Supplementary Table S1: List of actionable genes and potential matched therapy

Gene	Level	Potential Matched Therapy
AKT1	3	AKT inhibitor
***ALK* fusion**	1	ALK inhibitor
ARAF	3	Sorafenib
***BRAF* V600E**	2A	BRAF inhibitors
***BRCA1/2* loss**	2B	PARP Inhibitor therapy
CD74-NRG	4	Anti-HER3 Monoclonal Antibody
***CDK4* AMP**	2B	CDK 4/6 inhibitors
***CDKN2A* loss**	4	CDK4/6 inhibitors
c-KIT	2B	Imatinib
EGFR	1	EGFR Tyrosine kinase inhibitors
***ERBB2* mutation**	3	HER2 Tyrosine kinase inhibitors
***ERBB2* Amplification**	2B	Pan-HER TKI e.g. Dacomitinib, anti-HER2 directed therapy e.g. Trastuzumab
ERBB3	4	ERBB3 kinase inhibitor, anti-HER3 monoclonal antibody
FGFR1	3	FGFR1 inhibitors
FGFR2	3	FGFR2 Inhibitors
FGFR3	3	FGFR3 inhibitors
***FGFR3-TACC3* fusion**	3	FGFR3 inhibitors
GNAS	4	MEK Inhibitors
HRAS	4	MEK Inhibitors
KRAS	4	MEK inhibitors
MAP2K1	3	MEK Inhibitors
***MDM2* Amplification**	4	MDM2 inhibitors
***MET exon 14* alteration**	2B	Cabozantinib, Crizotinib
***MET* Amplification**	2B	Cabozantinib, Crizotinib
***NF1* loss**	4	MEK Inhibitors
NRAS	3	MEK Inhibitors
PIK3CA	3	PI3K, Akt , mTOR inhibitors
***PTEN* loss**	4	PI3K, Akt , mTOR inhibitors
RAF1	4	Sorafenib
***RET* fusion**	2A	RET inhibitors
***ROS1* fusion**	1	ROS1 inhibitors
***TSC1/TSC2* loss**	2B	mTOR inhibitors

Supplementary Table S2: List of cooccurring Level 1-4 mutations

Cooccurring	Level 1	Level 2A	Level 2B	Level 3	Level 4	N=
Level 1+2A	EGFR L747_P753delinsS	MET AMP	CDK4 AMP		CDKN2A loss	1
	EGFR E746_A750del	MET AMP		PIK3CA E545K		1
	EGFR L858R	MET AMP			CDKN2A loss MDM2 AMP	1
	EGFR L858R	MET AMP			CDKN2A loss	1
	EGFR L858R	MET AMP			BRAF D594V	1
	EGFR L858R	MET AMP			CDKN2A loss	1
	EGFR L861Q	MET AMP				1
Level 1+2B	EGFR E746_A750del		ERBB2 AMP		MDM2 AMP	1
	EGFR E746_A750del		ERBB2 AMP	NRASQ61K	CDKN2A loss	1
	EGFR E746_A750del		ERBB2 AMP	PIK3CA E545K		1
	EGFR S752_I759del		ERBB2 AMP			1
	EGFR S752_I759del		ERBB2 AMP		CDKN2A loss	1
	EGFR L858R		ERBB2 AMP			5
	EGFR L858R		ERBB2 AMP	PIK3CA C420R	MDM2 AMP	1
	EGFR L747_A750delinsP		ERBB2 AMP			1
	EGFR L747_T751del		ERBB2 AMP			1
	EGFR [illegible]		ERBB2 AMP			1
	EGFR L747_P753delinsS		CDK4 AMP			1
	EGFR E746_A750del		CDK4 AMP	PIK3CA H1047R	MDM2 AMP	1
	EGFR E746_A750 deletion		CDK4 AMP		MDM2 AMP	1
	EGFR E746_A750del+T790M		CDK4 AMP		MDM2 AMP	1
	EGFR E746_A750delinsP		CDK4 AMP		MDM2 AMP, KRAS Q61R	1
	EGFR L858R		CDK4 AMP	PIK3CA H1047R	MDM2 AMP	1
	EGFR L858R		CDK4 AMP			4
	EGFR L858R+T790M		CDK4 AMP			1
	EGFR G719C+S768I		CDK4 AMP		MDM2 AMP	1
Level 1+3	EGFR E709_T710 del			PIK3CA E545K	CDKN2A loss	1
	EGFR E709_T710 del			PIK3CA E542K		1
	EGFR E709_T710 del			PIK3CA H1047R		1
	EGFR E746_A750del+T790M			PIK3CA E542K		2
	EGFR E746_A750del+T790M			PIK3CA E545K	CDKN2A loss	1
	EGFR E746_A750del			PIK3CA H1047R		1
	EGFR E746_A750del			PIK3CA C420R, FGFR1 AMP		1
	EGFR E746_A750del			PIK3CA M1043I		1
	EGFR E746_A750del			PIK3CA N345K		1
	EGFR E746_A750del			PIK3CA E545K	CDKN2A loss	1
	EGFR L747_A750delinsP			PIK3CA N345H		1
	EGFR L858R			PIK3CA H1047L		1

