemzar)<sup>10, 12-14</sup>
  - **mFOLFIRINOX\***: fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>15, 16</sup>

### First Line of Therapy (1<sup>st</sup> Line)

- Stages III, IV, and Recurrent
  - **FOLFIRINOX:** fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>1-2</sup>
  - **mFOLFIRINOX\***: fluorouracil (5FU), leucovorin, irinotecan (Camptosar), and oxaliplatin<sup>3</sup>
  - Gemcitabine (Gemzar)<sup>17-20</sup>
  - Gemcitabine (Gemzar) and albumin-bound-paclitaxel (Abraxane)<sup>4-6</sup>

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\* Modified FOLFIRINOX: Bolus 5-FU not administered and dose of Irinotecan 150mg/m2

## Pancreatic Adenocarcinoma References

### NCCN Clinical Practice Guidelines: Pancreatic Adenocarcinoma V1.2024

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1. Suer M, Beumer BR, Sadot E, et al. FOLFIRINOX for locally advanced pancreatic cancer: a systematic review and patient-level meta-analysis. *Lancet Oncol.* 2016;17(6):801-10. PMID: 27160474
2. Conroy T, Desseigne F, Ychou M, et al. FOLFIRINOX versus gemcitabine for metastatic pancreatic cancer. *N Engl J Med.* 2011;364(19):1817-25. PMID: 21561347
3. Klein-Brill A, Amar-Farkash S, Lawrence G, et al. Comparison of FOLFIRINOX vs gemcitabine plus nab-paclitaxel as first-line chemotherapy for metastatic pancreatic ductal adenocarcinoma. *JAMA Netw Open.* 2022;5(6):e2216199. PMID: 35675073
4. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Pancreatic Adenocarcinoma (Version 3.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
5. Goldstein D, El-Maraghi RH, Hammel P, et al. nab-Paclitaxel plus gemcitabine for metastatic pancreatic cancer: long-term survival from a phase III trial. *J Natl Cancer Inst.* 2015;107(2):[10 p.]. PMID: 25638248
6. Von Hoff DD, Ervin T, Arena FP, et al. Increased survival in pancreatic cancer with nab-paclitaxel plus gemcitabine. *N Engl J Med.* 2013;369(18):1691-703. PMID: 24131140
7. Jones RP, Psarelli EE, Jackson R, et al. Patterns of recurrence after resection of pancreatic ductal adenocarcinoma: a secondary analysis of the ESPAC-4 randomized adjuvant chemotherapy trial. *JAMA Surg.* 2019;154(11):1038-48. PMID: 31483448
8. Khorana AA, Mangu PB, Berlin J, et al. Potentially curable pancreatic cancer: American Society of Clinical Oncology clinical practice guideline update. *J Clin Oncol.* 2017;35(20):2324-8. PMID: 28398845
9. Neoptolemos JP, Palmer DH, Ghaneh P, et al. Comparison of adjuvant gemcitabine and capecitabine with gemcitabine monotherapy in patients with resected pancreatic cancer (ESPAc-4): a multicentre, open-label, randomised, phase 3 trial. *Lancet.* 2017;389(10073):1011-24. PMID: 28129987
10. Neoptolemos JP, Stocken DD, Bassi C, et al. Adjuvant chemotherapy with fluorouracil plus folinic acid vs gemcitabine following pancreatic cancer resection: a randomized controlled trial. *JAMA.* 2010;304(10):1073-81. PMID: 20823433
11. Neoptolemos JP, Stocken DD, Friess H, et al. A randomized trial of chemoradiotherapy and chemotherapy after resection of pancreatic cancer. *N Engl J Med.* 2004;350(12):1200-10. PMID: 15028824
12. Regine WF, Winter KA, Abrams RA, et al. Fluorouracil vs gemcitabine chemotherapy before and after fluorouracil-based chemoradiation following resection of pancreatic adenocarcinoma: a randomized controlled trial. *JAMA.* 2008;299(9):1019-26. PMID: 18319412
13. Oettle H, Neuhaus P, Hochhaus A, et al. Adjuvant chemotherapy with gemcitabine and long-term outcomes among patients with resected pancreatic cancer: the CONKO-001 randomized trial. *JAMA.* 2013;310(14):1473-81. PMID: 24104372
14. Regine WF, Winter KA, Abrams R, et al. Fluorouracil-based chemoradiation with either gemcitabine or fluorouracil chemotherapy after resection of pancreatic adenocarcinoma: 5-year analysis of the U.S. Intergroup/RTOG 9704 phase III trial. *Ann Surg Oncol.* 2011;18(5):1319-26. PMID: 21499862
15. Conroy T, Hammel P, Hebbar M, et al. Unicancer GI PRODIGE 24/CTG PA.6 trial: a multicenter international randomized phase III trial of adjuvant mFOLFIRINOX versus gemcitabine (gem) in patients with resected pancreatic ductal adenocarcinomas. *J Clin Oncol.* 2018;36(18 Suppl):abstr LBA4001. PMID: none
16. Conroy T, Hammel P, Hebbar M, et al. FOLFIRINOX or gemcitabine as adjuvant therapy for pancreatic cancer. *N Engl J Med.* 2018;1(25):2395-406. PMID: 30575490
17. Burris HA, 3rd, Moore MJ, Andersen J, et al. Improvements in survival and clinical benefit with gemcitabine as first-line therapy for patients with advanced pancreas cancer: a randomized trial. *J Clin Oncol.* 1997;15(6):2403-13. PMID: 9196156
18. Colucci G, Labianca R, Di Costanzo F, et al. Randomized phase III trial of gemcitabine plus cisplatin compared with single-agent gemcitabine as first-line treatment of patients with advanced pancreatic cancer: the GIP-1 study. *J Clin Oncol.* 2010;28(10):1645-51. PMID: 20194854
19. Cunningham D, Chau I, Stocken DD, et al. Phase III randomized comparison of gemcitabine versus gemcitabine plus capecitabine in patients with advanced pancreatic cancer. *J Clin Oncol.* 2009;27(33):5513-8. PMID: 19858379
20. Heinemann V, Quietzsch D, Gieseler F, et al. Randomized phase III trial of gemcitabine plus cisplatin compared with gemcitabine alone in advanced pancreatic cancer. *J Clin Oncol.* 2006;24(24):3946-52. PMID: 16921047
21. Mukherjee S, Hurt CN, Bridgewater J, et al. Gemcitabine-based or capecitabine-based chemoradiotherapy for locally advanced pancreatic cancer (SCALOP): a multicentre, randomised, phase 2 trial. *Lancet Oncol.* 2013;14(4):317-26. PMID: 23474363
22. Moertel CG, Frytak S, Hahn RG, et al. Therapy of locally unresectable pancreatic carcinoma: a randomized comparison of high dose (6000 rads) radiation alone, moderate dose radiation (4000 rads + 5-fluorouracil), and high dose radiation + 5-fluorouracil: the Gastrointestinal Tumor Study Group. *Cancer.* 1981;48(8):1705-10. PMID: 7284971
23. Chauffert B, Mornex F, Bonnetain F, et al. Phase III trial comparing intensive induction chemoradiotherapy (60 Gy, infusional 5-FU and intermittent cisplatin) followed by maintenance gemcitabine with gemcitabine alone for locally advanced unresectable pancreatic cancer. Definitive results of the 2000-01 FFCD/SFRO study. *Ann Oncol.* 2008;19(9):1592-9. PMID: 18467316
24. Loehrer PJ, Sr., Feng Y, Cardenes H, et al. Gemcitabine alone versus gemcitabine plus radiotherapy in patients with locally advanced pancreatic cancer: an Eastern Cooperative Oncology Group trial. *J Clin Oncol.* 2011;29(31):4105-12. PMID: 21969502
25. Blackstock AW, Tepper JE, Niedwiecki D, et al. Cancer and Leukemia Group B (CALGB) 89805: phase II chemoradiation trial using gemcitabine in patients with locoregional adenocarcinoma of the pancreas. *Int J Gastrointest Cancer.* 2003;34(2-3):107-16. PMID: 15361643

