

Table S1 Overlapping genes between DEGs and OS in KIRC

Gene symbol	Gene ID	Median (tumor)	Median (normal)	Log ₂ (fold change)	Adjusted P	P value (survival OS)
<i>WDR72</i>	ENSG00000166415.14	10.53	29.804	-1.418	4.50E-24	2.25E-13
<i>C1orf210</i>	ENSG00000253313.5	6.96	21.635	-1.508	5.83E-21	7.72E-12
<i>IL20RB</i>	ENSG00000174564.12	1.33	0.16	1.006	5.54E-17	7.83E-12
<i>FZD1</i>	ENSG00000157240.3	27.68	9.655	1.429	4.30E-28	1.48E-11
<i>MPP7</i>	ENSG00000150054.18	1.33	9.21	-2.132	7.08E-70	2.05E-11
<i>PANK1</i>	ENSG00000152782.16	7.82	19.809	-1.238	2.62E-14	3.41E-11
<i>SLC16A12</i>	ENSG00000152779.13	20.31	45.55	-1.127	5.93E-05	3.52E-11
<i>ANK3</i>	ENSG00000151150.20	23.789	54.524	-1.163	3.54E-12	5.66E-11
<i>G6PC</i>	ENSG00000131482.9	0.71	6.662	-2.164	6.89E-21	7.58E-11
<i>SPATA18</i>	ENSG00000163071.10	15.45	3.904	1.746	3.91E-31	7.82E-11
<i>SOX6</i>	ENSG00000110693.15	4.07	9.71	-1.079	8.96E-09	8.75E-11
<i>TLN2</i>	ENSG00000171914.14	16.9	35.444	-1.026	5.69E-13	1.25E-10
<i>ACADM</i>	ENSG00000117054.13	57.671	134.745	-1.21	4.97E-14	1.76E-10
<i>ALDH6A1</i>	ENSG00000119711.12	12.85	57.382	-2.076	1.20E-46	1.81E-10
<i>PAQR5</i>	ENSG00000137819.13	11.16	37.993	-1.681	8.39E-29	2.97E-10
<i>AUH</i>	ENSG00000148090.11	19.779	46.091	-1.18	9.21E-24	4.85E-10
<i>MYO6</i>	ENSG00000196586.13	18.911	41.869	-1.106	1.13E-16	6.85E-10
<i>FREM2</i>	ENSG00000150893.10	1.68	5.65	-1.311	9.18E-24	7.25E-10
<i>KIF13B</i>	ENSG00000197892.12	8.02	21.254	-1.303	1.11E-26	1.10E-09
<i>ATP6V1C2</i>	ENSG00000143882.9	0.67	14.26	-3.192	9.61E-98	1.26E-09
<i>TRPM3</i>	ENSG00000083067.22	1.84	5.575	-1.211	6.14E-25	1.48E-09
<i>CDS1</i>	ENSG00000163624.5	5.57	12.87	-1.078	8.19E-17	1.54E-09
<i>SLC25A4</i>	ENSG00000151729.10	30.6	63.094	-1.02	3.22E-20	1.61E-09
<i>FLRT3</i>	ENSG00000125848.9	6.91	23	-1.601	4.48E-13	1.70E-09
<i>MTURN</i>	ENSG00000180354.15	7.96	45.71	-2.382	7.07E-64	1.81E-09
<i>IRF6</i>	ENSG00000117595.10	5.02	20.364	-1.827	1.57E-28	2.14E-09