	EGFR L858R			PIK3CA H1047R		1
	EGFR L858R			PIK3CA E545K		2
	EGFR L858R			PIK3CA N345Y		1
	EGFR S7681+G719C+T790M			PIK3CA E545K		1
	EGFR E709K+G719S			PIK3CA E545K		1
Level 2A+2B		MET AMP	ERBB2 AMP			1
		MET AMP	BRCA1 loss			1
		MET exon 14 splice	TSC2 loss	PIK3CA E545K		1
			ERBB2 AMP. BRCA2 loss	PIK3CA E545K		1
		MET exon 14 splice	CDK4 AMP		MDM2 AMP	2
		MET exon 14 splice	CDK4 AMP		MDM2 AMP	4
		RET fusion, MET AMP				
Level 2A+3		MET exon 14 splice		FGFR3-TACC3 fusion		1
		BRAF-V600E		IDH1 R132C		1
Level 2A+4		RET fusion			CDKN2A loss	1
		MET exon 14 splice, MET AMP			MDM2 AMP	1
		MET exon 14 splice, MET AMP			NF1 loss, MDM2 AMP,	1
		MET exon 14 splice			MDM2 AMP	1
		MET exon 14 splice			NF1 loss, CDKN2A loss	1
		MET exon 14 splice			CDKN2A loss	3
		MET AMP			NF1 loss	2
		MET AMP			CDKN2A loss	2
		MET AMP			BRAFG596C	1
		MET AMP			KRAS G12V	1
		BRAF V600E			CDKN2A loss	1
		BRAF V600E			PTEN loss	1
Level 2B + 3			TSC1 loss		KRAS G12C	2
			TSC1 loss		CDKN2A loss, KRAS G12C	1
			TSC2 loss		KRAS G12C	1
			TSC2 loss	PIK3CA AMP		1
			TSC2 loss	PIK3CA E545K		1
			TSC2 loss BRCA2 loss		CDKN2A loss	1
			BRCA2 loss, ERBB2 AMP	PIK3CA E545K		1

			CDK4 AMP	ERBB2 Y772_A775dup		1
			CDK4 AMP	ERBB2 V659E PIK3CA E542K	MDM2 AMP	1
			CDK4 AMP	ERBB2 S310F	MDM2 AMP	1
			ERBB2 AMP	ERBB2 Y772_A775dup	CDKN2A loss	1
			ERBB2 AMP	ERBB2 S310F		2
			ERBB2 AMP	ERBB2 G776delinsVC		1
			ERBB2 AMP	ERBB2 Y772_A775dup	CDKN2A loss	1
			ERBB2 AMP	PIK3CA N345K		1
Level 2B + 4			ERBB2 AMP		CDKN2A loss	1
			ERBB2 AMP		PTEN loss, CDKN2A loss	1
			TSC2 loss		CDKN2A loss	1
			TSC1 loss + BRCA1 loss		KRAS G12C, CDKN2A loss	1
			BRCA2 loss		PTEN loss	1
			BRCA2 loss		NF1 loss	1
			BRCA2 loss		KRAS G12A	1
			BRCA2 loss		KRAS G12A, CDKN2A loss,	1
			BRCA1 loss		KRAS G12C	1
			CDK4 AMP		NF1 loss	1
			CDK4 AMP		BRAF D594N	1
			CDK4 AMP		MDM2 AMP	2
			CDK4 AMP		KRAS G12C	1
Level 3 + 4				AKT1 E17K	KRAS G12A	1
				PIK3CA M1043I	KRAS G12A	1
				PIK3CA E726K	KRAS G12C,	1
				PIK3CA E542K	KRAS G12C,	2
				PIK3CA E545K	KRAS G12C,	2
				PIK3CA N345T	KRAS G12C,	1
				FGFR1 AMP	KRAS G12C,	1
				PIK3CA G1049R	KRAS G12D	1
				FGFR3 AMP	KRAS G12D,	1
				PIK3CA E542K	KRAS G12V,	1
				PIK3CA E542K	KRAS Q61H,	1
				FGFR1 AMP	NF1 loss	1
				FGFR1 AMP	CDKN2A loss	1
				MAP2K1 K57N, PIK3CA N545Y	CDKN2A loss	1
				MAP2K1 E203K	PTEN loss	1
				NRAS Q61R	BRAF K601E	1
				NRAS Q61L	NF1 loss	1
				NRAS Q61H	CDKN2A loss	1