26. Rothenberg ML, Moore MJ, Cripps MC, et al. A phase II trial of gemcitabine in patients with 5-FU-refractory pancreas cancer. *Ann Oncol*. 1996;7(4):347-53. PMID: 8805925
27. Moore MJ, Goldstein D, Hamm J, et al. Erlotinib plus gemcitabine compared with gemcitabine alone in patients with advanced pancreatic cancer: a phase III trial of the National Cancer Institute of Canada Clinical Trials Group. *J Clin Oncol*. 2007;25(15):1960-6. PMID: 17452677
28. Gill S, Ko YJ, Cripps C, et al. PANCREOX: a randomized phase III study of fluorouracil/leucovorin with or without oxaliplatin for second-line advanced pancreatic cancer in patients who have received gemcitabine-based chemotherapy. *J Clin Oncol*. 2016;34(32):3914-20. PMID: 27621395
29. Wang-Gillam A, Hubner RA, Siveke JT, et al. NAPOLI-1 phase 3 study of liposomal irinotecan in metastatic pancreatic cancer: Final overall survival analysis and characteristics of long-term survivors. *Eur J Cancer*. 2019;108:78-87. PMID: 30654298
30. Oettle H, Riess H, Stieler JM, et al. Second-line oxaliplatin, folinic acid, and fluorouracil versus folinic acid and fluorouracil alone for gemcitabine-refractory pancreatic cancer: outcomes from the CONKO-003 trial. *J Clin Oncol*. 2014;32(23):2423-9. PMID: 24982456
31. Pelzer U, Schwaner I, Stieler J, et al. Best supportive care (BSC) versus oxaliplatin, folinic acid and 5-fluorouracil (OFF) plus BSC in patients for second-line advanced pancreatic cancer: a phase III-study from the German CONKO-study group. *Eur J Cancer*. 2011;47(11):1676-81. PMID: 21565490
32. Sohal DPS, Duong M, Ahmad SA, et al. Efficacy of perioperative chemotherapy for resectable pancreatic adenocarcinoma: a phase 2 randomized clinical trial. *JAMA Oncol*. 2021;7(3):421-7. PMID: 33475684
33. van Roessel S, van Veldhuizen E, Klompmaker S, et al. Evaluation of adjuvant chemotherapy in patients with resected pancreatic cancer after neoadjuvant FOLFIRINOX treatment. *JAMA Oncol*. 2020;6(11):1733-40. PMID: 32910170
34. Conroy T, Castan F, Lopez A, et al. Five-year outcomes of FOLFIRINOX vs gemcitabine as adjuvant therapy for pancreatic cancer: a randomized clinical trial. *JAMA Oncol*. 2022;8(11):1571-8. PMID: 36048453
35. Tempero MA, Pelzer U, O'Reilly EM, et al. Adjuvant nab-paclitaxel + gemcitabine in resected pancreatic ductal adenocarcinoma: results from a randomized, open-label, phase III trial. *J Clin Oncol*. 2022;41(11):2007-19. PMID: 36521097
36. Hurt CN, Mukherjee S, Bridgewater J, et al. Health-related quality of life in SCALOP, a randomized phase 2 trial comparing chemoradiation therapy regimens in locally advanced pancreatic cancer. *Int J Radiat Oncol Biol Phys*. 2015;93(4):810-8. PMID: 26530749
37. Hammel P, Huguet F, van Laethem JL, et al. Effect of chemoradiotherapy vs chemotherapy on survival in patients with locally advanced pancreatic cancer controlled after 4 months of gemcitabine with or without erlotinib: the LAP07 randomized clinical trial. *JAMA*. 2016;315(17):1844-53. PMID: 27139057
38. Schellenberg D, Kim J, Christman-Skieller C, et al. Single-fraction stereotactic body radiation therapy and sequential gemcitabine for the treatment of locally advanced pancreatic cancer. *Int J Radiat Oncol Biol Phys*. 2011;81(1):181-8. PMID: 21549517
39. Fogelman D, Sugar EA, Oliver G, et al. Family history as a marker of platinum sensitivity in pancreatic adenocarcinoma. *Cancer Chemother Pharmacol*. 2015;76(3):489-98. PMID: 26126726
40. Jameson GS, Borazanci E, Babiker HM, et al. Response rate following albumin-bound paclitaxel plus gemcitabine plus cisplatin treatment among patients with advanced pancreatic cancer: a phase 1b/2 pilot clinical trial. *JAMA Oncol*. 2019;6(1):125-13. PMID: 31580386
41. Shroff RT, Javle MM, Xiao L, et al. Gemcitabine, cisplatin, and nab-paclitaxel for the treatment of advanced biliary tract cancers: a phase 2 clinical trial. *JAMA Oncol*. 2019;5(6):824-30. PMID: 30998813
42. Irigoyen A, Gallego J, Guillen Ponce C, et al. Gemcitabine-erlotinib versus gemcitabine-erlotinib-capecitabine in the first-line treatment of patients with metastatic pancreatic cancer: efficacy and safety results of a phase IIb randomised study from the Spanish TTD Collaborative Group. *Eur J Cancer*. 2017;75:73-82. PMID: 28222309
43. Wainberg ZA, Melisi D, Macarulla T, et al. NALIRIFOX versus nab-paclitaxel and gemcitabine in treatment-naïve patients with metastatic pancreatic ductal adenocarcinoma (NAPOLI 3): a randomised, open-label, phase 3 trial. *Lancet*. 2023;402(10409):1272-81. PMID: 37708904
44. Carrato A, Pazo-Cid R, Macarulla T, et al. Nab-paclitaxel plus gemcitabine and FOLFOX in metastatic pancreatic cancer. *NEJM Evid*. 2024;3(2):EVIDoa2300144. PMID: 38320486
45. Sahai V, Benson AB. Are we there yet? - alternating chemotherapy regimens in pancreatic cancer. *NEJM Evid*. 2024;3(2):EVIDe2300341. PMID: 38320497
46. Heinemann V, Vehling-Kaiser U, Waldschmidt D, et al. Gemcitabine plus erlotinib followed by capecitabine versus capecitabine plus erlotinib followed by gemcitabine in advanced pancreatic cancer: final results of a randomised phase 3 trial of the 'Arbeitsgemeinschaft Internistische Onkologie' (AIO-PK0104). *Gut*. 2013;62(5):751-9. PMID: 22773551
47. Xiong HQ, Varadachary GR, Blais JC, et al. Phase 2 trial of oxaliplatin plus capecitabine (XELOX) as second-line therapy for patients with advanced pancreatic cancer. *Cancer*. 2008;113(8):2046-52. PMID: 18756532
48. Chiorean EG, Von Hoff DD, Tabernero J, et al. Second-line therapy after nab-paclitaxel plus gemcitabine or after gemcitabine for patients with metastatic pancreatic cancer. *British Journal of Cancer*. 2016;115(2):188-94. PMID: 27351217
49. Boeck S, Vehling-Kaiser U, Waldschmidt D, et al. Erlotinib 150 mg daily plus chemotherapy in advanced pancreatic cancer: an interim safety analysis of a multicenter, randomized, cross-over phase III trial of the 'Arbeitsgemeinschaft Internistische Onkologie'. *Anticancer Drugs*. 2010;21(1):94-100. PMID: 19770635
50. Wang-Gillam A, Li CP, Bodoky G, et al. Nanoliposomal irinotecan with fluorouracil and folinic acid in metastatic pancreatic cancer after previous gemcitabine-based therapy (NAPOLI-1): a global, randomised, open-label, phase 3 trial. *Lancet*. 2016;387(10018):545-57. PMID: 26615328
51. Wang-Gillam A, Li CP, Bodoky G, et al. Updated overall survival analysis of NAPOLI-1: phase III study of nanoliposomal irinotecan (nal-IRI, MM-398), with or without 5-fluorouracil and leucovorin (5-FU/LV), versus 5-FU/LV in metastatic pancreatic cancer (mPAC) previously treated with gemcitabine-based therapy. *J Clin Oncol*. 2016;34(4 Suppl):abstract 417. PMID: 72224980
52. Lamb YN, Scott LJ. Liposomal irinotecan: a review in metastatic pancreatic adenocarcinoma. *Drugs*. 2017;77(7):785-92. PMID: 28401446
53. Pelzer U, Blanc JF, Melisi D, et al. Quality-adjusted survival with combination nal-IRI+5-FU/LV vs 5-FU/LV alone in metastatic pancreatic cancer patients previously treated with gemcitabine-based therapy: a Q-TWiST analysis. *British Journal of Cancer*. 2017;116(10):1247-53. PMID: 28350787
54. Zaniboni A, Aitini E, Barni S, et al. FOLFIRI as second-line chemotherapy for advanced pancreatic cancer: a GISCAD multicenter phase II study. *Cancer Chemother Pharmacol*. 2012;69(6):1641-5. PMID: 22576338
55. Neuzillet C, Hentic O, Rousseau B, et al. FOLFIRI regimen in metastatic pancreatic adenocarcinoma resistant to gemcitabine and platinum-salts. *World J Gastroenterol*. 2012;18(33):4533-41. PMID: 22969226
56. Yoo C, Hwang JY, Kim JE, et al. A randomised phase II study of modified FOLFIRI.3 vs modified FOLFOX as second-line therapy in patients with gemcitabine-refractory advanced pancreatic cancer. *British Journal of Cancer*. 2009;101(10):1658-63. PMID: 19826418

57. Assaf E, Verlinde-Carvalho M, Delbaldo C, et al. 5-fluorouracil/leucovorin combined with irinotecan and oxaliplatin (FOLFIRINOX) as second-line chemotherapy in patients with metastatic pancreatic adenocarcinoma. *Oncology*. 2011;80(5-6):301-6. PMID: 21778770
58. Chung V, McDonough S, Philip PA, et al. Effect of selumetinib and MK-2206 vs oxaliplatin and fluorouracil in patients with metastatic pancreatic cancer after prior therapy: SWOG S1115 study randomized clinical trial. *JAMA Oncol*. 2017;3(4):516-22. PMID: 27978579
59. Tempero MA, Cardin DB, Biankin A, et al. nab-paclitaxel (nab-P) plus gemcitabine (Gem) vs Gem alone as adjuvant treatment for resected pancreatic cancer (PC) in a phase III trial (APACT). *J Clin Oncol*. 2015;33(15 Suppl):abstract TPS4153. PMID: none
60. Drilon A, Laetsch TW, Kummar S, et al. Efficacy of larotrectinib in TRK fusion-positive cancers in adults and children. *N Engl J Med*. 2018;378(8):731-9. PMID: 29466156
61. Golan T, Hammel P, Reni M, et al. Maintenance olaparib for germline BRCA-mutated metastatic pancreatic cancer. *N Engl J Med*. 2019;381(2):317-27. PMID: 31157963
62. Hammel P, Kindler HL, Reni M, et al. Health-related quality of life in patients with a germline BRCA mutation and metastatic pancreatic cancer receiving maintenance olaparib. *Ann Oncol*. 2019;30(12):1959-68. PMID: 31562758
63. Kindler HL, Hammel P, Reni M, et al. Overall survival results from the POLO trial: a phase III study of active maintenance olaparib versus placebo for germline BRCA-mutated metastatic pancreatic cancer. *J Clin Oncol*. 2022;40(34):3929-39. PMID: 35834777
64. Reiss KA, Mick R, O'Hara MH, et al. Phase II study of maintenance rucaparib in patients with platinum-sensitive advanced pancreatic cancer and a pathogenic germline or somatic variant in BRCA1, BRCA2, or PALB2. *J Clin Oncol*. 2021;39(22):2497-505. PMID: 33970687
65. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med*. 2015;372(26):2509-20. PMID: 26028255
66. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science*. 2017;357(6349):409-13. PMID: 28596308
67. Marabelle A, Le DT, Ascierto PA, et al. Efficacy of pembrolizumab in patients with noncolorectal high microsatellite instability/mismatch repair-deficient cancer: results from the phase II KEYNOTE-158 study. *J Clin Oncol*. 2020;38(1):1-10. PMID: 31682550
68. Demetri GD, Paz-Ares L, Farago AF, et al. Efficacy and safety of entrectinib in patients with NTRK fusion-positive (NTRK-fp) tumors: pooled analysis of STARTRK-2, STARTRK-1 and ALKA-372-001. *Ann Oncol*. 2018;29(Suppl 8):viii713. PMID: none
69. Doebele RC, Drilon A, Paz-Ares L, et al. Entrectinib in patients with advanced or metastatic NTRK fusion-positive solid tumours: integrated analysis of three phase 1-2 trials. *Lancet Oncol*. 2020;21(2):271-82. PMID: 31838007
70. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan in patients with HER2-expressing solid tumors: primary results from the DESTINY-PanTumor02 phase II trial. *J Clin Oncol*. 2024;42(1):47-58. PMID: 37870536
71. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2- expressing solid tumors: DESTINY-PanTumor02 (DP-02) interim results. *J Clin Oncol*. 2023;41(17 Suppl):abstract LBA3000. PMID: none
72. Kalser MH, Ellenberg SS. Pancreatic cancer. Adjuvant combined radiation and chemotherapy following curative resection. *Arch Surg*. 1985;120(8):899-903. PMID: 4015380
73. Hsu CC, Herman JM, Corsini MM, et al. Adjuvant chemoradiation for pancreatic adenocarcinoma: the Johns Hopkins Hospital-Mayo Clinic collaborative study. *Ann Surg Oncol*. 2010;17(4):981-90. PMID: 20087786
74. Smeenk HG, van Eijck CH, Hop WC, et al. Long-term survival and metastatic pattern of pancreatic and periampullary cancer after adjuvant chemoradiation or observation: long-term results of EORTC trial 40891. *Ann Surg*. 2007;246(5):734-40. PMID: 17968163
75. Liao WC, Chien KL, Lin YL, et al. Adjuvant treatments for resected pancreatic adenocarcinoma: a systematic review and network meta-analysis. *Lancet Oncol*. 2013;14(11):1095-103. PMID: 24035532