<i>RP11-152H18.3</i>	ENSG00000254665.1	1.39	0.125	1.087	3.80E-03	2.44E-09
<i>LRP2</i>	ENSG00000081479.12	75.019	35.221	1.07	6.61E-03	2.70E-09
<i>TLR3</i>	ENSG00000164342.12	33.55	9.685	1.693	1.14E-24	2.80E-09
<i>RP11-297L17.2</i>	ENSG00000260963.1	0.76	5.075	-1.787	1.02E-54	3.43E-09
<i>ERBB2</i>	ENSG00000141736.13	35.931	91.356	-1.322	3.11E-24	5.33E-09
<i>GJB1</i>	ENSG00000169562.9	10.47	24.794	-1.169	3.88E-16	6.19E-09
<i>DOCK8</i>	ENSG00000107099.15	18.371	7.6	1.171	7.44E-29	6.35E-09
<i>PRUNE2</i>	ENSG00000106772.17	51.228	14.709	1.733	1.12E-21	6.37E-09
<i>TEK</i>	ENSG00000120156.20	9.06	22.06	-1.197	2.06E-14	6.88E-09
<i>COL4A4</i>	ENSG00000081052.11	2.25	11.375	-1.929	8.28E-62	8.42E-09
<i>CLCN5</i>	ENSG00000171365.15	9.07	22.608	-1.229	5.21E-15	8.62E-09
<i>LRRC19</i>	ENSG00000184434.7	3.6	17.644	-2.019	4.41E-28	1.26E-08
<i>RP11-386G11.10</i>	ENSG00000258017.1	122.623	27.296	2.127	1.36E-32	1.28E-08
<i>AP5M1</i>	ENSG00000053770.11	11.6	24.36	-1.009	1.54E-12	1.38E-08
<i>SLC10A2</i>	ENSG00000125255.6	3.51	1.22	1.023	9.11E-03	1.46E-08
<i>RBM47</i>	ENSG00000163694.14	31.491	64.619	-1.014	4.08E-11	1.46E-08
<i>UGT2A3</i>	ENSG00000135220.10	49.49	20.859	1.208	1.02E-04	1.50E-08
<i>CX3CL1</i>	ENSG00000006210.6	86.689	39.175	1.126	1.82E-20	1.83E-08
<i>ATP6V1A</i>	ENSG00000114573.9	31.55	90.93	-1.498	2.11E-15	1.85E-08
<i>CALCRL</i>	ENSG00000064989.12	31.291	14.874	1.024	1.51E-11	2.02E-08
<i>CEACAM1</i>	ENSG00000079385.21	8.06	21.714	-1.326	1.81E-26	2.35E-08
<i>SYNJ2BP</i>	ENSG00000213463.4	10.47	23.167	-1.075	7.04E-21	2.53E-08
<i>GPD1L</i>	ENSG00000152642.10	6.69	25.12	-1.764	4.29E-37	2.55E-08
<i>CRHBP</i>	ENSG00000145708.10	0.83	16.925	-3.292	4.44E-83	2.88E-08
<i>HYAL1</i>	ENSG00000114378.16	20.281	42.26	-1.023	2.94E-17	2.89E-08
<i>NR3C2</i>	ENSG00000151623.14	2.89	12.144	-1.757	1.72E-37	3.15E-08
<i>CPEB4</i>	ENSG00000113742.12	15.12	34.228	-1.128	3.82E-10	3.25E-08