				ERBB2 Y772_A775dup	MDM2 AMP	1
				ERBB2 Y772_A775dup	CDKN2A loss	1
				ERBB2 Y772_A775dup	CDKN2A loss	1
				FGFR2 AMP	NF1 loss	1
				MAP2K1 E102_I103 del	CDKN2A loss	1
				PIK3CA E542K	CDKN2A loss	1
				PIK3CA E545K	BRAF G469A	1
				PIK3CA R93W	PTEN loss	1
Level 1+4	EGFR L858R				MDM2 AMP, CDKN2A loss	1
	EGFR L858R				MDM2 AMP	1
	EGFR L858R				CDK4, MDM2 AMP	4
	EGFR L858R				KRAS Q61H+ Q22K	1
	EGFR L858R				PTEN loss	1
	EGFR L858R				CDKN2A loss	1
	EGFR L858R+S768I				CDKN2A loss	1
	EGFR L858R+T790M				CDKN2A loss	2
	EGFR L858R+T790M				PTEN loss	1
	EGFR L858R+T790M				PTEN, CDKN2A loss,	1
	EGFR L858R+T790M				CDKN2A loss	1
	EGFR L858R +E709K +T790M				CDKN2A loss	1
	EGFR E746_A750 deletion				PTEN loss	1
	EGFR E746_A750 deletion				CDKN2A loss	5
	EGFR E746_A750 deletion				PTEN loss	2
	EGFR E746_A750del +T790M				CDKN2A loss	2
	EGFR E746_S752delinsV				CDKN2A loss	1
	EGFR E746_T751delinsA				CDK4 AMP	1
	EGFR L747_A750delinsP				CDKN2A loss, MDM2 AMP	1
	EGFR L747_T751				CKN2A loss	1
	EGFR L861Q + G719A				CDKN2A loss	1
	EGFR G719A + T790M				CDKN2A loss	1
	EGFR E709_T710 delinsD				CDKN2A loss	2
	EGFR K745_E746insVPVAIK				CDKN2A loss	1
	EGFR L861Q				CDKN2A loss	1
	ROS1 fusion				CDKN2A loss	2
	ROS1 fusion				CDKN2A loss	1
	ALK fusion				CDKN2A loss, NF1 loss	1
	ALK fusion				CDKN2A loss	5
	ALK fusion				MDM2 AMP	1
Level 2A + 4		RET fusion			MDM2 AMP	1
		RET fusion			CDKN2A loss	1
		RET fusion			mTOR S2215F	1

Level 4+4					CDKN2A loss, MDM2 AMP	1
					CDKN2A loss MDM2 AMP	1
					KRAS G12A, PTEN loss	1
					KRAS G12A, MDM2 AMP	1
					KRAS G12A, CDKN2A loss	2
					KRAS G12C, MDM2 AMP	1
					KRAS G12C,CDKN2A loss	5
					KRAS G12C, mTOR S2215F	1
					KRAS G12C NF1 loss	1
					KRAS G12D, BRAF G469A	1
					KRAS G12D,CDKN2A loss	1
					KRAS G12D, MDM2 AMP	2
					KRAS G12D GNAS R201H	1
					KRAS G12R, CDKN2A loss	1
					KRAS G12V, NF1 loss	2
					KRAS G12V, MDM2 AMP	1
					KRAS G12V,CDKN2A loss	2
					KRAS G12V, BRAF D594Y, CDKN2A loss	1
					KRAS G13C, NF1 loss	1
					KRAS G13C, BRAF G469A	1
					KRAS G13D,CDKN2A loss	2
					KRAS G13D, NF1 loss	1
					KRAS Q61H,CDKN2A loss	2
					NF1 loss, CDKN2A loss	2
					NF1 loss, PTEN loss	1
					NF1 loss, BRAF G466V	1
					NF1 loss, HRAS G13V	1
					BRAF T599 duplication CDKN2A loss	1
					EGFR exon 20 insertion, CDKN2A loss	3
					EGFR exon 20 insertion, MDM2 AMP	1
					GNAS Q227H, CDKN2A loss	1
					RAF1 S257L, NF1 loss	1
					RAF1 S257L, MDM2 AMP	1
					PTEN Loss, NF1 loss	1
					PTEN loss, CDKN2A loss	1
					PTEN loss, EGFR Exon 20 insertion	1
					mTOR S2215F, CDKN2A loss	1

Supplementary Table S3: EGFR mutations identified and associated therapy

EGFR Mutations	No. of pts	EGFR TKI	Clinical Benefit	Chemotherapy	Immunotherapy
Exon 21					
L858R	48	44	34^	30	4
L861Q	5	5	2	3	3
Exon 19 deletion					
E746_A750del	56	53	48**	29	3
E746_S752delinsV	7	7	7	2	0
E746_T751delinsP	1	1	1	1	0
E746_T751delinsVA	1	1	1	0	0
L747_P753delinsS	7	7	6*	3	1
L747_E749del	1	4	1	1	0
L747_T751del	4	3	3	1	0
L747P	3	5	2	3	1
L747_A750delinsP	5	2	5	3	2
S752_I759del	2	1	1	1	0
L747_S752del	1	1	1	0	0
Exon 19 Insertion					
K745_E746insVPAIK	1		1	1	1
T790M Mutated					
T790M+E746_A750del	23	23	23	12	4
T790M+E746_T751delinsA	2	2	2	1	0
T790M+L858R	11	11	9	6	0
T790M+L861Q	1	1	1	1	0
T790M+L747_P753delinsS	1	1	1	1	1
T790M+L858R+D761Y	1	1	1	1	0
T790M+L858R+E709K+G5A	1	1	1	1	1
T790M+L858R+T854S	1	1	1	1	0
T790M+L747_A750delinsP	2	2	2	2	0
T790M+S752_I759del+A750P	1	1	1	1	1
T790M+G719C+S768I+C775Y	1	1	1	1	0
T790M+G719A+L707W	1	1	1	1	1