## Prostate Adenocarcinoma Pathways

### Adjuvant Therapy

- Regional disease (lymph node involvement)
  - Post-Prostatectomy
    - Goserelin (Zoladex)<sup>1-3</sup>
    - Leuprolide (Eligard/Lupron)<sup>1-3</sup>
    - Triptorelin (Trelstar)<sup>1-3</sup>

### First Line of Therapy (1<sup>st</sup> Line), Localized M0 Disease

- Localized favorable intermediate and Localized unfavorable intermediate
  - Primary Treatment with Radiotherapy (RT)
    - Goserelin (Zoladex)\*<sup>1-3</sup>
    - Leuprolide (Eligard/Lupron)\*<sup>1-3</sup>
    - Triptorelin (Trelstar)\*<sup>1-3</sup>
- Localized high risk, Localized very high risk and Regional Disease
  - Primary Treatment with Radiotherapy (RT)
    - Goserelin (Zoladex)<sup>1-3</sup>
    - Goserelin (Zoladex) with abiraterone (Zytiga)<sup>4-7</sup>
    - Leuprolide (Eligard/Lupron)<sup>1-3</sup>
    - Leuprolide (Eligard/Lupron) with abiraterone (Zytiga)<sup>4-7</sup>
    - Triptorelin (Trelstar)<sup>1-3</sup>
    - Triptorelin (Trelstar) with abiraterone (Zytiga)<sup>4-7</sup>

### First Line of Therapy (1<sup>st</sup> line), M1 Disease

- Metastatic/Recurrent, Castration Sensitive Disease
  - Abiraterone (Zytiga) and prednisone with Androgen Deprivation Therapy (ADT)<sup>†‡ 4, 6-10</sup>
  - Abiraterone (Zytiga), docetaxel (Taxotere), and prednisone with ADT<sup>†‡ 11</sup>
  - Apalutamide (Erleada) with ADT<sup>† 12-15</sup>
  - Darolutamide (Nubeqa) and docetaxel (Taxotere) with ADT<sup>† 16</sup>
  - Enzalutamide (Xtandi) with ADT<sup>†‡ 17-21</sup>
- Metastatic/Recurrent, Castration Resistant Disease
  - Abiraterone (Zytiga) and prednisone with ADT<sup>† 7, 22-29</sup>
  - Docetaxel (Taxotere) (every 3 weeks) with ADT<sup>† 30-32</sup>
  - Enzalutamide (Xtandi) with ADT<sup>†‡ 33-39</sup>

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Bilateral orchiectomy (surgical castration) is an equally effective alternative to medical castration

\* May be coadministered with bicalutamide (Casodex) or flutamide (Eulexin) for up to 30-60 days in patients who are at risk of developing symptoms associated with testosterone flare

† ADT pathway options, when given as listed above: goserelin (Zoladex), leuprolide (Eligard/Lupron), triptorelin (Trelstar) or history of bilateral orchiectomy

‡ The use of androgen-signaling-targeted inhibitor (e.g., abiraterone or enzalutamide) should be limited to one line of therapy and should be used in combination with ADT unless not indicated due to bilateral orchiectomy.

## Prostate Adenocarcinoma References

### NCCN Clinical Practice Guidelines: Prostate Cancer. Version 4.2024

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Messing EM, Manola J, Sarosdy M, et al. Immediate hormonal therapy compared with observation after radical prostatectomy and pelvic lymphadenectomy in men with node-positive prostate cancer. *N Engl J Med.* 1999;341(24):1781-8. PMID: 10588962
2. Messing EM, Manola J, Yao J, et al. Immediate versus deferred androgen deprivation treatment in patients with node-positive prostate cancer after radical prostatectomy and pelvic lymphadenectomy. *Lancet Oncol.* 2006;7(6):472-9. PMID: 16750497
3. Wong YN, Freedland S, Egleston B, et al. Role of androgen deprivation therapy for node-positive prostate cancer. *J Clin Oncol.* 2009;27(1):100-5. PMID: 19047295
4. James ND, de Bono JS, Spears MR, et al. Abiraterone for prostate cancer not previously treated with hormone therapy. *N Engl J Med.* 2017;377(4):338-51. PMID: 28578639
5. Rush HL, Murphy L, Morgans AK, et al. Quality of life in men with prostate cancer randomly allocated to receive docetaxel or abiraterone in the STAMPEDE trial. *J Clin Oncol.* 2022;40(8):825-36. PMID: 34757812
6. Sydes MR, Spears MR, Mason MD, et al. Adding abiraterone or docetaxel to long-term hormone therapy for prostate cancer: directly randomised data from the STAMPEDE multi-arm, multi-stage platform protocol. *Ann Oncol.* 2018;29(5):1235-48. PMID: 29529169
7. Szmulewitz RZ, Peer CJ, Ibraheem A, et al. Prospective international randomized phase II study of low-dose abiraterone with food versus standard dose abiraterone in castration-resistant prostate cancer. *J Clin Oncol.* 2018;36(14):1389-95. PMID: 29590007
8. Chi KN, Protheroe A, Rodriguez-Antolin A, et al. Patient-reported outcomes following abiraterone acetate plus prednisone added to androgen deprivation therapy in patients with newly diagnosed metastatic castration-naïve prostate cancer (LATITUDE): an international, randomised phase 3 trial. *Lancet Oncol.* 2018;19(2):194-206. PMID: 29326030
9. Fizazi K, Tran N, Fein L, et al. Abiraterone plus prednisone in metastatic, castration-sensitive prostate cancer. *N Engl J Med.* 2017;377(4):352-60. PMID: 28578607
10. Fizazi K, Tran N, Fein L, et al. Abiraterone acetate plus prednisone in patients with newly diagnosed high-risk metastatic castration-sensitive prostate cancer (LATITUDE): final overall survival analysis of a randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2019;20(5):686-700. PMID: 30987939
11. Fizazi K, Foulon S, Carles J, et al. Abiraterone plus prednisone added to androgen deprivation therapy and docetaxel in de novo metastatic castration-sensitive prostate cancer (PEACE-1): a multicentre, open-label, randomised, phase 3 study with a 2 x 2 factorial design. *Lancet.* 2022;399(10336):1695-707. PMID: 35405058
12. Agarwal N, McQuarrie K, Bjartell A, et al. Health-related quality of life after apalutamide treatment in patients with metastatic castration-sensitive prostate cancer (TITAN): a randomised, placebo-controlled, phase 3 study. *Lancet Oncol.* 2019;20(11):1518-30. PMID: 31578173
13. Chi KN, Agarwal N, Bjartell A, et al. Apalutamide for metastatic, castration-sensitive prostate cancer. *N Engl J Med.* 2019;381(1):13-24. PMID: 31150574
14. Chi KN, Chowdhury S, Bjartell A, et al. Apalutamide in patients with metastatic castration-sensitive prostate cancer: final survival analysis of the randomized, double-blind, phase III TITAN study. *J Clin Oncol.* 2021;39(20):2294-303. PMID: 33914595
15. Chowdhury S, Bjartell A, Agarwal N, et al. Deep, rapid, and durable prostate-specific antigen decline with apalutamide plus androgen deprivation therapy is associated with longer survival and improved clinical outcomes in TITAN patients with metastatic castration-sensitive prostate cancer. *Ann Oncol.* 2023;34(5):477-85. PMID: 36858151
16. Smith MR, Hussain M, Saad F, et al. Darolutamide and survival in metastatic, hormone-sensitive prostate cancer. *N Engl J Med.* 2022;386(12):1132-42. PMID: 35179323
17. Armstrong AJ, Azad AA, Iguchi T, et al. Improved survival with enzalutamide in patients with metastatic hormone-sensitive prostate cancer. *J Clin Oncol.* 2022;40(15):1616-22. PMID: 35420921
18. Armstrong AJ, Szmulewitz RZ, Petrylak DP, et al. ARCHES: a randomized, phase III study of androgen deprivation therapy with enzalutamide or placebo in men with metastatic hormone-sensitive prostate cancer. *J Clin Oncol.* 2019;37(32):2974-86. PMID: 31329516
19. Davis ID, Martin AJ, Stockler MR, et al. Enzalutamide with standard first-line therapy in metastatic prostate cancer. *N Engl J Med.* 2019;381(2):121-31. PMID: 31157964
20. Stockler MR, Martin AJ, Davis ID, et al. Health-related quality of life in metastatic, hormone-sensitive prostate cancer: ENZAMET (ANZUP 1304), an international, randomized phase III trial led by ANZUP. *J Clin Oncol.* 2021;40(8):837-46. PMID: 34928708
21. Sweeney CJ, Martin AJ, Stockler MR, et al. Testosterone suppression plus enzalutamide versus testosterone suppression plus standard antiandrogen therapy for metastatic hormone-sensitive prostate cancer (ENZAMET): an international, open-label, randomised, phase 3 trial. *Lancet Oncol.* 2023;24(4):323-34. PMID: 36990608
22. Basch E, Loblaw DA, Oliver TK, et al. Systemic therapy in men with metastatic castration-resistant prostate cancer: American Society of Clinical Oncology and Cancer Care Ontario clinical practice guideline. *J Clin Oncol.* 2014;32(30):3436-48. PMID: 25199761
23. de Bono JS, Logothetis CJ, Molina A, et al. Abiraterone and increased survival in metastatic prostate cancer. *N Engl J Med.* 2011;364(21):1995-2005. PMID: 21612468
24. Fizazi K, Scher HI, Molina A, et al. Abiraterone acetate for treatment of metastatic castration-resistant prostate cancer: final overall survival analysis of the COU-AA-301 randomised, double-blind, placebo-controlled phase 3 study. *Lancet Oncol.* 2012;13(10):983-92. PMID: 22995653

