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| **Supplementary Information 9. Survival analysis of RAD51 and RAD52-dependent ALT activation pathways.** | | | | | |
|  | | **MFS** | | **OS** | |
| **HR**  **(95% CI)** | ***P*** | **HR**  **(95% CI)** | ***P*** |
| **Telomere** | | 1.952  (0.485 to 7.860) | *0.347* | 3.809  (1.076 to 13.479) | *0.038* |
| **TME-*NELL2*-*PAX7* cascades** | ***MEGF11*** | 4.516  (1.105 to 18.459) | *0.036* | 2.797  (0.718 to 10.890) | *0.138* |
| ***EHPA6*** | 4.445  (0.925 to 21.360) | *0.063* | 1.456  (0.375 to 5.651) | *0.588* |
| ***PARD6B*** | 17.185  (1.923 to 153.558) | *0.011* | 1.851  (0.532 to 6.449) | *0.333* |
| ***PDZD9*** | 2.550  (0.644 to 10.097) | *0.182* | 1.964  (0.506 to 7.629) | *0.330* |
| ***NELL2*** | 1.683  (0.352 to 8.041) | *0.514* | 0.663  (0.170 to 2.579) | *0.553* |
| ***PAX7*** | 9.129  (1.818 to 45.847) | *0.007* | 4.896  (1.026 to 23.363) | *0.046* |
| ***RAD52*** | 8.669  (1.654 to 45.432) | *0.011* | 2.055  (0.574 to 7.354) | *0.268* |
| **DNA damage signal** | ***H2AFX*** | 2.669  (0.555 to 12.844) | *0.221* | 2.358  (0.499 to 11.148) | *0.279* |
| ***RAD51*** | 2.474  (0.511 to 11.978) | *0.260* | 2.291  (0.484 to 10.846) | *0.296* |
| Abbreviations: MFS, metastasis-free survival; OS, overall 5years survival; HR, hazard ratio; CI, confidence interval; TME, tumor microenvironment | | | | | |