T790M+E746_T751delinsVP	1	1	1	0	0
Total					
Co-occurring Mutations:					
L858R+E709K	3	3	3	3	0
L858R+S768I	1	1	0	0	0
L858R+L833V	1	1	1	1	0
L858R+MD277IY	1	1	1	1	0
L858R+G221V	1	1	0	1	0
L858R+H870R+S306L	1	1	1	1	1
L858R+V689M	1	1	0	1	0
L858R+D761Y	1	1	1	1	0
L858R+T854S	1	1	1	1	0
L858R+D1014V	1	1	1	1	0
L858R+K860I+K867T	1	1	1	0	0
L858R+L62R	1	1	1	1	0
L858R+V834L	1	1	1	1	0
E709K+G719S	2	1	1	2	0
E709K+G719A	1	1	0	1	0
E709A+G719S	1	1	1	1	0
G719C+S7681	1	1	1	1	0
G719S+S7681	1	1	1	0	0
G719A+L861Q	1	1	1	1	0
T751_A755del+L747P	1	1	1	1	0
L747_P753delinsS+A755G	1	1	0	1	0
L861Q+S720F	1	1	0	1	0
Exon 18					
E709_T710delinsD	6	5	2	4	2
G719A	3	3	1	0	0
L858R+E746_A750del	1	1	1	1	0
EGFR-KDD	2	2	2	2	1
Unknown significance	2	0	0	2	2
V765L	1	0	0	1	1
G779F	1	0	0	1	0

Exon 20 Insertions					
K766delinsNGQR	1	0	0	0	0
N771_H773dup	2	0	0	2	0
H773_V774insH	1	0	0	1	0
P772_H773dup	1	0	0	1	1
H773dup	1	0	0	1	1
N771delinSTH	1	0	0	1	0
V769_D770insGGTR	1	0	0	1	1
N771_P772insV	2	0	0	2	0
A767_V769dup	2	0	0	2	1
S7678_D770dup	1	0	0	1	1
K766_N771insQPP	1	1	0	1	0
D770_N771insQPP	1	0	0	1	1
D770_N771insG	1	0	0	1	0
N771_P772insH	1	0	0	1	0
Exon 20 Missense					
H773R	1	1	1	1	0

L858R: ^ 3 patients await imaging

Exon 19 deletion: ** 3 patients await imaging

L747_P753delinsS ^ 1 patient awaits imaging

Supplementary Table S4: List of 410 genes in MSK-IMPACT assay

Approved Symbol	Approved Name
ABL1	c-abl oncogene 1, non-receptor tyrosine kinase
ACVR1	activin A receptor, type I
AKT1	v-akt murine thymoma viral oncogene homolog 1
AKT2	v-akt murine thymoma viral oncogene homolog 2
AKT3	v-akt murine thymoma viral oncogene homolog 3 (protein kinase B, gamma)
ALK	anaplastic lymphoma receptor tyrosine kinase
ALOX12B	arachidonate 12-lipoxygenase, 12R type
ANKRD11	ankyrin repeat domain 11
APC	adenomatous polyposis coli
AR	androgen receptor
ARAF	v-raf murine sarcoma 3611 viral oncogene homolog
ARID1A	AT rich interactive domain 1A (SWI-like)
ARID1B	AT rich interactive domain 1B (SWI1-like)
ARID2	AT rich interactive domain 2 (ARID, RFX-like)
ARID5B	AT rich interactive domain 5B (MRF1-like)
ASXL1	additional sex combs like 1 (Drosophila)
ASXL2	additional sex combs like 2 (Drosophila)
ATM	ataxia telangiectasia mutated
ATR	ataxia telangiectasia and Rad3 related
ATRX	alpha thalassemia/mental retardation syndrome X-linked
AURKA	aurora kinase A
AURKB	aurora kinase B
AXIN1	axin 1
AXIN2	axin 2
AXL	AXL receptor tyrosine kinase
B2M	beta-2-microglobulin
BAP1	BRCA1 associated protein-1 (ubiquitin carboxy-terminal hydrolase)
BARD1	BRCA1 associated RING domain 1
BBC3	BCL2 binding component 3
BCL10	B-cell CLL/lymphoma 10
BCL2	B-cell CLL/lymphoma 2
BCL2L1	BCL2-like 1
BCL2L11	BCL2-like 11 (apoptosis facilitator)
BCL6	B-cell CLL/lymphoma 6
BCOR	BCL6 corepressor
BIRC3	baculoviral IAP repeat-containing 3