25. Logothetis CJ, Basch E, Molina A, et al. Effect of abiraterone acetate and prednisone compared with placebo and prednisone on pain control and skeletal-related events in patients with metastatic castration-resistant prostate cancer: exploratory analysis of data from the COU-AA-301 randomised trial. *Lancet Oncol.* 2012;13(12):1210-7. PMID: 23142059
26. Ryan CJ, Smith MR, de Bono JS, et al. Abiraterone in metastatic prostate cancer without previous chemotherapy. *N Engl J Med.* 2013;368(2):138-48. PMID: 23228172
27. Ryan CJ, Smith MR, Fizazi K, et al. Abiraterone acetate plus prednisone versus placebo plus prednisone in chemotherapy-naïve men with metastatic castration-resistant prostate cancer (COU-AA-302): final overall survival analysis of a randomised, double-blind, placebo-controlled phase 3 study. *Lancet Oncol.* 2015;16(2):152-60. PMID: 25601341
28. Smith M, Parker C, Saad F, et al. Addition of radium-223 to abiraterone acetate and prednisone or prednisolone in patients with castration-resistant prostate cancer and bone metastases (ERA 223): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2019;20(3):408-19. PMID: 30738780
29. Sternberg CN, Castellano D, Daugaard G, et al. Abiraterone acetate for patients with metastatic castration-resistant prostate cancer progressing after chemotherapy: final analysis of a multicentre, open-label, early-access protocol trial. *Lancet Oncol.* 2014;15(11):1263-8. PMID: 25242048
30. Berthold DR, Pond GR, Soban F, et al. Docetaxel plus prednisone or mitoxantrone plus prednisone for advanced prostate cancer: updated survival in the TAX 327 study. *J Clin Oncol.* 2008;26(2):242-5. PMID: 18182665
31. Petrylak DP, Tangen CM, Hussain MH, et al. Docetaxel and estramustine compared with mitoxantrone and prednisone for advanced refractory prostate cancer. *N Engl J Med.* 2004;351(15):1513-20. PMID: 15470214
32. Tannock IF, de Wit R, Berry WR, et al. Docetaxel plus prednisone or mitoxantrone plus prednisone for advanced prostate cancer. *N Engl J Med.* 2004;351(15):1502-12. PMID: 15470213
33. Beer TM, Armstrong AJ, Rathkopf D, et al. Enzalutamide in men with chemotherapy-naïve metastatic castration-resistant prostate cancer: extended analysis of the phase 3 PREVAIL study. *Eur Urol.* 2017;71(2):151-4. PMID: 27477525
34. Beer TM, Armstrong AJ, Rathkopf DE, et al. Enzalutamide in metastatic prostate cancer before chemotherapy. *N Engl J Med.* 2014;371(5):424-33. PMID: 24881730
35. Cella D, Ivanescu C, Holmstrom S, et al. Impact of enzalutamide on quality of life in men with metastatic castration-resistant prostate cancer after chemotherapy: additional analyses from the AFFIRM randomized clinical trial. *Ann Oncol.* 2015;26(1):179-85. PMID: 25361992
36. Penson DF, Armstrong AJ, Concepcion R, et al. Enzalutamide versus bicalutamide in castration-resistant prostate cancer: the STRIVE trial. *J Clin Oncol.* 2016;34(18):2098-106. PMID: 26811535
37. Scher HI, Fizazi K, Saad F, et al. Increased survival with enzalutamide in prostate cancer after chemotherapy. *N Engl J Med.* 2012;367(13):1187-97. PMID: 22894553
38. Shore ND, Chowdhury S, Villers A, et al. Efficacy and safety of enzalutamide versus bicalutamide for patients with metastatic prostate cancer (TERRAIN): a randomised, double-blind, phase 2 study. *Lancet Oncol.* 2016;17(2):153-63. PMID: 26774508
39. Sternberg CN, de Bono JS, Chi KN, et al. Improved outcomes in elderly patients with metastatic castration-resistant prostate cancer treated with the androgen receptor inhibitor enzalutamide: results from the phase III AFFIRM trial. *Ann Oncol.* 2014;25(2):429-34. PMID: 24478320
40. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Prostate Cancer (Version 4.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
41. Schellhammer PF, Sharifi R, Block NL, et al. Clinical benefits of bicalutamide compared with flutamide in combined androgen blockade for patients with advanced prostatic carcinoma: final report of a double-blind, randomized, multicenter trial. *J Urology.* 1997;50(3):330-6. PMID: 9301693
42. Lu-Yao GL, Albertsen PC, Moore DF, et al. Fifteen-year survival outcomes following primary androgen-deprivation therapy for localized prostate cancer. *JAMA Intern Med.* 2014;174(9):1460-7. PMID: 25023796
43. Roach M, 3rd, Bae K, Speight J, et al. Short-term neoadjuvant androgen deprivation therapy and external-beam radiotherapy for locally advanced prostate cancer: long-term results of RTOG 8610. *J Clin Oncol.* 2008;26(4):585-91. PMID: 18172188
44. D'Amico AV, Manola J, Loffredo M, et al. 6-month androgen suppression plus radiation therapy vs radiation therapy alone for patients with clinically localized prostate cancer: a randomized controlled trial. *JAMA.* 2004;292(7):821-7. PMID: 15315996
45. Bolla M, Collette L, Blank L, et al. Long-term results with immediate androgen suppression and external irradiation in patients with locally advanced prostate cancer (an EORTC study): a phase III randomised trial. *Lancet.* 2002;360(9327):103-6. PMID: 12126818
46. Sandler HM, Hu C, Rosenthal SA, et al. A phase III protocol of androgen suppression (AS) and 3DCRT/IMRT versus AS and 3DCRT/IMRT followed by chemotherapy (CT) with docetaxel and prednisone for localized, high-risk prostate cancer (RTOG 0521). *J Clin Oncol.* 2015;33(18 suppl):abstract LBA5002. PMID: none
47. Klotz L, Boccon-Gibod L, Shore ND, et al. The efficacy and safety of degarelix: a 12-month, comparative, randomized, open-label, parallel-group phase III study in patients with prostate cancer. *BJU Int.* 2008;102(11):1531-8. PMID: 19035858
48. James ND, Sydes MR, Clarke NW, et al. Addition of docetaxel, zoledronic acid, or both to first-line long-term hormone therapy in prostate cancer (STAMPEDE): survival results from an adaptive, multiarm, multistage, platform randomised controlled trial. *Lancet.* 2016;387(10024):1163-77. PMID: 26719232
49. Sweeney CJ, Chen YH, Carducci M, et al. Chemohormonal therapy in metastatic hormone-sensitive prostate cancer. *N Engl J Med.* 2015;373(8):737-46. PMID: 26244877
50. Small EJ, Halabi S, Dawson NA, et al. Antiandrogen withdrawal alone or in combination with ketoconazole in androgen-independent prostate cancer patients: a phase III trial (CALGB 9583). *J Clin Oncol.* 2004;22(6):1025-33. PMID: 15020604
51. Small EJ, Schellhammer PF, Higano CS, et al. Placebo-controlled phase III trial of immunologic therapy with sipuleucel-T (APC8015) in patients with metastatic, asymptomatic hormone refractory prostate cancer. *J Clin Oncol.* 2006;24(19):3089-94. PMID: 16809734
52. Kantoff PW, Higano CS, Shore ND, et al. Sipuleucel-T immunotherapy for castration-resistant prostate cancer. *N Engl J Med.* 2010;363(5):411-22. PMID: 20818862
53. de Bono JS, Oudard S, Ozguroglu M, et al. Prednisone plus cabazitaxel or mitoxantrone for metastatic castration-resistant prostate cancer progressing after docetaxel treatment: a randomised open-label trial. *Lancet.* 2010;376(9747):1147-54. PMID: 20888992
54. Heck MM, Thalgott M, Retz M, et al. Rational indication for docetaxel rechallenge in metastatic castration-resistant prostate cancer. *BJU Int.* 2012;110(11 Pt B):E635-40. PMID: 22889368
55. Loblaw DA, Virgo KS, Nam R, et al. Initial hormonal management of androgen-sensitive metastatic, recurrent, or progressive prostate cancer: 2006 update of an American Society of Clinical Oncology practice guideline. *J Clin Oncol.* 2007;25(12):1596-605. PMID: 17404365