<i>OGDHL</i>	ENSG00000197444.9	14.56	97.392	-2.661	1.40E-35	3.54E-08
<i>BSPRY</i>	ENSG00000119411.10	1.76	12.069	-2.243	7.00E-54	3.70E-08
<i>TMEM82</i>	ENSG00000162460.6	1.66	5.353	-1.256	9.01E-08	3.83E-08
<i>NCOA7</i>	ENSG00000111912.18	24.261	50.808	-1.036	2.31E-11	3.98E-08
<i>TMEM25</i>	ENSG00000149582.15	10.23	23.665	-1.135	1.16E-19	4.12E-08
<i>GRAMD1C</i>	ENSG00000178075.19	6.26	17.295	-1.333	4.43E-25	4.14E-08
<i>ACADSB</i>	ENSG00000196177.12	11.04	31.064	-1.413	5.03E-29	4.55E-08
<i>ACAT1</i>	ENSG00000075239.13	111.283	263.653	-1.237	9.32E-16	4.72E-08
<i>HADH</i>	ENSG00000138796.15	30.189	80.258	-1.381	1.94E-35	5.23E-08
<i>ENAM</i>	ENSG00000132464.11	1.46	6.475	-1.603	3.34E-25	5.92E-08
<i>TNIP1</i>	ENSG00000145901.14	192.204	83.966	1.185	6.55E-37	5.98E-08
<i>NPY6R</i>	ENSG00000226306.6	8.53	2.361	1.504	6.23E-13	6.27E-08
<i>KCNAB1</i>	ENSG00000169282.17	4.45	1.21	1.302	1.66E-22	6.68E-08
<i>PCCA</i>	ENSG00000175198.14	32.599	70.766	-1.095	1.42E-20	6.93E-08
<i>ATP11A</i>	ENSG00000068650.18	44.39	14.475	1.552	8.96E-22	7.61E-08
<i>DNASE1L3</i>	ENSG00000163687.13	4.9	29.931	-2.39	2.54E-46	8.41E-08
<i>DBT</i>	ENSG00000137992.14	3.84	11.124	-1.325	1.22E-28	9.30E-08
<i>L2HGDH</i>	ENSG00000087299.11	2.98	7.609	-1.113	5.99E-24	9.57E-08
<i>EPB41L5</i>	ENSG00000115109.13	7.53	29.984	-1.861	8.53E-48	9.98E-08
<i>CLDN10</i>	ENSG00000134873.9	24.12	123.956	-2.315	8.93E-41	1.01E-07
<i>NEBL</i>	ENSG00000078114.18	9.51	24.48	-1.278	1.60E-15	1.02E-07
<i>ATP5A1</i>	ENSG00000152234.15	264.348	649.731	-1.294	8.26E-23	1.02E-07
<i>NTN4</i>	ENSG00000074527.11	39.24	92.612	-1.218	1.99E-11	1.04E-07
<i>MFSD4</i>	ENSG00000174514.12	6.53	58.231	-2.976	5.01E-73	1.07E-07
<i>MPP5</i>	ENSG00000072415.8	9.27	21.635	-1.14	7.22E-21	1.12E-07
<i>GNG7</i>	ENSG00000176533.12	3.41	8.52	-1.11	1.09E-36	1.12E-07
<i>RIT1</i>	ENSG00000143622.10	37.93	18.1	1.027	2.73E-21	1.18E-07
<i>MYL3</i>	ENSG00000160808.9	5.7	21.944	-1.776	3.22E-22	1.29E-07

