

Supplementary Table 1. Targeted therapies and immunotherapies approved by the U.S. Food and Drug Administration in the last 2 years

Date approved	Name/trial/mechanism	Cancer type	Eligibility	Outcomes
1/25/22	Tebentafusp-1ebn, NCT03070392, bispecific GP100 peptide-HLA-directed CD3 T cell engager	Unresectable or metastatic uveal melanoma	HLA-A*02:01 positive adult patients, no prior systemic or liver-directed therapy, no symptomatic untreated brain metastases, no cardiac disease, ok post resection	OS 21.7 months with trial vs. 16 months, PFS 3.3 months with trial vs. 2.9 months
12/3/21	Pembrolizumab	Stage IIB of IIC melanoma post complete resection	Adjuvant Tx, adult and pediatric > 12 years	
11/17/21	Pembrolizumab, KEY-NOTE-564	RCC, intermediate high or high risk of recurrence	Adjuvant Tx, post nephrectomy, with resection of metastatic lesions	Statistically significant improvement in DFS with trial Tx. 109 (22%) in Pembro arm and 151 (30%) in placebo
10/15/21	Atezolizumab	Stage II-IIIa NSCLC	Adjuvant Tx, post resection and platinum based chemoTx, > 1% PD-L1 expression in tumor cells	Median DFS not reached in trial Tx, 35.3 months in BSC arm
10/12/21	Abemaciclib +, first CDK4/6 inhibitor approved for adjuvant Tx, monarchE NCT03155997	HR+ HER2- LN+ early breast ca with high-risk recurrence, Ki67 > 20%	Adjuvant Tx, combined with endocrine Tx (tamoxifen or aromatase inhibitor)	Statistically significant difference in IDFS with trial Tx. 86.1% at 36 months vs. 79% with only tamoxifen or aromatase inhibitor
9/17/21	Cabozantinib, COSMIC-311 NCT03690388	Differentiated thyroid cancer, locally advanced or metastatic	Adult or pediatric > 12 yo, progressive post VEGFR targeted Tx, ineligible of refractory to radioactive iodine	PFS 11 months with trial Tx vs. 1.9 months with placebo
9/15/21	Mobocertinib	Locally advanced or metastatic NSCLC, Study 101 NCT02716116	Adult patients, EGFR exon 20 insertion mutations, progressive on platinum-based chemoTx	ORR 28% with median response duration of 17.5 months
8/17/21	Dostarlimab-gxly, GARNET NCT02715284	Recurrent or advanced solid tumors, dMMR	Adult patients, mismatch repair deficient dMMR	ORR 41.6%, 9.1% complete, 32.5% partial response; DOR 34.7 months, with 95.4% patients with duration of > 6 months
8/13/21	Belzutifan, HIF1 alpha inhibitor, study 004 NCT03401788	RCC, VHL associated	Adult patients, ok for associated CNS hemangioblastoma or pNET not requiring urgent surgery	ORR 49%, median DOR not reached, 56% of responders DOR > 12 months, median TTR of 8 months
8/10/21	Lenvantinib +, CLEAR Study 307 KEYNOTE-581 NCT02811861	Advanced RCC	First line, in combination with pembrolizumab, regardless of PD-L1 status	PFS 23.9 months with trial Tx vs. 9.2 months with sunitinib, ORR 71% vs. 36%, complete response 16% vs 4% respectively
7/26/21	Pembrolizumab +, KEY-NOTE-522 (NCT03036488)	High risk, early-stage triple negative breast cancer TNBC	Neoadjuvant Tx combined with chemoTx, followed by adjuvant single agent post resection, 1-2 cm lesions LN+ or all lesions > 2 cm regardless of PD-L1	CR was 63% with trial Tx vs. 56% with chemoTx only, event-free survival 123 (16%) in trial Tx vs. 93 (24%) in chemoTx alone
11/13/20	Pembrolizumab +, KEY-NOTE-355 NCT02819518	Locally recurrent unresectable or metastatic TNBC	Combined with chemoTx, expressing PD-L1 CPS > 10	Median PFS 9.7 months pembrolizumab + chemoTx vs. 5.6 months placebo