56. Denham JW, Steigler A, Lamb DS, et al. Short-term neoadjuvant androgen deprivation and radiotherapy for locally advanced prostate cancer: 10-year data from the TROG 96.01 randomised trial. *Lancet Oncol.* 2011;12(5):451-9. PMID: 21440505
57. Shipley WU, Seiferheld W, Lukka HR, et al. Radiation with or without antiandrogen therapy in recurrent prostate cancer. *N Engl J Med.* 2017;376(5):417-28. PMID: 28146658
58. Jones CU, Hunt D, McGowan DG, et al. Radiotherapy and short-term androgen deprivation for localized prostate cancer. *N Engl J Med.* 2011;365(2):107-18. PMID: 21751904
59. Pisansky TM, Hunt D, Gomella LG, et al. Duration of androgen suppression before radiotherapy for localized prostate cancer: Radiation Therapy Oncology Group randomized clinical trial 9910. *J Clin Oncol.* 2015;33(4):332-9. PMID: 25534388
60. Bolla M, Neven A, Maingon P, et al. Short androgen suppression and radiation dose escalation in prostate cancer: 12-year results of EORTC trial 22991 in patients with localized intermediate-risk disease. *J Clin Oncol.* 2021;39(27):3022-33. PMID: 34310202
61. Stein CA, Levin R, Given R, et al. Randomized phase 2 therapeutic equivalence study of abiraterone acetate fine particle formulation vs. originator abiraterone acetate in patients with metastatic castration-resistant prostate cancer: the STAAR study. *Urol.* 2018;36(2):81.e9-e16. PMID: 29150328
62. Fizazi K, Faivre L, Lesaunier F, et al. Androgen deprivation therapy plus docetaxel and estramustine versus androgen deprivation therapy alone for high-risk localised prostate cancer (GETUG 12): a phase 3 randomised controlled trial. *Lancet Oncol.* 2015;16(7):787-94. PMID: 26028518
63. Rosenthal SA, Hu C, Sartor O, et al. Effect of chemotherapy with docetaxel with androgen suppression and radiotherapy for localized high-risk prostate cancer: the randomized phase III NRG Oncology RTOG 0521 trial. *J Clin Oncol.* 2019;37(14):1159-68. PMID: 30860948
64. Horwitz EM, Bae K, Hanks GE, et al. Ten-year follow-up of radiation therapy oncology group protocol 92-02: a phase III trial of the duration of elective androgen deprivation in locally advanced prostate cancer. *J Clin Oncol.* 2008;26(15):2497-504. PMID: 18413638
65. Lawton CAF, Lin X, Hanks GE, et al. Duration of androgen deprivation in locally advanced prostate cancer: long-term update of NRG Oncology RTOG 9202. *Int J Radiat Oncol Biol Phys.* 2017;98(2):296-303. PMID: 28463149
66. Bolla M, de Reijke TM, Van Tienhoven G, et al. Duration of androgen suppression in the treatment of prostate cancer. *N Engl J Med.* 2009;360(24):2516-27. PMID: 19516032
67. Zapatero A, Guerrero A, Maldonado X, et al. Late radiation and cardiovascular adverse effects after androgen deprivation and high-dose radiation therapy in prostate cancer: results from the DART 01/05 randomized phase 3 trial. *Int J Radiat Oncol Biol Phys.* 2016;96(2):341-8. PMID: 27598804
68. Aggarwal R, Heller G, Hillman DW, et al. PRESTO: a phase III, open-label study of intensification of androgen blockade in patients with high-risk biochemically relapsed castration-sensitive prostate cancer (AFT-19). *J Clin Oncol.* 2024;42(10):1114-23. PMID: 38261983
69. Sweeney C, Chen YH, Carducci MA, et al. Impact on overall survival (OS) with chemohormonal therapy versus hormonal therapy for hormone-sensitive newly metastatic prostate cancer (MPRCA): an ECOG-led phase III randomized trial. *J Clin Oncol.* 2014;32(18 Suppl):abstract LBA2. PMID: none
70. Kyriakopoulos CE, Chen YH, Carducci MA, et al. Chemohormonal therapy in metastatic hormone-sensitive prostate cancer: long-term survival analysis of the randomized phase III E3805 CHARTED trial. *J Clin Oncol.* 2018;36(11):1080-7. PMID: 29384722
71. Morgans AK, Chen YH, Sweeney CJ, et al. Quality of life during treatment with chemohormonal therapy: analysis of E3805 chemohormonal androgen ablation randomized trial in prostate cancer *J Clin Oncol.* 2018;36(11):1088-95. PMID: 29522362
72. Gravis G, Boher JM, Joly F, et al. Androgen deprivation therapy (ADT) plus docetaxel versus ADT alone in metastatic non castrate prostate cancer: impact of metastatic burden and long-term survival analysis of the randomized phase 3 GETUG-AFU15 trial. *Eur Urol.* 2016;70(2):256-62. PMID: 26610858
73. Zengerling F, Jakob JJ, Schmidt S, et al. Degarelix for treating advanced hormone-sensitive prostate cancer. *Cochrane Database Syst Rev.* 2021(8):article no. CD012548. PMID: 34350976
74. Shore ND, Saad F, Cookson MS, et al. Oral relugolix for androgen-deprivation therapy in advanced prostate cancer. *N Engl J Med.* 2020;382(23):2187-96. PMID: 32469183
75. Spratt DE, George DJ, Shore ND, et al. Efficacy and safety of radiotherapy plus relugolix in men with localized or advanced prostate cancer. *JAMA Oncol.* 2024;10(5):594-602. PMID: 38451492
76. Gu W, Han W, Luo H, et al. Rezvutamide versus bicalutamide in combination with androgen-deprivation therapy in patients with high-volume, metastatic, hormone-sensitive prostate cancer (CHART): a randomised, open-label, phase 3 trial. *Lancet Oncol.* 2022;23(10):1249-60. PMID: 36075260
77. Saad F, Efstathiou E, Attard G, et al. Apalutamide plus abiraterone acetate and prednisone versus placebo plus abiraterone and prednisone in metastatic, castration-resistant prostate cancer (ACIS): a randomised, placebo-controlled, double-blind, multinational, phase 3 study. *Lancet Oncol.* 2021;22(11):1541-59. PMID: 34600602
78. Sartor AO, Tangen CM, Hussain MH, et al. Antiandrogen withdrawal in castrate-refractory prostate cancer: a Southwest Oncology Group trial (SWOG 9426). *Cancer.* 2008;112(11):2393-400. PMID: 18383517
79. Dupont A, Gomez JL, Cusan L, et al. Response to flutamide withdrawal in advanced prostate cancer in progression under combination therapy. *J Urol.* 1993;150(3):908-13. PMID: 7688437
80. Sweeney C, Bracarda S, Sternberg CN, et al. Ipatasertib plus abiraterone and prednisolone in metastatic castration-resistant prostate cancer (IPATential150): a multicentre, randomised, double-blind, phase 3 trial. *Lancet.* 2021;398(10295):131-42. PMID: 34246347
81. Parker CC, Coleman RE, Sartor O, et al. Three-year safety of radium-223 dichloride in patients with castration-resistant prostate cancer and symptomatic bone metastases from phase 3 randomized Alpharadin in Symptomatic Prostate Cancer trial. *Eur Urol.* 2018;73(3):427-35. PMID: 28705540
82. Hoskin P, Sartor O, O'Sullivan JM, et al. Efficacy and safety of radium-223 dichloride in patients with castration-resistant prostate cancer and symptomatic bone metastases, with or without previous docetaxel use: a prespecified subgroup analysis from the randomised, double-blind, phase 3 ALSYMPCA trial. *Lancet Oncol.* 2014;15(12):1397-406. PMID: 25439694
83. Sartor O, Coleman R, Nilsson S, et al. Effect of radium-223 dichloride on symptomatic skeletal events in patients with castration-resistant prostate cancer and bone metastases: results from a phase 3, double-blind, randomised trial. *Lancet Oncol.* 2014;15(7):738-46. PMID: 24836273
84. Nilsson S, Cislo P, Sartor O, et al. Patient-reported quality-of-life analysis of radium-223 dichloride from the phase III ALSYMPCA study. *Ann Oncol.* 2016;27(5):868-74. PMID: 26912557
85. Chi KN, Rathkopf D, Smith MR, et al. Niraparib and abiraterone acetate for metastatic castration-resistant prostate cancer. *J Clin Oncol.* 2023;41 (18):3339-51. PMID: 36952634

86. Chi KN, Sandhu S, Smith MR, et al. Niraparib plus abiraterone acetate with prednisone in patients with metastatic castration-resistant prostate cancer and homologous recombination repair gene alterations: second interim analysis of the randomized phase III MAGNITUDE trial. *Ann Oncol.* 2023;14(9):772-82. PMID: 37399894
87. Clarke NW, Armstrong AJ, Thiery-Vuillemin A, et al. Abiraterone and olaparib for metastatic castration-resistant prostate cancer. *NEJM Evid.* 2022;1(9):EVIDoaa2200043. PMID: 38319800
88. Fallah J, Xu J, Weinstock C, et al. FDA approval summary: olaparib in combination with abiraterone for treatment of patients with BRCA-mutated metastatic castration-resistant prostate cancer. *J Clin Oncol.* 2024;42(5):605-13. PMID: 38127780
89. Saad F, Clarke NW, Oya M, et al. Olaparib plus abiraterone versus placebo plus abiraterone in metastatic castration-resistant prostate cancer (PROpel): final prespecified overall survival results of a randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2023;24(10):1094-108. PMID: 37714168
90. Heiss BL, Chang E, Gao X, et al. US Food and Drug Administration approval summary: talazoparib in combination with enzalutamide for treatment of patients with homologous recombination repair gene-mutated metastatic castration-resistant prostate cancer. *J Clin Oncol.* 2024;42(15):1851-60. PMID: 38452327
91. Agarwal N, Azad AA, Carles J, et al. Talazoparib plus enzalutamide in men with first-line metastatic castration-resistant prostate cancer (TALAPRO-2): a randomised, placebo-controlled, phase 3 trial. *Lancet.* 2023;402(10398):291-303. PMID: 37285865
92. de Wit R, de Bono J, Sternberg CN, et al. Cabazitaxel versus abiraterone or enzalutamide in metastatic prostate cancer. *N Engl J Med.* 2019;381(26):2506-18. PMID: 31566937
93. Romero-Laorden N, Lozano R, Jayaram A, et al. Phase II pilot study of the prednisone to dexamethasone switch in metastatic castration-resistant prostate cancer (mCRPC) patients with limited progression on abiraterone plus prednisone (SWITCH study). *British Journal of Cancer.* 2018;119(9):1052-9. PMID: 30131546
94. Eisenberger M, Hardy-Bessard AC, Kim CS, et al. Phase III study comparing a reduced dose of cabazitaxel (20 mg/m<sup>2</sup>) and the currently approved dose (25 mg/m<sup>2</sup>) in postdocetaxel patients with metastatic castration-resistant prostate cancer-PROSELICA. *J Clin Oncol.* 2017;35(28):3198-206. PMID: 28809610
95. Fizazi K, Kramer G, Eymard JC, et al. Quality of life in patients with metastatic prostate cancer following treatment with cabazitaxel versus abiraterone or enzalutamide (CARD): an analysis of a randomised, multicentre, open-label, phase 4 study. *Lancet Oncol.* 2020;21(11):1513-25. PMID: 32926841
96. Fuxius S, Mueller A, Kleitz K, et al. Weekly docetaxel rechallenge in patients with hormone-resistant prostate cancer refractory to conventionally three weekly docetaxel. *J Clin Oncol.* 2010;28(15 Suppl):abstract e15004. PMID: none
97. Merseburger AS, Attard G, Astrom L, et al. Continuous enzalutamide after progression of metastatic castration-resistant prostate cancer treated with docetaxel (PRESIDE): an international, randomised, phase 3b study. *Lancet Oncol.* 2022;23(11):1398-408. PMID: 36265504
98. Ott PA, Bang YJ, Berton-Rigaud D, et al. Safety and antitumor activity of pembrolizumab in advanced programmed death ligand 1-positive endometrial cancer: results from the KEYNOTE-028 Study. *J Clin Oncol.* 2017;35(22):2535-41. PMID: 28489510
99. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255
100. Graff JN, Alumkal JJ, Drake CG, et al. Early evidence of anti-PD-1 activity in enzalutamide-resistant prostate cancer. *Oncotarget.* 2016;7(33):52810-7. PMID: 27429197
101. de Bono J, Mateo J, Fizazi K, et al. Olaparib for metastatic castration-resistant prostate cancer. *N Engl J Med.* 2020;382(22):2091-102. PMID: 32343890
102. Hussain M, Mateo J, Fizazi K, et al. Survival with olaparib in metastatic castration-resistant prostate cancer. *N Engl J Med.* 2020;383(24):2345-57. PMID: 32955174
103. Thiery-Vuillemin A, de Bono J, Hussain M, et al. Pain and health-related quality of life with olaparib versus physician's choice of next-generation hormonal drug in patients with metastatic castration-resistant prostate cancer with homologous recombination repair gene alterations (PROfound): an open-label, randomised, phase 3 trial. *Lancet Oncol.* 2022;23(3):393-405. PMID: 35157830
104. Abida W, Campbell D, Patnaik A, et al. Preliminary results from the TRITON2 study of rucaparib in patients (pts) with DNA damage repair (DDR)-deficient metastatic castration-resistant prostate cancer (mCRPC): updated analyses. *Ann Oncol.* 2019;30 (Suppl 5):v327-v8. PMID: none
105. Abida W, Campbell D, Patnaik A, et al. Non-BRCA DNA damage repair gene alterations and response to the PARP inhibitor rucaparib in metastatic castration-resistant prostate cancer: analysis from the phase II TRITON2 study. *Clin Cancer Res.* 2020;26(11):2487-96. PMID: 32086346
106. Fizazi K, Piulats JM, Reaume MN, et al. Rucaparib or physician's choice in metastatic prostate cancer. *N Engl J Med.* 2023;388(8):719-32. PMID: 36795891
107. Corn PG, Heath EI, Zurita A, et al. Cabazitaxel plus carboplatin for the treatment of men with metastatic castration-resistant prostate cancers: a randomised, open-label, phase 1-2 trial. *Lancet Oncol.* 2019;20(10):1432-43. PMID: 31515154
108. Fizazi K, Shore N, Tammela TL, et al. Darolutamide in nonmetastatic, castration-resistant prostate cancer. *N Engl J Med.* 2019;380(13):1235-46. PMID: 30763142
109. Fizazi K, Shore N, Tammela TL, et al. Nonmetastatic, castration-resistant prostate cancer and survival with darolutamide. *N Engl J Med.* 2020;383(11):1040-9. PMID: 32905676
110. Hussain M, Fizazi K, Saad F, et al. Enzalutamide in men with nonmetastatic, castration-resistant prostate cancer. *N Engl J Med.* 2018;378(26):2465-74. PMID: 29949494
111. Tombal B, Saad F, Penson D, et al. Patient-reported outcomes following enzalutamide or placebo in men with non-metastatic, castration-resistant prostate cancer (PROSPER): a multicentre, randomised, double-blind, phase 3 trial. *Lancet Oncol.* 2019;20(4):556-69. PMID: 30770294
112. Smith MR, Saad F, Chowdhury S, et al. Apalutamide treatment and metastasis-free survival in prostate cancer. *N Engl J Med.* 2018;378(15):1408-18. PMID: 29420164
113. Saad F, Celli D, Basch E, et al. Effect of apalutamide on health-related quality of life in patients with non-metastatic castration-resistant prostate cancer: an analysis of the SPARTAN randomised, placebo-controlled, phase 3 trial. *Lancet Oncol.* 2018;19(10):1404-16. PMID: 30213449
114. Small EJ, Saad F, Chowdhury S, et al. Apalutamide and overall survival in non-metastatic castration-resistant prostate cancer. *Ann Oncol.* 2019;30(11):1813-20. PMID: 31560066
115. Freedland SJ, de Almeida Luz M, De Giorgi U, et al. Improved outcomes with enzalutamide in biochemically recurrent prostate cancer. *N Engl J Med.* 2023;389(16):1453-65. PMID: 37851874