DEGs, differentially expressed genes; OS, overall survival-related differential survival genes; KIRC, kidney renal clear cell carcinoma.

Table S2 Overlapping genes between DEGs and OS in KICH

Gene symbol	Gene ID	Median (tumor)	Median (normal)	Log ₂ (fold change)	Adjusted P	P value (survival OS)
<i>SEC61A2</i>	ENSG00000065665.20	1.085	3.97	-1.253	3.44E-09	0.000273
<i>ITGAE</i>	ENSG00000083457.11	7.137	23	-1.56	2.33E-08	0.000285
<i>BNIP3</i>	ENSG00000176171.11	20.599	42.411	-1.007	0.00118	0.000386
<i>NT5C3B</i>	ENSG00000141698.16	22.525	52.53	-1.186	0.000118	0.000504
<i>ANKRD6</i>	ENSG00000135299.16	2.185	9.31	-1.695	4.08E-09	0.000641
<i>SYNGR3</i>	ENSG00000127561.14	34.959	1.64	3.768	5.19E-25	0.000678
<i>SLC16A1</i>	ENSG00000155380.11	6.355	2.46	1.088	0.000185	0.000752
<i>FAM104B</i>	ENSG00000182518.13	6.485	20.11	-1.496	0.00000144	0.000808
<i>DALRD3</i>	ENSG00000178149.16	13.965	33.121	-1.189	0.0000107	0.00084
<i>RAB23</i>	ENSG00000112210.11	1.175	4.14	-1.241	0.0000036	0.000872
<i>MT1H</i>	ENSG00000205358.3	0.31	147.267	-6.823	2.21E-20	0.000896
<i>CTNNBIP1</i>	ENSG00000178585.14	5.99	13.46	-1.049	0.0000121	0.000928
<i>TEX30</i>	ENSG00000151287.16	3.635	12.28	-1.519	3.39E-09	0.000937
<i>PITPNA-AS1</i>	ENSG00000236618.2	5.579	12.83	-1.072	0.000689	0.000955
<i>CCDC13</i>	ENSG00000244607.5	0.84	2.94	-1.099	4.45E-11	0.000979
<i>CLDN3</i>	ENSG00000165215.6	4.938	46.401	-2.997	3.1E-11	0.000989
<i>WDR27</i>	ENSG00000184465.15	2.7	11.57	-1.764	1.79E-10	0.001
<i>MRPL9</i>	ENSG00000143436.10	19.191	39.681	-1.011	0.000442	0.00114
<i>PLEKHA2</i>	ENSG00000169499.14	4.38	13.67	-1.447	9.47E-09	0.00116
<i>AURKA</i>	ENSG00000087586.17	5.54	1.58	1.342	1.16E-11	0.0012
<i>PTBP2</i>	ENSG00000117569.18	2.945	8.36	-1.247	2.56E-08	0.0013
<i>KIF9</i>	ENSG00000088727.12	5.415	20.11	-1.718	6.51E-09	0.00131
<i>ANKRD65</i>	ENSG00000235098.8	0.655	3.52	-1.45	2.91E-12	0.00132
<i>HRG</i>	ENSG00000113905.4	0.01	6.45	-2.883	6.78E-14	0.0014
<i>XYLB</i>	ENSG00000093217.9	0.28	1.56	-1	1.41E-08	0.00141
<i>MED31</i>	ENSG00000108590.10	5.49	12.04	-1.007	0.0000124	0.00168
<i>TPRKB</i>	ENSG00000144034.14	12.585	26.39	-1.012	0.000082	0.00175
<i>MYL6B</i>	ENSG00000196465.10	29.283	77.632	-1.377	0.000207	0.00188
<i>ADM</i>	ENSG00000148926.9	79.519	36.269	1.111	0.000127	0.00191
<i>NBPF15</i>	ENSG00000266338.6	2.08	7.7	-1.498	7.3E-09	0.00225
<i>HNF4A</i>	ENSG00000101076.16	0.105	6.52	-2.767	8.1E-16	0.00236
<i>OGG1</i>	ENSG00000114026.21	9.78	21.11	-1.036	0.00000216	0.00255
<i>SHFM1</i>	ENSG00000127922.9	240.725	114.19	1.069	0.00000575	0.0026
<i>IDS</i>	ENSG00000241489.7	0.989	3.28	-1.105	0.0022	0.00263
<i>CTB-191K22.5</i>	ENSG00000267815.1	11.466	4.68	1.134	0.00094	0.00296
<i>KIF26A</i>	ENSG00000066735.14	0.31	1.99	-1.191	0.000000046	0.00305
<i>ABI3BP</i>	ENSG00000154175.16	2.01	13.09	-2.227	9.36E-10	0.00326
<i>MNS1</i>	ENSG00000138587.5	0.53	6.25	-2.244	5.88E-13	0.00336
<i>KANK3</i>	ENSG00000186994.11	2.38	10.87	-1.812	3.03E-10	0.00348
<i>CTD-2015H6.3</i>	ENSG00000249042.5	0.58	2.97	-1.329	6.72E-09	0.00364
<i>C1QTNF3</i>	ENSG00000082196.20	1.095	6.18	-1.777	1.28E-13	0.00374
<i>HDAC1</i>	ENSG00000116478.11	23.68	60.9	-1.327	0.00004	0.00376
<i>MSTO1</i>	ENSG00000125459.14	6.245	16.56	-1.277	6.62E-10	0.00382
<i>RP11-295G20.2</i>	ENSG00000233461.5	2.285	6.68	-1.225	0.0000735	0.00388
<i>RAD51D</i>	ENSG00000185379.20	2.24	5.78	-1.065	0.000000277	0.00422
<i>AGAP1</i>	ENSG00000157985.17	2.625	6.87	-1.118	0.00134	0.00439