BLM	Bloom syndrome, RecQ helicase-like
BMPR1A	bone morphogenetic protein receptor, type IA
BRAF	v-raf murine sarcoma viral oncogene homolog B1
BRCA1	breast cancer 1, early onset
BRCA2	breast cancer 2, early onset
BRD4	bromodomain containing 4
BRIP1	BRCA1 interacting protein C-terminal helicase 1
BTK	Bruton agammaglobulinemia tyrosine kinase
CALR	calreticulin
CARD11	caspase recruitment domain family, member 11
CASP8	caspase 8, apoptosis-related cysteine peptidase
CBFB	core-binding factor, beta subunit
CBL	Cas-Br-M (murine) ecotropic retroviral transforming sequence
CCND1	cyclin D1
CCND2	cyclin D2
CCND3	cyclin D3
CCNE1	cyclin E1
CD274	CD274 molecule
CD276	CD276 molecule
CD79A	CD79a molecule, immunoglobulin-associated alpha
CD79B	CD79b molecule, immunoglobulin-associated beta
CDC73	cell division cycle 73, Paf1/RNA polymerase II complex component, homolog (S. cerevisiae)
CDH1	cadherin 1, type 1, E-cadherin (epithelial)
CDK12	cyclin-dependent kinase 12
CDK4	cyclin-dependent kinase 4
CDK6	cyclin-dependent kinase 6
CDK8	cyclin-dependent kinase 8
CDKN1A	cyclin-dependent kinase inhibitor 1A (p21, Cip1)
CDKN1B	cyclin-dependent kinase inhibitor 1B (p27, Kip1)
CDKN2A	cyclin-dependent kinase inhibitor 2A (melanoma, p16, inhibits CDK4)
CDKN2B	cyclin-dependent kinase inhibitor 2B (p15, inhibits CDK4)
CDKN2C	cyclin-dependent kinase inhibitor 2C (p18, inhibits CDK4)
CEBPA	CCAAT/enhancer binding protein (C/EBP), alpha
CENPA	centromere protein A
CHEK1	CHK1 checkpoint homolog (S. pombe)
CHEK2	CHK2 checkpoint homolog (S. pombe)
CIC	capicua homolog (Drosophila)
CREBBP	CREB binding protein
CRKL	v-crk sarcoma virus CT10 oncogene homolog (avian)-like

CRLF2	cytokine receptor-like factor 2
CSF1R	colony stimulating factor 1 receptor
CSF3R	colony stimulating factor 3 receptor (granulocyte)
CTCF	CCCTC-binding factor (zinc finger protein)
CTLA4	cytotoxic T-lymphocyte-associated protein 4
CTNNB1	catenin (cadherin-associated protein), beta 1, 88kDa
CUL3	cullin 3
CXCR4	chemokine (C-X-C motif) receptor 4
DAXX	death-domain associated protein
DCUN1D1	DCN1, defective in cullin neddylation 1, domain containing 1 (S. cerevisiae)
DDR2	discoidin domain receptor tyrosine kinase 2
DICER1	dicer 1, ribonuclease type III
DIS3	DIS3 mitotic control homolog (S. cerevisiae)
DNAJB1	DnaJ (Hsp40) homolog, subfamily B, member 1
DNMT1	DNA (cytosine-5-)-methyltransferase 1
DNMT3A	DNA (cytosine-5-)-methyltransferase 3 alpha
DNMT3B	DNA (cytosine-5-)-methyltransferase 3 beta
DOT1L	DOT1-like, histone H3 methyltransferase (S. cerevisiae)
E2F3	E2F transcription factor 3
EED	embryonic ectoderm development
EGFL7	EGF-like-domain, multiple 7
EGFR	epidermal growth factor receptor
EIF1AX	eukaryotic translation initiation factor 1A, X-linked
EIF4A2	eukaryotic translation initiation factor 4A2
EIF4E	eukaryotic translation initiation factor 4E
EP300	E1A binding protein p300
EPCAM	epithelial cell adhesion molecule
EPHA3	EPH receptor A3
EPHA5	EPH receptor A5
EPHA7	EPH receptor A7
EPHB1	EPH receptor B1
ERBB2	v-erb-b2 erythroblastic leukemia viral oncogene homolog 2, neuro/glioblastoma derived oncogene homolog (avian)
ERBB3	v-erb-b2 erythroblastic leukemia viral oncogene homolog 3 (avian)
ERBB4	v-erb-a erythroblastic leukemia viral oncogene homolog 4 (avian)
ERCC2	excision repair cross-complementing rodent repair deficiency, complementation group 2
ERCC3	excision repair cross-complementing rodent repair deficiency, complementation group 3 (xeroderma pigmentosum group B complementing)
ERCC4	excision repair cross-complementing rodent repair deficiency, complementation group 4
ERCC5	excision repair cross-complementing rodent repair deficiency, complementation group 5

ERG	v-ets erythroblastosis virus E26 oncogene homolog (avian)
ERRFI1	ERBB receptor feedback inhibitor 1
ESR1	estrogen receptor 1
ETV1	ets variant 1
ETV6	ets variant 6
EZH2	enhancer of zeste homolog 2 (Drosophila)
FAM123B	family with sequence similarity 123B
FAM175A	family with sequence similarity 175, member A
FAM46C	family with sequence similarity 46, member C
FANCA	Fanconi anemia, complementation group A
FANCC	Fanconi anemia, complementation group C
FAT1	FAT tumor suppressor homolog 1 (Drosophila)
FBXW7	F-box and WD repeat domain containing 7
FGF19	fibroblast growth factor 19
FGF3	fibroblast growth factor 3
FGF4	fibroblast growth factor 4
FGFR1	fibroblast growth factor receptor 1
FGFR2	fibroblast growth factor receptor 2
FGFR3	fibroblast growth factor receptor 3
FGFR4	fibroblast growth factor receptor 4
FH	fumarate hydratase
FLCN	folliculin
FLT1	fms-related tyrosine kinase 1 (vascular endothelial growth factor/vascular permeability factor receptor)
FLT3	fms-related tyrosine kinase 3
FLT4	fms-related tyrosine kinase 4
FOXA1	forkhead box A1
FOXL2	forkhead box L2
FOXO1	forkhead box O1
FOXP1	forkhead box P1
FUBP1	far upstream element (FUSE) binding protein 1
FYN	FYN oncogene related to SRC, FGR, YES
GATA1	GATA binding protein 1 (globin transcription factor 1)
GATA2	GATA binding protein 2
GATA3	GATA binding protein 3
GLI1	GLI family zinc finger 1
GNA11	guanine nucleotide binding protein (G protein), alpha 11 (Gq class)
GNAQ	guanine nucleotide binding protein (G protein), q polypeptide
GNAS	GNAS complex locus
GPS2	G protein pathway suppressor 2