116. Freedland SJ, Gleave M, De Giorgi U, et al. Enzalutamide and quality of life in biochemical recurrence prostate cancer. NEJM Evid. 2023;2(12):EVIDoa2300251. PMID: 38320501
117. Shamash J, Powles T, Sarker SJ, et al. A multi-centre randomised phase III trial of dexamethasone vs dexamethasone and diethylstilbestrol in castration-resistant prostate cancer: immediate vs deferred diethylstilbestrol. British Journal of Cancer. 2011;104(4):620-8. PMID: 21285990
118. Oudard S, Fizazi K, Sengelov L, et al. Cabazitaxel versus docetaxel as first-line therapy for patients with metastatic castration-resistant prostate cancer: a randomized phase III trial-FIRSTANA. J Clin Oncol. 2017;35(28):3189-97. PMID: 28753384

## Testicular Cancer (Germ Cell Tumors) Pathways

### Primary Therapy

- Stages II-IIIA and IS
  - Seminoma and Non-Seminoma
    - **BEP:** bleomycin, etoposide, and cisplatin<sup>1-4</sup>
    - **EP:** etoposide and cisplatin<sup>\*5</sup>
- Stages IIIB and IIIC
  - **Seminoma** with Good and Intermediate Risk†
    - **BEP:** bleomycin, etoposide, and cisplatin<sup>3</sup>
  - **Seminoma** with Good Risk
    - **EP:** etoposide and cisplatin<sup>5</sup>
  - Non-Seminoma
    - **BEP:** bleomycin, etoposide, and cisplatin<sup>1-4</sup>

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\* EP given for 4 cycles

† BEP is typically given for 3 cycles in good risk seminoma, and 4 cycles in intermediate risk

## Testicular Cancer (Germ Cell Tumors) References

### NCCN Practice Guidelines: Testicular Cancer 2.2024

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Albers P, Siener R, Krege S, et al. Randomized phase III trial comparing retroperitoneal lymph node dissection with one course of bleomycin and etoposide plus cisplatin chemotherapy in the adjuvant treatment of clinical stage I Nonseminomatous testicular germ cell tumors: AUO trial AH 01/94 by the German Testicular Cancer Study Group. *J Clin Oncol.* 2008;26(18):2966-72. PMID: 18458040
2. Culine S, Kramar A, Theodore C, et al. Randomized trial comparing bleomycin/etoposide/cisplatin with alternating cisplatin/cyclophosphamide/doxorubicin and vinblastine/bleomycin regimens of chemotherapy for patients with intermediate- and poor-risk metastatic nonseminomatous germ cell tumors: Genito-Urinary Group of the French Federation of Cancer Centers Trial T93MP. *J Clin Oncol.* 2008;26(3):421-7. PMID: 18202419
3. Saxman SB, Finch D, Gonin R, et al. Long-term follow-up of a phase III study of three versus four cycles of bleomycin, etoposide, and cisplatin in favorable-prognosis germ-cell tumors: the Indian University experience. *J Clin Oncol.* 1998;16(2):702-6. PMID: 9469360
4. Tandstad T, Dahl O, Cohn-Cedermark G, et al. Risk-adapted treatment in clinical stage I nonseminomatous germ cell testicular cancer: the SWENOTECA management program. *J Clin Oncol.* 2009;27(13):2122-8. PMID: 19307506
5. Xiao H, Mazumdar M, Bajorin DF, et al. Long-term follow-up of patients with good-risk germ cell tumors treated with etoposide and cisplatin. *J Clin Oncol.* 1997;15(7):2553-8. PMID: 9215824
6. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Testicular Cancer (Version 2.2024). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2024.
7. Oliver RT, Mead GM, Rustin GJ, et al. Randomized trial of carboplatin versus radiotherapy for stage I seminoma: mature results on relapse and contralateral testis cancer rates in MRC TE19/EORTC 30982 study (ISRCTN27163214). *J Clin Oncol.* 2011;29(8):957-62. PMID: 21282539
8. Feldman DR, Sheinfeld J, Bajorin DF, et al. TI-CE high-dose chemotherapy for patients with previously treated germ cell tumors: results and prognostic factor analysis. *J Clin Oncol.* 2010;28(10):1706-13. PMID: 20194867
9. Nichols CR, Catalano PJ, Crawford ED, et al. Randomized comparison of cisplatin and etoposide and either bleomycin or ifosfamide in treatment of advanced disseminated germ cell tumors: an Eastern Cooperative Oncology Group, Southwest Oncology Group, and Cancer and Leukemia Group B Study. *J Clin Oncol.* 1998;16(4):1287-93. PMID: 9552027
10. Kondagunta GV, Sheinfeld J, Mazumdar M, et al. Relapse-free and overall survival in patients with pathologic stage II nonseminomatous germ cell cancer treated with etoposide and cisplatin adjuvant chemotherapy. *J Clin Oncol.* 2004;22(3):464-7. PMID: 14752068
11. Motzer RJ, Sheinfeld J, Mazumdar M, et al. Etoposide and cisplatin adjuvant therapy for patients with pathologic stage II germ cell tumors. *J Clin Oncol.* 1995;13(11):2700-4. PMID: 7595727
12. Einhorn LH, Williams SD, Chamness A, et al. High-dose chemotherapy and stem-cell rescue for metastatic germ-cell tumors. *N Engl J Med.* 2007;357(4):340-8. PMID: 17652649
13. Kondagunta GV, Bacik J, Sheinfeld J, et al. Paclitaxel plus Ifosfamide followed by high-dose carboplatin plus etoposide in previously treated germ cell tumors. *J Clin Oncol.* 2007;25(1):85-90. PMID: 17194908
14. Motzer RJ, Mazumdar M, Sheinfeld J, et al. Sequential dose-intensive paclitaxel, ifosfamide, carboplatin, and etoposide salvage therapy for germ cell tumor patients. *J Clin Oncol.* 2000;18(6):1173-80. PMID: 10715285
15. Kondagunta GV, Bacik J, Donadio A, et al. Combination of paclitaxel, ifosfamide, and cisplatin is an effective second-line therapy for patients with relapsed testicular germ cell tumors. *J Clin Oncol.* 2005;23(27):6549-55. PMID: 16170162
16. Loehrer PJ, Sr., Lauer R, Roth BJ, et al. Salvage therapy in recurrent germ cell cancer: ifosfamide and cisplatin plus either vinblastine or etoposide. *Ann Intern Med.* 1988;109(7):540-6. PMID: 2844110
17. Einhorn LH, Brames MJ, Julian B, et al. Phase II study of paclitaxel plus gemcitabine salvage chemotherapy for germ cell tumors after progression following high-dose chemotherapy with tandem transplant. *J Clin Oncol.* 2007;25(5):513-6. PMID: 17290059
18. Mulherin BP, Brames MJ, Einhorn LH. Long-term survival with paclitaxel and gemcitabine for germ cell tumors after progression following high-dose chemotherapy with tandem transplant. *Am J Clin Oncol.* 2015;38(4):373-6. PMID: 26214082
19. Hinton S, Catalano P, Einhorn LH, et al. Phase II study of paclitaxel plus gemcitabine in refractory germ cell tumors (E9897): a trial of the Eastern Cooperative Oncology Group. *J Clin Oncol.* 2002;20(7):1859-63. PMID: 11919245
20. Kollmannsberger C, Beyer J, Liersch R, et al. Combination chemotherapy with gemcitabine plus oxaliplatin in patients with intensively pretreated or refractory germ cell cancer: a study of the German Testicular Cancer Study Group. *J Clin Oncol.* 2004;22(1):108-14. PMID: 14701772
21. De Giorgi U, Rosti G, Aieta M, et al. Phase II study of oxaliplatin and gemcitabine salvage chemotherapy in patients with cisplatin-refractory nonseminomatous germ cell tumor. *Eur Urol.* 2006;50(5):1032-8; discussion 8-9. PMID: 16757095
22. Pectasides D, Pectasides M, Farmakis D, et al. Gemcitabine and oxaliplatin (GEMOX) in patients with cisplatin-refractory germ cell tumors: a phase II study. *Ann Oncol.* 2004;15(3):493-7. PMID: 14998855