5/28/21	Sotorasib, RAS GTPase family inhibitor, CodeBreak100 NCT03600883	Locally advanced or metastatic NSCLC	Adult patients, KRAS G12C mutation, at least one prior systemic Tx	ORR 36% with median response duration 10 months

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5/21/21	Amivantamab-vmjw, bispecific Ab EGFR/MET, CHRYSALIS NCT02609776	Locally advanced or metastatic NSCLC	Adult patients, EGFR exon 20 insertion mutations, progressive on platinum-based chemoTx	ORR 40% with median response duration 11.1 months
4/7/21	Sacituzumab govitecan, AS-CENT NCT025274455	Unresectable locally advanced or metastatic TNBC	Adult patients, at least 2 systemic therapies, adjuvant or neoadjuvant, at least one systemic therapy for metastatic disease	Median PFS 4.8 months with trial Tx vs. 1.7 months with chemoTx; median OS 11.8 months with trial Tx vs. 6.9 months with chemoTx
3/10/21	Tivozanib, kinase inhibitor, TIVO-3 NCT02627963	Relapsed or refractory advanced RCC	Adult patients, following 2 or more systemic Tx, at least one VEGFR kinase inhibitor other than sorafenib or tivozanib	Median PFS 5.6 months with trial Tx vs. 3.9 months with sorafenib; median OS 16.4 months with trial Tx vs. 19.2 months with sorafenib; ORR18% trial Tx vs. 8% sorafenib arm
3/3/21	Lorlatinib, Study B7461006 NCT03052608	Metastatic NSCLC	ALK-positive patients as first line, second or third line; no prior systemic Tx for metastatic disease	Improved PFS with trial Tx vs. crizotinib, HR 0.28; median PFS cannot estimate with trial Tx, 9.3 months with crizotinib; in patients with intracranial lesions ORR 82% lorlatinib vs. 23% ORR crizotinib arm
2/22/21	Cemiplimab-rwl, Study 1624 NCT03088540	Locally advanced (not candidate for surgery/chemo), or metastatic NSCLC	High PD-L1 expression TPS > 50%, first line; no EGFR, ALK or ROS1 aberrations	Median OS 22.1 months with trial Tx vs. 14.3 months with platinum chemoTx; median PFS 6.2 months with trial Tx vs. 5.6 months platinum chemoTx; ORR 37% trial Tx vs. 21% platinum chemoTx
2/3/21	Tepotinib, VISION NCT02864992	Metastatic NSCLC	Adult patients, MET exon 14 skipping alterations	ORR 43%, median response duration of 10.8 months
1/22/21	Nivolumab +, CHECK-MATE-9ER NCT03141177	Advanced RCC	Combination with cabozantinib vs sunitinib, first line; previously untreated	Median PFS 16.6 months with trial Tx vs. 8.3 months with nivolumab + sunitinib; HR 0.6; median OS not reached; ORR 55.7% trial Tx vs. 27.1% nivolumab + sunitinib
12/18/20	Osimertinib, ADAURA NCT02511106	Stage IB-IIIa NSCLC, non-squamous histology	Adjuvant Tx, EGFR exon 19 deletions or exon 21 L858R mutations, post resection, with or without prior chemoTx	Median DFS not reached trial arm, 19.6 months in placebo arm
12/18/20	Relugolix, first oral GnRH receptor antagonist, HERO NCT03085095	Advanced prostate cancer	Adult patients, at least 1 year androgen deprivation Tx with recurrence post-surgery and RT, or newly diagnosed castration sensitive	Medical castration rate 96.7% trial Tx by day 29 of 48-week treatment
12/16/20	Margetuximab-cmkb, SOPHIA NCT02492711	Metastatic HER2+ breast cancer	Combined with chemoTx, had 2 or more anti-HER2 regimens, at least one for metastatic disease	PFS 5.8 months trial Tx vs. 4.9 months in trastuzumab plus chemoTx; ORR 22% vs. 16%; median DOR 6.1 months vs. 6.0 months
12/1/20	Pralsetinib, ARROW NCT03037385	Medullary thyroid cancer, advanced or metastatic	Adult and pediatric > 12 yo, RET mutated requiring systemic Tx, or RET fusion + requiring systemic Tx and radioactive iodine refractory	ORR 60% in patients w/prior cabozantinib or vandetanib, with 79% responses lasting over 6 months; ORR 66% with no prior cabozantinib or vandetanib, 84% patients with responses over 6 months

