Supplementary Figure 1. Imaging features of EWSR1-BEND2 fused gliomas.
Patient #1, 20 y/o M, brainstem, *EWSR1-BEND2* fusion, histologic features = astroblastoma

**Supplementary Figure 2.** Histologic features of *EWSR1-BEND2* fused gliomas. Shown are H&E stained sections at various magnifications for each of the four tumors.
Patient #2, 6 y/o F, cervical spinal cord, *EWSR1-BEND2* fusion, histologic features = astroblastoma
Patient #3, 26 y/o F, initial resection, R frontal lobe, *EWSR1-BEND2* fusion, histologic features = astroblastoma
Patient #3, 26 y/o F, recurrent tumor resection, *EWSR1-BEND2* fusion, histologic features = astroblastoma
Patient #4, 6 y/o F, left frontal lobe, *EWSR1-BEND2* fusion, histologic features = astroblastoma
Supplementary Figure 3. Immunohistochemical features of *EWSR1-BEND2* fused gliomas. Shown are representative images of Gomori trichrome staining and immunostains for GFAP, OLIG2, EMA, synaptophysin, and BCOR.
Supplementary Figure 4. Snapshots from the Integrative Genome Viewer showing sequencing reads spanning the EWSR1-BEND2 fusion breakpoints in tumor #4. The fusion junction is between intron 7-8 of EWSR1 and exon 3 of BEND2. This fusion is expected to result in an in-frame fusion transcript with the 5’ portion composed of exons 1-7 (codons 1-199) of EWSR1 and the 3’ portion composed of exons 4-14 (codons 126-799) of BEND2. RefSeq transcripts used for annotation: EWSR1, NM_013986; BEND2, NM_153346.
Supplementary Figure 5. Chromosomal copy number plots for tumor #4 demonstrating that the EWSR1-BEND2 fusion resulted from an unbalanced translocation between the EWSR1 locus at chromosome 22q12.2 and the BEND2 locus at chromosome Xp22.13.
Supplementary Figure 6. Gliomas with EWSR1-BEND2 fusion resolve into a distinct epigenetic group most similar to the methylation class “HGNET, MN1”. tSNE plot of genome-wide DNA methylation profiles from 4 EWSR1-BEND2-fused gliomas alongside 1,099 reference tumors spanning 25 CNS tumor entities.

A IDH - astrocytoma, IDH-mutant; A IDH, HG - astrocytoma, IDH-mutant, high-grade; ANA PA - high-grade astrocytoma with piloid features; DLGNT - diffuse leptomeningeal glioneuronal tumor; DMG, K27 - diffuse midline glioma, H3 K27-mutant; EPN, RELA - supratentorial ependymoma, RELA-fused; EPN, YAP - supratentorial ependymoma, YAP1-fused; GBM, G34 - diffuse hemispheric glioma, H3 G34-mutant; GBM, MES - glioblastoma, IDH-wildtype, mesenchymal subclass; GBM, MID - glioblastoma, IDH-wildtype, midline subclass; GBM, MYCN - glioblastoma, IDH-wildtype, MYCN subclass; GBM, RTK I - glioblastoma, IDH-wildtype, RTK1 subclass; GBM, RTK II - glioblastoma, IDH-wildtype, RTK2 subclass; GBM, RTK III - glioblastoma, IDH-wildtype, RTK3 subclass; HGNET, BCOR - CNS tumor with BCOR tandem duplication; HGNET, MN1 - astroblastoma, MN1-altered; LGG, DNT - dysembryoplastic neuroepithelial tumor; LGG, GG - ganglioglioma; LGG, MYB - pediatric-type diffuse low-grade glioma, MYB/MYBL1 fusion positive; LGG, PA MID - pilocytic astrocytoma, midline subclass; LGG, PA PF - pilocytic astrocytoma, posterior fossa subclass; LGG, PA/GG ST - pilocytic astrocytoma, supratentorial subclass; LGG, RGNT - rosette-forming glioneuronal tumor; O IDH - oligodendroglioma, IDH-mutant and 1p/19q-codeleted; PXA - pleomorphic xanthoastrocytoma