23. Bokemeyer C, Oechsle K, Honecker F, et al. Combination chemotherapy with gemcitabine, oxaliplatin, and paclitaxel in patients with cisplatin-refractory or multiply relapsed germ-cell tumors: a study of the German Testicular Cancer Study Group. *Ann Oncol.* 2008;19(3):448-53. PMID: 18006893
24. Miller JC, Einhorn LH. Phase II study of daily oral etoposide in refractory germ cell tumors. *Semin Oncol.* 1990;17(1 Suppl 2):36-9. PMID: 2154858
25. Oliver RT, Mason MD, Mead GM, et al. Radiotherapy versus single-dose carboplatin in adjuvant treatment of stage I seminoma: a randomised trial. *Lancet.* 2005;366(9482):293-300. PMID: 16039331
26. Tandstad T, Stahl O, Dahl O, et al. Treatment of stage I seminoma, with one course of adjuvant carboplatin or surveillance, risk-adapted recommendations implementing patient autonomy: a report from the Swedish and Norwegian Testicular Cancer Group (SWENOTECA). *Ann Oncol.* 2016;27(7):1299-304. PMID: 27052649
27. Aparicio J, Maroto P, del Muro XG, et al. Risk-adapted treatment in clinical stage I testicular seminoma: the third Spanish Germ Cell Cancer Group study. *J Clin Oncol.* 2011;29(35):4677-81. PMID: 22042940
28. Fizazi K, Delva R, Caty A, et al. A risk-adapted study of cisplatin and etoposide, with or without ifosfamide, in patients with metastatic seminoma: results of the GETUG S99 multicenter prospective study. *Eur Urol.* 2014;65(2):381-6. PMID: 24094847
29. Hinton S, Catalano PJ, Einhorn LH, et al. Cisplatin, etoposide and either bleomycin or ifosfamide in the treatment of disseminated germ cell tumors: final analysis of an intergroup trial. *Cancer.* 2003;97(8):1869-75. PMID: 12673712
30. Fizazi K, Pagliaro L, Laplanche A, et al. Personalised chemotherapy based on tumour marker decline in poor prognosis germ-cell tumours (GETUG 13): a phase 3, multicentre, randomised trial. *Lancet Oncol.* 2014;15(13):1442-50. PMID: 25456363
31. Fizazi K, Le Teuff G, Flechon A, et al. Personalized chemotherapy on the basis of tumor marker decline in poor-prognosis germ-cell tumors: updated analysis of the GETUG-13 phase III trial. *J Clin Oncol.* 2024;42(28):3270-6. PMID: 39167741
32. Behnia M, Foster R, Einhorn LH, et al. Adjuvant bleomycin, etoposide and cisplatin in pathological stage II non-seminomatous testicular cancer. the Indiana University experience. *Eur J Cancer.* 2000;36(4):472-5. PMID: 10717522
33. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255
34. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science.* 2017;357(6349):409-13. PMID: 28596308
35. Marabelle A, Fakih M, Lopez J, et al. Association of tumour mutational burden with outcomes in patients with advanced solid tumours treated with pembrolizumab: prospective biomarker analysis of the multicohort, open-label, phase 2 KEYNOTE-158 study. *Lancet Oncol.* 2020;21(10):1353-65. PMID: 32919526
36. Lala M, Li TR, de Alwis DP, et al. A six-weekly dosing schedule for pembrolizumab in patients with cancer based on evaluation using modelling and simulation. *Eur J Cancer.* 2020;131:68-75. PMID: 32305010

## Uterine Cancer (Epithelial Carcinoma) Pathways

### Adjuvant or Primary Therapy

- Stages III-IVA
  - Carboplatin, paclitaxel, and dostarlimab-gxly (Jemperli)<sup>1</sup>
  - Carboplatin, paclitaxel, and pembrolizumab<sup>2</sup>

### First Line of Therapy (1<sup>st</sup> Line)

- Stages IVB and Recurrent
  - Carboplatin, paclitaxel, and dostarlimab-gxly (Jemperli)<sup>1</sup>
  - Carboplatin, paclitaxel, and pembrolizumab<sup>2</sup>

## Uterine Cancer (Epithelial Carcinoma) References

### NCCN Practice Guidelines: Uterine Neoplasms Version 2.2025.

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These Guidelines are a work in progress that may be refined as often as new significant data becomes available.

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1. Mirza MR, Chase DM, Slomovitz BM, et al. Dostarlimab for primary advanced or recurrent endometrial cancer. *N Engl J Med.* 2023;388(23):2145-58. PMID: 36972026
2. Eskander RN, Sill MW, Beffa L, et al. Pembrolizumab plus chemotherapy in advanced endometrial cancer. *N Engl J Med.* 2023;388(23):2159-70. PMID: 36972022
3. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Uterine Neoplasms (Version 2.2025). Available at <http://www.nccn.org>. ©National Comprehensive Cancer Network, 2025.
4. Miller D, Filiaci V, Fleming G, et al. Randomized phase III noninferiority trial of first line chemotherapy for metastatic or recurrent endometrial carcinoma: a gynecologic oncology group study. *Gynecol Oncol.* 2012;125 (3):771. PMID: none
5. Hidaka T, Nakamura T, Shima T, et al. Paclitaxel/carboplatin versus cyclophosphamide/adriamycin/cisplatin as postoperative adjuvant chemotherapy for advanced endometrial adenocarcinoma. *J Obstet Gynaecol Res.* 2006;32(3):330-7. PMID: 16764625
6. Homesley HD, Filiaci V, Gibbons SK, et al. A randomized phase III trial in advanced endometrial carcinoma of surgery and volume directed radiation followed by cisplatin and doxorubicin with or without paclitaxel: a Gynecologic Oncology Group study. *Gynecol Oncol.* 2009;112(3):543-52. PMID: 19108877
7. Randall ME, Filiaci VL, Muss H, et al. Randomized phase III trial of whole-abdominal irradiation versus doxorubicin and cisplatin chemotherapy in advanced endometrial carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 2006;24(1):36-44. PMID: 16330675
8. Fleming GF, Brunetto VL, Celli D, et al. Phase III trial of doxorubicin plus cisplatin with or without paclitaxel plus filgrastim in advanced endometrial carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 2004;22(11):2159-66. PMID: 15169803
9. Secord AA, Havrilesky LJ, Carney ME, et al. Weekly low-dose paclitaxel and carboplatin in the treatment of advanced or recurrent cervical and endometrial cancer. *Int J Clin Oncol.* 2007;12(1):31-6. PMID: 17380438
10. Pectasides D, Xiros N, Papaxoinis G, et al. Carboplatin and paclitaxel in advanced or metastatic endometrial cancer. *Gynecol Oncol.* 2008;109(2):250-4. PMID: 18299146
11. Aghajanian C, Sill MW, Darcy KM, et al. Phase II trial of bevacizumab in recurrent or persistent endometrial cancer: a Gynecologic Oncology Group study. *J Clin Oncol.* 2011;29(16):2259-65. PMID: 21537039
12. van Wijk FH, Lhomme C, Bolis G, et al. Phase II study of carboplatin in patients with advanced or recurrent endometrial carcinoma. a trial of the EORTC Gynaecological Cancer Group. *Eur J Cancer.* 2003;39(1):78-85. PMID: 12504662
13. Nomura H, Aoki D, Takahashi F, et al. Randomized phase II study comparing docetaxel plus cisplatin, docetaxel plus carboplatin, and paclitaxel plus carboplatin in patients with advanced or recurrent endometrial carcinoma: a Japanese Gynecologic Oncology Group study (JGOG2041). *Ann Oncol.* 2011;22(3):636-42. PMID: 20696677
14. Seski JC, Edwards CL, Herson J, et al. Cisplatin chemotherapy for disseminated endometrial cancer. *Obstet Gynecol.* 1982;59(2):225-8. PMID: 7043339
15. Homesley HD, Filiaci V, Markman M, et al. Phase III trial of ifosfamide with or without paclitaxel in advanced uterine carcinosarcoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 2007;25(5):526-31. PMID: 17290061
16. Katsumata N, Noda K, Nozawa S, et al. Phase II trial of docetaxel in advanced or metastatic endometrial cancer: a Japanese Cooperative study. *British Journal of Cancer.* 2005;93(9):999-1004. PMID: 16234823
17. Thigpen JT, Blessing JA, DiSaia PJ, et al. A randomized comparison of doxorubicin alone versus doxorubicin plus cyclophosphamide in the management of advanced or recurrent endometrial carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 1994;12(7):1408-14. PMID: 8021731
18. Rose PG, Brunetto VL, VanLe L, et al. A phase II trial of anastrozole in advanced recurrent or persistent endometrial carcinoma: a Gynecologic Oncology Group study. *Gynecol Oncol.* 2000;78(2):212-6. PMID: 10926805
19. Coombes RC, Hall E, Gibson LJ, et al. A randomized trial of exemestane after two to three years of tamoxifen therapy in postmenopausal women with primary breast cancer. *N Engl J Med.* 2004;350(11):1081-92. PMID: 15014181
20. Thigpen JT, Brady MF, Alvarez RD, et al. Oral medroxyprogesterone acetate in the treatment of advanced or recurrent endometrial carcinoma: a dose-response study by the Gynecologic Oncology Group. *J Clin Oncol.* 1999;17(6):1736-44. PMID: 10561210
21. Lentz SS, Brady MF, Major FJ, et al. High-dose megestrol acetate in advanced or recurrent endometrial carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 1996;14(2):357-61. PMID: 8636744
22. Thigpen T, Brady MF, Homesley HD, et al. Tamoxifen in the treatment of advanced or recurrent endometrial carcinoma: a Gynecologic Oncology Group study. *J Clin Oncol.* 2001;19(2):364-7. PMID: 11208827