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9/4/20	Pralsetinib, ARROW NCT03037385	Metastatic NSCLC	Adult patients, RET fusion +	ORR 57%, 80% responders with prior platinum Tx with responses over 6 months; ORR 70%, 58% responders with responses over 6 months no prior systemic Tx
7/30/20	Atezolizumab, IMspire150, NCT02908672	Unresectable or metastatic melanoma	BRAF V600E mutated, combination with cobimetinib and vemurafenib	Median PFS 15.1 months trial Tx vs 10.6 months in the placebo arm
6/29/20	Pertuzumab with trastuzumab, vs. hyaluronidase-zzxf; FeDeriCa NCT03493854	HER2+ breast cancer, locally advanced, inflammatory or early stage	Combined with chemoTx as neoadjuvant Tx, >2cm or LN+, part of complete Tx for early breast cancer; or Adjuvant Tx for early breast ca with high risk of recurrence Combined with docetaxel, no prior anti-HER2 therapy or chemotherapy for metastatic disease	Combined trial Tx showed noninferior pertuzumab and trastuzumab serum trough concentrations; pCR was 59.7% trial Tx vs. 59.5% pertuzumab/trastuzumab
6/16/20	Pembrolizumab, KEY-NOTE-158 NCT02628067	Unresectable or metastatic tumors mutation burden high TMB H> 10 mut/MB	Adult and pediatric > 12 years, progressive through prior Tx and no other Tx options, max 10 target lesions, max 5 target lesions per organ	ORR 29%, 4% complete and 25% partial response rate; median DOR not reached, 57% with responses over 12 months, 50% patients with responses over 24 months
5/29/20	Ramucirumab, RELAY NCT02411448	Metastatic NSCLC	Combined with erlotinib, first line, EGFR exon 19 deletions or exon 21 L858R mutations	Median PFS 19.4 months trial Tx vs. 12.4-month placebo plus erlotinib; ORR 76% trial Tx vs. 75%, median DOR 18.0 months vs. 11.1 months
5/26/20	Nivolumab plus ipilimumab +, CHECKMATE-9LA NCT03215706	Metastatic or recurrent NSCLC	Combined with 2 cycles, platinum doublet chemoTx, first line, no EGFR or ALK genomic aberrations	Median OS 14.1 months trial Tx vs. 10.7 months platinum doublet Tx; PFS 6.8 months trial Tx vs. 5 months platinum doublet Tx; ORR 38% vs. 25%; median response duration 10 months trial Tx vs. 5.1 months chemoTx
5/22/20	Brigatinib, ALTAIL NCT02737501	Metastatic NSCLC	Adult patients, ALK mutation +	PFS 24 months trial Tx vs 11 months crizotinib; ORR 74% trial Tx vs 62% crizotinib
5/19/20	Olaparib, PROfound NCT02987543	Metastatic castration resistant prostate cancer	Adult patient, HRR pathway gene mutations (including BRCA1/2 or ATM), progressive on enzalutamide or abiraterone, all had bilateral orchiectomy	rPFS 7.4 months trial Tx vs. 3.6 months with enzalutamide or abiraterone; median OS 19.1 months vs. 14.7 months; ORR 33% trial Tx vs. 2%
5/18/20	Atezolizumab, IMpower110 NCT02409342	Metastatic stage IV NSCLC	High PD-L1 expression > 50% tumor cells, first line, no EGFR or ALK genomic aberrations, no prior chemoTx for metastatic disease	Median OS 20.2 months trial Tx vs. 13.1 months chemoTx platinum; median PFS 8.1 months trial Tx and 5.0 months platinum chemoTx; ORR 38% vs. 29%
5/15/20	Rucaparib, TRITON2 NCT02952534	Metastatic castration resistant prostate cancer	BRCA mutated, prior Tx androgen receptor therapy or taxanes, prior bilateral orchiectomy vs. GhrH analog	ORR 44%, median DOR cannot evaluate, range 1.7-24 months; 56% responders with DOR over 6 months