Table S3 Overlapping genes between DEGs and OS in KIRP

Gene symbol	Gene ID	Median (tumor)	Median (normal)	Log ₂ (fold change)	Adjusted P	P value (survival OS)
<i>HOXD11</i>	ENSG00000128713.12	0.16	3.29	-1.887	1.35E-19	0.0000131
<i>KLK6</i>	ENSG00000167755.13	0.06	9.628	-3.326	1.07E-18	0.0000316
<i>IL15RA</i>	ENSG00000134470.19	2.32	6.424	-1.161	0.00159	0.0000385
<i>SLC6A20</i>	ENSG00000163817.15	10.925	1.27	2.393	9.13E-13	0.0000895
<i>MYH11</i>	ENSG00000133392.16	2.465	29.635	-3.144	1.51E-15	0.0000919
<i>CPNE5</i>	ENSG00000124772.11	0.39	2.035	-1.127	0.0000136	0.000119
<i>PTH1R</i>	ENSG00000160801.13	66.942	271.893	-2.006	5.18E-08	0.000128
<i>RP11-617F23.1</i>	ENSG00000259291.2	10.045	26.345	-1.308	1.06E-15	0.000152
<i>RP11-63A11.1</i>	ENSG00000250781.1	0.325	2.925	-1.567	3.8E-16	0.000158
<i>ASPN</i>	ENSG00000106819.11	0.57	3.195	-1.418	1.89E-11	0.000162
<i>LINGO1</i>	ENSG00000169783.12	0.42	2.205	-1.174	1.77E-11	0.000164
<i>PAQR4</i>	ENSG00000162073.13	6.735	1.444	1.662	2.68E-20	0.00017
<i>MYBL2</i>	ENSG00000101057.15	1.495	0.13	1.143	1.79E-12	0.000203
<i>C19orf33</i>	ENSG00000167644.11	270.052	23.933	3.442	1.66E-15	0.000254
<i>TOP2A</i>	ENSG00000131747.14	3.29	0.415	1.6	1.48E-17	0.000287
<i>AC245100.1</i>	ENSG00000280649.1	10.83	4.74	1.043	4.61E-13	0.000313
<i>FOLH1</i>	ENSG00000086205.16	0.54	4.775	-1.907	4.86E-16	0.000324
<i>UBE2C</i>	ENSG00000175063.16	3.795	0.7	1.496	5.66E-15	0.000366
<i>NOTCH3</i>	ENSG00000074181.8	2.915	19.429	-2.384	4.99E-10	0.000402
<i>CENPH</i>	ENSG00000153044.9	3.58	1.19	1.064	2.78E-17	0.000417
<i>ALOX15B</i>	ENSG00000179593.15	1.235	0.065	1.069	6.26E-08	0.000424
<i>PTGIS</i>	ENSG00000124212.5	0.65	2.735	-1.179	0.000186	0.000428
<i>CNN1</i>	ENSG00000130176.7	1.565	11.524	-2.288	1.02E-12	0.000434
<i>HSPB6</i>	ENSG00000004776.11	3.369	24.524	-2.547	2.85E-21	0.000436
<i>RGS5</i>	ENSG00000143248.12	12.605	45.822	-1.783	0.000379	0.000447
<i>LBP</i>	ENSG00000129988.5	0.055	1.339	-1.149	6.88E-11	0.000455
<i>VEGFA</i>	ENSG00000112715.20	21.29	77.203	-1.811	0.000000086	0.00046
<i>TFAP2A</i>	ENSG00000137203.10	0.17	7.74	-2.901	8.86E-26	0.000479
<i>RASGRF2</i>	ENSG00000113319.11	0.39	3.14	-1.575	1.05E-24	0.000506
<i>CDT1</i>	ENSG00000167513.8	2.63	0.565	1.214	1.4E-21	0.000511
<i>MIOX</i>	ENSG00000100253.12	68.429	143.537	-1.058	0.000715	0.000513
<i>P4HB</i>	ENSG00000185624.14	609.675	282.684	1.106	3.27E-26	0.000555
<i>HOXA11</i>	ENSG00000005073.5	0.56	2.123	-1.001	0.00455	0.000563
<i>NOVA2</i>	ENSG00000104967.6	0.19	1.615	-1.136	7.99E-34	0.000581
<i>SPAG5</i>	ENSG00000076382.16	4.825	18.076	-1.711	1.53E-12	0.000591
<i>NR2F1</i>	ENSG00000175745.11	2.24	23.235	-2.903	1.14E-28	0.000636
<i>C16orf89</i>	ENSG00000153446.15	0.39	20.448	-3.948	4.46E-37	0.00067
<i>PSAT1</i>	ENSG00000135069.13	7.675	31.333	-1.898	0.000000095	0.000736
<i>CLDN3</i>	ENSG00000165215.6	193.299	41.871	2.18	9.23E-09	0.00077