GREM1	gremlin 1
GRIN2A	glutamate receptor, ionotropic, N-methyl D-aspartate 2A
GSK3B	glycogen synthase kinase 3 beta
H3F3A	H3 histone, family 3A
H3F3B	H3 histone, family 3B (H3.3B)
H3F3C	H3 histone, family 3C
HGF	hepatocyte growth factor (hepapoietin A; scatter factor)
HIST1H1C	histone cluster 1, H1c
HIST1H2BD	histone cluster 1, H2bd
HIST1H3A	histone cluster 1, H3a
HIST1H3B	histone cluster 1, H3b
HIST1H3C	histone cluster 1, H3c
HIST1H3D	histone cluster 1, H3d
HIST1H3E	histone cluster 1, H3e
HIST1H3F	histone cluster 1, H3f
HIST1H3G	histone cluster 1, H3g
HIST1H3H	histone cluster 1, H3h
HIST1H3I	histone cluster 1, H3i
HIST1H3J	histone cluster 1, H3j
HIST2H3C	histone cluster 2, H3c
HIST2H3D	histone cluster 2, H3d
HIST3H3	histone cluster 3, H3
HLA-A	major histocompatibility complex, class I, A
HNF1A	HNF1 homeobox A
HOXB13	homeobox B13
HRAS	v-Ha-ras Harvey rat sarcoma viral oncogene homolog
ICOSLG	inducible T-cell co-stimulator ligand
ID3	inhibitor of DNA binding 3, dominant negative helix-loop-helix protein
IDH1	isocitrate dehydrogenase 1 (NADP+), soluble
IDH2	isocitrate dehydrogenase 2 (NADP+), mitochondrial
IFNGR1	interferon gamma receptor 1
IGF1	insulin-like growth factor 1 (somatomedin C)
IGF1R	insulin-like growth factor 1 receptor
IGF2	insulin-like growth factor 2 (somatomedin A)
IKBKE	inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase epsilon
IKZF1	IKAROS family zinc finger 1 (Ikaros)
IL10	interleukin 10
IL7R	interleukin 7 receptor
INHA	inhibin, alpha

INHBA	inhibin, beta A
INPP4A	inositol polyphosphate-4-phosphatase, type I, 107kDa
INPP4B	inositol polyphosphate-4-phosphatase, type II, 105kDa
INSR	insulin receptor
IRF4	interferon regulatory factor 4
IRS1	insulin receptor substrate 1
IRS2	insulin receptor substrate 2
JAK1	Janus kinase 1
JAK2	Janus kinase 2
JAK3	Janus kinase 3
JUN	jun proto-oncogene
KDM5A	lysine (K)-specific demethylase 5A
KDM5C	lysine (K)-specific demethylase 5C
KDM6A	lysine (K)-specific demethylase 6A
KDR	kinase insert domain receptor (a type III receptor tyrosine kinase)
KEAP1	kelch-like ECH-associated protein 1
KIT	v-kit Hardy-Zuckerman 4 feline sarcoma viral oncogene homolog
KLF4	Kruppel-like factor 4 (gut)
KRAS	v-Ki-ras2 Kirsten rat sarcoma viral oncogene homolog
LATS1	LATS, large tumor suppressor, homolog 1 (Drosophila)
LATS2	LATS, large tumor suppressor, homolog 2 (Drosophila)
LMO1	LIM domain only 1 (rhombotin 1)
MALT1	mucosa associated lymphoid tissue lymphoma translocation gene 1
MAP2K1	mitogen-activated protein kinase kinase 1
MAP2K2	mitogen-activated protein kinase kinase 2
MAP2K4	mitogen-activated protein kinase kinase 4
MAP3K1	mitogen-activated protein kinase kinase kinase 1
MAP3K13	mitogen-activated protein kinase kinase kinase 13
MAP3K14	mitogen-activated protein kinase kinase kinase 14
MAPK1	mitogen-activated protein kinase 1
MAPK3	mitogen-activated protein kinase 3
MAX	MYC associated factor X
MCL1	myeloid cell leukemia sequence 1 (BCL2-related)
MDC1	mediator of DNA-damage checkpoint 1
MDM2	Mdm2 p53 binding protein homolog (mouse)
MDM4	Mdm4 p53 binding protein homolog (mouse)
MED12	mediator complex subunit 12
MEF2B	myocyte enhancer factor 2B
MEN1	multiple endocrine neoplasia I