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5/15/20	Nivolumab plus ipilimumab, CHECKMATE-227 NCT02477826	Metastatic or recurrent NSCLC	PD-L1 expression > 1%, no EGFR or ALK aberrations, no prior systemic Tx	Statistically significant OS 17.1 months trial Tx vs 14.9 months platinum doublet chemoTx; median PFS 5.1 months vs 5.6; ORR 36% vs 30%; median duration 23.2 months vs 6.2 months
5/8/2020	Selpercatinib, LIBRETTO-001	Metastatic RET fusion + NSCLC; advanced or metastatic RET mutant medullary thyroid cancer requiring systemic Tx; RET fusion positive thyroid ca requiring systemic Tx or radioactive iodine refractory	Adult and pediatric > 12yo; RET fusion +, RET mutation +; NSCLC prior platinum Tx	NSCLC RET fusion+, prior platinum chemo: ORR 64%, 81% responders had responses > 6 months; no systemic Tx ORR 85%, 58% responses > 6 months RET mutant MTC post cabozantinib, vandetanib or both: ORR 69%, 76% responders lasting > 6 months, in previously untreated patients ORR 73%, 61% responses > 6 months RET fusion+ iodine-refractory groups with systemic Tx ORR 79%, 87% responders > 6 months, without systemic Tx ORR 100%, 75% responses > 6 months
5/6/2020	Capmatinib, GEOMETRY mono1, NCT02414139	Metastatic NSCLC, confirmed MET exon 14 skipping	Treatment naïve or previously treated patients	ORR 68%, response duration of 12.6 months in naïve, ORR 41%, response duration 9.7 months in previously treated
4/22/20	Govitecan-hzjy, IMMU-132-01, NCT01631552	Triple negative breast cancer	Adult, at least 2 prior Tx for metastatic disease	ORR 33.3%, median response duration of 7.7 months
4/17/20	Tucatinib+, HER2CLIMB NCT02614794	HER2+ metastatic breast cancer	Adult, advanced unresectable or metastatic including brain, prior Tx trastuzumab, pertuzumab and ado-trastuzumab emtansine	Treatment arm PFS 7.8 months and OS 21.9 months with trastuzumab, capecitabine and tucatinib; control arm PFS 5.6 months, OS 17.4 months; with brain metastases patients PFS 7.6 vs. 5.4 months; ORR 40.6% vs. 22.8%
2/25/20	Neratinib+, NALA NCT01808573	HER2+ breast cancer	Adult, advanced or metastatic cancer, 2 or more prior anti-HER2 based regimens post metastatic diagnoses	Neratinib with capecitabine PFS 5.6 months, PFS at 12 months 29%, OS 21 months, ORR 32.8%, median response duration 8.5 months; lapatinib with capecitabine PFS 5.5 months, PFS at 12 months 15%, OS 18.7 months, ORR 26.7%, median response duration 5.6 months

HLA, human leukocyte antigen; OS, overall survival; PFS, progression free survival; DFS, disease free survival; TX, treatment; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; PD-L1, programmed cell death ligand 1; IDFS, invasive disease free survival; VEGFR, vascular endothelial growth factor receptor; ORR, overall response rate; dMMR, mismatch repair deficient; DOR, duration of response; RCC, renal cell carcinoma; VHL, von Hippel Lindau; CNS, central nervous system; PNET, primitive neuro ectodermal tumor; TTR, time in therapeutic range; TNBC, triple negative breast cancer; LN, lymph node; CR, complete response; CPS, combined positive score; NSCLC, non-small cell lung cancer; KRAS, Kirsten rat sarcoma virus; EGFR, epidermal growth factor receptor; ALK, anaplastic lymphoma kinase; HR, hormone receptor; RT, radiation therapy; RET, rearranged during transfection; pCR, pathological complete response; rPFS, radiographic progression free survival; GHRH, growth hormone releasing hormone; MTC, medullary thyro.