<i>CHIT1</i>	ENSG00000133063.15	11.358	0.22	3.341	1.1E-14	0.000785
<i>COL12A1</i>	ENSG00000111799.20	3.325	9.565	-1.288	0.000000272	0.000815
<i>C15orf59</i>	ENSG00000205363.5	4.695	14.039	-1.401	0.00000105	0.00085
<i>PYCR1</i>	ENSG00000183010.16	7.29	2.219	1.365	1.95E-10	0.000941
<i>ADCY2</i>	ENSG00000078295.15	2.93	0.385	1.505	1.21E-10	0.000964
<i>HOXD10</i>	ENSG00000128710.5	0.33	17.407	-3.791	3.87E-35	0.00104
<i>ANO1</i>	ENSG00000131620.17	1.07	3.28	-1.048	0.00083	0.00108
<i>NOS3</i>	ENSG00000164867.10	1.635	9.18	-1.95	6.93E-30	0.00114
<i>FAM83F</i>	ENSG00000133477.16	0.415	3.065	-1.522	7.99E-09	0.00116
<i>AURKB</i>	ENSG00000178999.12	1.88	0.39	1.051	1.8E-12	0.00116
<i>ENO2</i>	ENSG00000111674.8	32.474	7.055	2.055	6.25E-18	0.00119
<i>TMEM171</i>	ENSG00000157111.12	22.554	8.805	1.264	0.00259	0.00124
<i>PRSS35</i>	ENSG00000146250.6	0.07	1.149	-1.006	1.46E-15	0.00125
<i>CACNA1C</i>	ENSG00000151067.20	0.23	1.795	-1.184	1.33E-25	0.00126
<i>MFAP4</i>	ENSG00000166482.11	7.41	31.989	-1.972	2.49E-12	0.00128
<i>DPYSL3</i>	ENSG00000113657.12	1.2	5.727	-1.612	0.0000542	0.00131
<i>CTB-193M12.5</i>	ENSG00000280206.1	4.73	1.47	1.214	5.47E-20	0.00131
<i>RP11-231P20.2</i>	ENSG00000236155.6	2.945	7.36	-1.083	2.5E-14	0.00139
<i>FLRT2</i>	ENSG00000185070.10	0.18	1.62	-1.151	3.51E-27	0.0014
<i>SERPINH1</i>	ENSG00000149257.13	96.018	42.395	1.161	2.23E-19	0.00142
<i>NRN1</i>	ENSG00000124785.8	0.815	4.605	-1.627	4.81E-33	0.00148
<i>USH1C</i>	ENSG00000006611.15	107.761	47.392	1.168	0.0000225	0.00155
<i>SCN1B</i>	ENSG00000105711.10	11.735	5.1	1.062	8.73E-08	0.00156
<i>PCDH12</i>	ENSG00000113555.5	0.935	4.735	-1.567	3.98E-25	0.00163
<i>PRAM1</i>	ENSG00000133246.11	3.475	0.69	1.405	1.07E-16	0.00167
<i>FAM134B</i>	ENSG00000154153.13	58.25	25.94	1.137	2.94E-13	0.00167
<i>SLC39A8</i>	ENSG00000138821.12	20.589	7.865	1.284	0.000000493	0.00168
<i>FZD7</i>	ENSG00000155760.2	1.6	5.834	-1.394	2.53E-11	0.00171
<i>RASL11B</i>	ENSG00000128045.6	0.18	14.074	-3.675	6.44E-83	0.00173

DEGs, differentially expressed genes; OS, overall survival-related differential survival genes; KIRP, kidney renal papillary cell carcinoma.

Table S4 Five key genes associated with overall survival of KIRC in Prognoscan database

Dataset	Gene symbol	Gene ID	Endpoint	N	HR (95% CI)	COX P-VALUE	Log ₂ (fold change)
<i>E-DKFZ-1</i>	ANK3	ENSG00000151150.20	Overall survival	59	2.65 (0.42–16.51)	0.296880	–1.163
<i>E-DKFZ-1</i>	FREM2	ENSG00000150893.10	Overall survival	59	2.75 (0.54–13.93)	0.221532	–1.311
<i>E-DKFZ-1</i>	KIF13B	ENSG00000197892.12	Overall survival	59	0.48 (0.10–2.24)	0.352628	–1.303
<i>E-DKFZ-1</i>	MPP7	ENSG00000150054.18	Overall survival	59	0.16 (0.03–0.81)	0.026543	–2.132
<i>E-DKFZ-1</i>	SOX6	ENSG00000110693.15	Overall survival	59	2.81 (0.62–12.78)	0.181474	–1.079

KIRC, kidney renal clear cell carcinoma; HR, hazard ratio; CI, confidence interval.