MET	met proto-oncogene (hepatocyte growth factor receptor)
MGA	MAX gene associated
MITF	microphthalmia-associated transcription factor
MLH1	mutL homolog 1, colon cancer, nonpolyposis type 2 (E. coli)
MLL	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila)
MLL2	myeloid/lymphoid or mixed-lineage leukemia 2
MLL3	myeloid/lymphoid or mixed-lineage leukemia 3
MPL	myeloproliferative leukemia virus oncogene
MRE11A	MRE11 meiotic recombination 11 homolog A (S. cerevisiae)
MSH2	mutS homolog 2, colon cancer, nonpolyposis type 1 (E. coli)
MSH6	mutS homolog 6 (E. coli)
MST1	macrophage stimulating 1 (hepatocyte growth factor-like)
MST1R	macrophage stimulating 1 receptor (c-met-related tyrosine kinase)
MTOR	mechanistic target of rapamycin (serine/threonine kinase)
MUTYH	mutY homolog (E. coli)
MYC	v-myc myelocytomatosis viral oncogene homolog (avian)
MYCL1	v-myc myelocytomatosis viral oncogene homolog 1, lung carcinoma derived (avian)
MYCN	v-myc myelocytomatosis viral related oncogene, neuroblastoma derived (avian)
MYD88	myeloid differentiation primary response gene (88)
MYOD1	myogenic differentiation 1
NBN	nibrin
NCOA3	nuclear receptor coactivator 3
NCOR1	nuclear receptor corepressor 1
NEGR1	neuronal growth regulator 1
NF1	neurofibromin 1
NF2	neurofibromin 2 (merlin)
NFE2L2	nuclear factor (erythroid-derived 2)-like 2
NFKBIA	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, alpha
NKX2-1	NK2 homeobox 1
NKX3-1	NK3 homeobox 1
NOTCH1	notch 1
NOTCH2	notch 2
NOTCH3	notch 3
NOTCH4	notch 4
NPM1	nucleophosmin (nucleolar phosphoprotein B23, numatrin)
NRAS	neuroblastoma RAS viral (v-ras) oncogene homolog
NSD1	nuclear receptor binding SET domain protein 1
NTRK1	neurotrophic tyrosine kinase, receptor, type 1
NTRK2	neurotrophic tyrosine kinase, receptor, type 2

NTRK3	neurotrophic tyrosine kinase, receptor, type 3
NUP93	nucleoporin 93kDa
PAK1	p21 protein (Cdc42/Rac)-activated kinase 1
PAK7	p21 protein (Cdc42/Rac)-activated kinase 7
PALB2	partner and localizer of BRCA2
PARK2	parkinson protein 2, E3 ubiquitin protein ligase (parkin)
PARP1	poly (ADP-ribose) polymerase 1
PAX5	paired box 5
PBRM1	polybromo 1
PDCD1	programmed cell death 1
PDGFRA	platelet-derived growth factor receptor, alpha polypeptide
PDGFRB	platelet-derived growth factor receptor, beta polypeptide
PDPK1	3-phosphoinositide dependent protein kinase-1
PGR	progesterone receptor
PHOX2B	paired-like homeobox 2b
PIK3C2G	phosphoinositide-3-kinase, class 2, gamma polypeptide
PIK3C3	phosphoinositide-3-kinase, class 3
PIK3CA	phosphoinositide-3-kinase, catalytic, alpha polypeptide
PIK3CB	phosphoinositide-3-kinase, catalytic, beta polypeptide
PIK3CD	phosphoinositide-3-kinase, catalytic, delta polypeptide
PIK3CG	phosphoinositide-3-kinase, catalytic, gamma polypeptide
PIK3R1	phosphoinositide-3-kinase, regulatory subunit 1 (alpha)
PIK3R2	phosphoinositide-3-kinase, regulatory subunit 2 (beta)
PIK3R3	phosphoinositide-3-kinase, regulatory subunit 3 (gamma)
PIM1	pim-1 oncogene
PLCG2	phospholipase C, gamma 2 (phosphatidylinositol-specific)
PLK2	polo-like kinase 2
PMAIP1	phorbol-12-myristate-13-acetate-induced protein 1
PMS1	PMS1 postmeiotic segregation increased 1 (S. cerevisiae)
PMS2	PMS2 postmeiotic segregation increased 2 (S. cerevisiae)
PNRC1	proline-rich nuclear receptor coactivator 1
POLD1	polymerase (DNA directed), delta 1, catalytic subunit 125kDa
POLE	polymerase (DNA directed), epsilon
PPM1D	protein phosphatase, Mg2+/Mn2+ dependent, 1D
PPP2R1A	protein phosphatase 2, regulatory subunit A, alpha
PPP6C	protein phosphatase 6, catalytic subunit
PRDM1	PR domain containing 1, with ZNF domain
PRKAR1A	protein kinase, cAMP-dependent, regulatory, type I, alpha (tissue specific extinguisher 1)
PTCH1	patched 1