23. Lissoni A, Zanetta G, Losa G, et al. Phase II study of paclitaxel as salvage treatment in advanced endometrial cancer. *Ann Oncol.* 1996;7(8):861-3. PMID: 8922203
24. Oza AM, Elit L, Tsao MS, et al. Phase II study of temsirolimus in women with recurrent or metastatic endometrial cancer: a trial of the NCIC Clinical Trials group. *J Clin Oncol.* 2011;29(24):3278-85. PMID: 21788564
25. Wadler S, Levy DE, Lincoln ST, et al. Topotecan is an active agent in the first-line treatment of metastatic or recurrent endometrial carcinoma: Eastern Cooperative Oncology Group study E3E93. *J Clin Oncol.* 2003;21(11):2110-4. PMID: 12775736
26. Van Gorp T, Cibula D, Lv W, et al. ENGOT-en11/GOG-3053/KEYNOTE-B21: a randomised, double-blind, phase 3 study of pembrolizumab or placebo plus adjuvant chemotherapy with or without radiotherapy in patients with newly diagnosed, high-risk endometrial cancer. *Ann Oncol.* 2024;35(11):968-80. PMID: 39284383
27. Slomovitz BM, Cibula D, Lv W, et al. Pembrolizumab or placebo plus adjuvant chemotherapy with or without radiotherapy for newly diagnosed, high-risk endometrial cancer: results in mismatch repair-deficient tumors. *J Clin Oncol.* 2025;43(3):251-9. PMID: 39411812
28. Miller DS, Filiaci VL, Mannel RS, et al. Carboplatin and paclitaxel for advanced endometrial cancer: final overall survival and adverse event analysis of a phase III trial (NRG Oncology/GOG0209). *J Clin Oncol.* 2020;38(33):3841-50. PMID: 33078978
29. Nomura H, Aoki D, Michimae H, et al. Effect of taxane plus platinum regimens vs doxorubicin plus cisplatin as adjuvant chemotherapy for endometrial cancer at a high risk of progression: a randomized clinical trial. *JAMA Oncol.* 2019;5(6):833-40. PMID: 30896757
30. Wolfson AH, Brady MF, Rcereto T, et al. A gynecologic oncology group randomized phase III trial of whole abdominal irradiation (WAI) vs. cisplatin-ifosfamide and mesna (CIM) as post-surgical therapy in stage I-IV carcinosarcoma (CS) of the uterus. *Gynecol Oncol.* 2007;107(2):177-85. PMID: 17822748
31. Cella D, Huang H, Homesley HD, et al. Patient-reported peripheral neuropathy of doxorubicin and cisplatin with and without paclitaxel in the treatment of advanced endometrial cancer: results from GOG 184. *Gynecol Oncol.* 2010;119(3):538-42. PMID: 20863554
32. Powell MA, Bjorge L, Willmott L, et al. Overall survival in patients with endometrial cancer treated with dostarlimab plus carboplatin-paclitaxel in the randomized ENGOT-EN6/GOG-3031/RUBY trial. *Ann Oncol.* 2024;35(8):728-38. PMID: 38866180
33. Bogani G, Monk BJ, Powell MA, et al. Adding immunotherapy to first-line treatment of advanced and metastatic endometrial cancer. *Ann Oncol.* 2024;35(5):414-28. PMID: 38431043
34. Sovak MA, Dupont J, Hensley ML, et al. Paclitaxel and carboplatin in the treatment of advanced or recurrent endometrial cancer: a large retrospective study. *Int J Gynecol Cancer.* 2007;17(1):197-203. PMID: 17291253
35. Fader AN, Roque DM, Siegel E, et al. Randomized phase II trial of carboplatin-paclitaxel versus carboplatin-paclitaxel-trastuzumab in uterine serous carcinomas that overexpress human epidermal growth factor receptor 2/neu. *J Clin Oncol.* 2018;36(20):2044-51. PMID: 29584549
36. Lorusso D, Ferrandina G, Colombo N, et al. Carboplatin-paclitaxel compared to carboplatin-paclitaxel-bevacizumab in advanced or recurrent endometrial cancer: MITO END-2 - a randomized phase II trial. *Gynecol Oncol.* 2019;155(3):406-12. PMID: 31677820
37. Aghajanian C, Filiaci V, Dizon DS, et al. A phase II study of frontline paclitaxel/carboplatin/bevacizumab, paclitaxel/carboplatin/temsirolimus, or ixabepilone/carboplatin/bevacizumab in advanced/recurrent endometrial cancer. *Gynecol Oncol.* 2018;150(2):274-81. PMID: 29804638
38. Rose PG, Ali S, Moslemi-Kebria M, et al. Paclitaxel, carboplatin, and bevacizumab in advanced and recurrent endometrial carcinoma. *Int J Gynecol Cancer.* 2017;27(3):452-8. PMID: 28187088
39. Sutton G, Brunetto VL, Kilgore L, et al. A phase III trial of ifosfamide with or without cisplatin in carcinosarcoma of the uterus: a Gynecologic Oncology Group study. *Gynecol Oncol.* 2000;79(2):147-53. PMID: 11063636
40. Slomovitz BM, Jiang Y, Yates MS, et al. Phase II study of everolimus and letrozole in patients with recurrent endometrial carcinoma. *J Clin Oncol.* 2015;33(8):930-6. PMID: 25624430
41. Altman AD, Thompson J, Nelson G, et al. Use of aromatase inhibitors as first- and second-line medical therapy in patients with endometrial adenocarcinoma: a retrospective study. *J Obstet Gynaecol Can.* 2012;34(7):664-72. PMID: 22742486
42. Emons G, Gunthert A, Thiel FC, et al. Phase II study of fulvestrant 250 mg/month in patients with recurrent or metastatic endometrial cancer: a study of the Arbeitsgemeinschaft Gynakologische Onkologie. *Gynecol Oncol.* 2013;129(3):495-9. PMID: 23500091
43. Westin SN, Sun CCL, Broaddus R, et al. Challenging the paradigm of progesterone-only therapy for early endometrial cancer: results of a prospective trial of the levonorgestrel intrauterine system. *Gynecol Oncol.* 2016;141(Suppl 1):18-9. PMID: none
44. Baker J, Obermair A, Gebski V, et al. Efficacy of oral or intrauterine device-delivered progestin in patients with complex endometrial hyperplasia with atypia or early endometrial adenocarcinoma: a meta-analysis and systematic review of the literature. *Gynecol Oncol.* 2012;125(1):263-70. PMID: 22196499
45. Gunderson CC, Fader AN, Carson KA, et al. Oncologic and reproductive outcomes with progestin therapy in women with endometrial hyperplasia and grade 1 adenocarcinoma: a systematic review. *Gynecol Oncol.* 2012;125(2):477-82. PMID: 22245711
46. Fiorica JV, Brunetto VL, Hanjani P, et al. Phase II trial of alternating courses of megestrol acetate and tamoxifen in advanced endometrial carcinoma: a Gynecologic Oncology Group study. *Gynecol Oncol.* 2004;92(1):10-4. PMID: 14751131
47. Ott PA, Bang YJ, Berton-Rigaud D, et al. Safety and antitumor activity of pembrolizumab in advanced programmed death ligand 1-positive endometrial cancer: results from the KEYNOTE-028 Study. *J Clin Oncol.* 2017;35(22):2535-41. PMID: 28489510
48. Le DT, Uram JN, Wang H, et al. PD-1 blockade in tumors with mismatch-repair deficiency. *N Engl J Med.* 2015;372(26):2509-20. PMID: 26028255

49. Le DT, Durham JN, Smith KN, et al. Mismatch repair deficiency predicts response of solid tumors to PD-1 blockade. *Science*. 2017;357(6349):409-13. PMID: 28596308
50. Marabelle A, Fakih MG, Lopez J, et al. Association of tumour mutational burden with outcomes in patients with select advanced solid tumours treated with pembrolizumab in KEYNOTE-158. *Ann Oncol*. 2019;30 (Suppl 5):v477-v8. PMID: none
51. Marabelle A, Fakih M, Lopez J, et al. Association of tumour mutational burden with outcomes in patients with advanced solid tumours treated with pembrolizumab: prospective biomarker analysis of the multicohort, open-label, phase 2 KEYNOTE-158 study. *Lancet Oncol*. 2020;21(10):1353-65. PMID: 32919526
52. Marabelle A, Le DT, Ascierto PA, et al. Efficacy of pembrolizumab in patients with noncolorectal high microsatellite instability/mismatch repair-deficient cancer: results from the phase II KEYNOTE-158 study. *J Clin Oncol*. 2020;38(1):1-10. PMID: 31682550
53. Makker V, Rasco D, Vogelzang NJ, et al. Lenvatinib plus pembrolizumab in patients with advanced endometrial cancer: an interim analysis of a multicentre, open-label, single-arm, phase 2 trial. *Lancet Oncol*. 2019;20(5):711-8. PMID: 30922731
54. Marth C, Moore RG, Bidzinski M, et al. First-line lenvatinib plus pembrolizumab versus chemotherapy for advanced endometrial cancer: a randomized, open-label, phase III trial. *J Clin Oncol*. 2025;43(9):1083-100. PMID: 39591551
55. Makker V, Colombo N, Casado Herraez A, et al. Lenvatinib plus pembrolizumab for advanced endometrial cancer. *N Engl J Med*. 2022;386(5):437-48. PMID: 35045221
56. Muggia FM, Blessing JA, Sorosky J, et al. Phase II trial of the pegylated liposomal doxorubicin in previously treated metastatic endometrial cancer: a Gynecologic Oncology Group study. *J Clin Oncol*. 2002;20(9):2360-4. PMID: 11981008
57. Picard M, Pur L, Caiado J, et al. Risk stratification and skin testing to guide re-exposure in taxane-induced hypersensitivity reactions. *J Allergy Clin Immunol*. 2016;137(4):1154-64.e12. PMID: 26725998
58. Azad NS, Gray RJ, Overman MJ, et al. Nivolumab is effective in mismatch repair-deficient noncolorectal cancers: results from arm Z1D-A subprotocol of the NCI-MATCH (EAY131) study. *J Clin Oncol*. 2020;38(3):214-22. PMID: 31765263
59. Oaknin A, Tinker AV, Gilbert L, et al. Clinical activity and safety of the anti-programmed death 1 monoclonal antibody dostarlimab for patients with recurrent or advanced mismatch repair-deficient endometrial cancer: a nonrandomized phase 1 clinical trial. *JAMA Oncol*. 2020;6(11):1766-72. PMID: 33001143
60. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan in patients with HER2-expressing solid tumors: primary results from the DESTINY-PanTumor02 phase II trial. *J Clin Oncol*. 2024;42(1):47-58. PMID: 37870536
61. Meric-Bernstam F, Makker V, Oaknin A, et al. Efficacy and safety of trastuzumab deruxtecan (T-DXd) in patients (pts) with HER2-expressing solid tumors: DESTINY-PanTumor02 (DP-02) interim results. *J Clin Oncol*. 2023;41(17 Suppl):abstract LBA3000. PMID: none
62. Westin SN, Moore K, Chon HS, et al. Durvalumab plus carboplatin/paclitaxel followed by maintenance durvalumab with or without olaparib as first-line treatment for advanced endometrial cancer: the phase III DUO-E trial. *J Clin Oncol*. 2024;42(3):283-99. PMID: 37864337
63. Colombo N, Biagioli E, Harano K, et al. Atezolizumab and chemotherapy for advanced or recurrent endometrial cancer (AtTEnd): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet Oncol*. 2024;25(9):1135-46. PMID: 39102832