PTEN	phosphatase and tensin homolog
PTPN11	protein tyrosine phosphatase, non-receptor type 11
PTPRD	protein tyrosine phosphatase, receptor type, D
PTPRS	protein tyrosine phosphatase, receptor type, S
PTPRT	protein tyrosine phosphatase, receptor type, T
RAB35	RAB35, member RAS oncogene family
RAC1	ras-related C3 botulinum toxin substrate 1 (rho family, small GTP binding protein Rac1)
RAD21	RAD21 homolog (S. pombe)
RAD50	RAD50 homolog (S. cerevisiae)
RAD51	RAD51 homolog (RecA homolog, E. coli) (S. cerevisiae)
RAD51C	RAD51 homolog C (S. cerevisiae)
RAD51L1	RAD51-like 1 (S. cerevisiae)
RAD51L3	RAD51-like 3 (S. cerevisiae)
RAD52	RAD52 homolog (S. cerevisiae)
RAD54L	RAD54-like (S. cerevisiae)
RAF1	v-raf-1 murine leukemia viral oncogene homolog 1
RARA	retinoic acid receptor, alpha
RASA1	RAS p21 protein activator (GTPase activating protein) 1
RB1	retinoblastoma 1
RBM10	RNA binding motif protein 10
RECQL4	RecQ protein-like 4
REL	v-rel reticuloendotheliosis viral oncogene homolog (avian)
RET	ret proto-oncogene
RFWD2	ring finger and WD repeat domain 2
RHEB	Ras homolog enriched in brain
RHOA	ras homolog gene family, member A
RICTOR	RPTOR independent companion of MTOR, complex 2
RIT1	Ras-like without CAAX 1
RNF43	ring finger protein 43
ROS1	c-ros oncogene 1 , receptor tyrosine kinase
RPS6KA4	ribosomal protein S6 kinase, 90kDa, polypeptide 4
RPS6KB2	ribosomal protein S6 kinase, 70kDa, polypeptide 2
RPTOR	regulatory associated protein of MTOR, complex 1
RUNX1	runt-related transcription factor 1
RYBP	RING1 and YY1 binding protein
SDHA	succinate dehydrogenase complex, subunit A, flavoprotein (Fp)
SDHAF2	succinate dehydrogenase complex assembly factor 2
SDHB	succinate dehydrogenase complex, subunit B, iron sulfur (Ip)
SDHC	succinate dehydrogenase complex, subunit C, integral membrane protein, 15kDa

SDHD	succinate dehydrogenase complex, subunit D, integral membrane protein
SETD2	SET domain containing 2
SF3B1	splicing factor 3b, subunit 1, 155kDa
SH2B3	SH2B adaptor protein 3
SH2D1A	SH2 domain containing 1A
SHQ1	SHQ1 homolog (S. cerevisiae)
SMAD2	SMAD family member 2
SMAD3	SMAD family member 3
SMAD4	SMAD family member 4
SMARCA4	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily a, member 4
SMARCB1	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily b, member 1
SMARCD1	SWI/SNF related, matrix associated, actin dependent regulator of chromatin, subfamily d, member 1
SMO	smoothened homolog (Drosophila)
SOCS1	suppressor of cytokine signaling 1
SOX17	SRY (sex determining region Y)-box 17
SOX2	SRY (sex determining region Y)-box 2
SOX9	SRY (sex determining region Y)-box 9
SPEN	spen homolog, transcriptional regulator (Drosophila)
SPOP	speckle-type POZ protein
SRC	v-src sarcoma (Schmidt-Ruppin A-2) viral oncogene homolog (avian)
SRSF2	serine/arginine-rich splicing factor 2
STAG2	stromal antigen 2
STAT3	signal transducer and activator of transcription 3 (acute-phase response factor)
STAT5A	signal transducer and activator of transcription 5A
STAT5B	signal transducer and activator of transcription 5B
STK11	serine/threonine kinase 11
STK40	serine/threonine kinase 40
SUFU	suppressor of fused homolog (Drosophila)
SUZ12	suppressor of zeste 12 homolog (Drosophila)
SYK	spleen tyrosine kinase
TBX3	T-box 3
TCEB1	transcription elongation factor B (SIII), polypeptide 1 (15kDa, elongin C)
TCF3	transcription factor 3 (E2A immunoglobulin enhancer binding factors E12/E47)
TCF7L2	transcription factor 7-like 2 (T-cell specific, HMG-box)
TERT	telomerase reverse transcriptase
TET1	tet oncogene 1
TET2	tet oncogene family member 2
TGFBR1	transforming growth factor, beta receptor 1

TGFBR2	transforming growth factor, beta receptor II (70/80kDa)
TMEM127	transmembrane protein 127
TMPRSS2	transmembrane protease, serine 2
TNFAIP3	tumor necrosis factor, alpha-induced protein 3
TNFRSF14	tumor necrosis factor receptor superfamily, member 14 (herpesvirus entry mediator)
TOP1	topoisomerase (DNA) I
TP53	tumor protein p53
TP63	tumor protein p63
TRAF2	TNF receptor-associated factor 2
TRAF7	TNF receptor-associated factor 7
TSC1	tuberous sclerosis 1
TSC2	tuberous sclerosis 2
TSHR	thyroid stimulating hormone receptor
U2AF1	U2 small nuclear RNA auxiliary factor 1
VEGFA	vascular endothelial growth factor A
VHL	von Hippel-Lindau tumor suppressor
VTCN1	V-set domain containing T cell activation inhibitor 1
WT1	Wilms tumor 1
XIAP	X-linked inhibitor of apoptosis
XPO1	exportin 1 (CRM1 homolog, yeast)
XRCC2	X-ray repair complementing defective repair in Chinese hamster cells 2
YAP1	Yes-associated protein 1
YES1	v-yes-1 Yamaguchi sarcoma viral oncogene homolog 1
ZFHX3	zinc finger homeobox 3
ZRSR2	zinc finger (CCCH type), RNA-binding motif and serine/arginine rich 2