BRAIN TUMOR SURVIVAL: RESULTS FROM THE CURRENT NATIONAL CANCER DATA BASE

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BACKGROUND:
We evaluated the National Cancer Data Base (NCDB) to describe current hospital-based epidemiologic survival patterns of brain and central nervous system (CNS) tumors.

METHODS:
NCDB data were analyzed for patients diagnosed with brain and CNS tumors defined according to the World Health Organization Classification of Tumours of the Central Nervous System.[1] The classification scheme involves histological grading that provides a means to predict prognostic outcomes having importance to survival. Diagnosis years 2004-2006 were selected for this study to coincide with implementation of *The Benign Brain Tumor Cancer Registries Amendment Act*. Survival estimates were generated using the Kaplan-Meier method with a follow-up cutoff date of December 2011. The survival analyses included detailed tumor classifications, tumor WHO grade groupings; demographic characteristics and primary site location were evaluated. Parallel analyses were conducted using the SEER 18 registries research database.[2]

RESULTS:

- The NCDB included substantially greater representation of WHO grades II, III, and especially IV tumors than SEER; whereas the SEER dataset included considerably more WHO grade I tumors than NCDB reflecting differences in hospital vs. population-based registries. (Figure 1.)
- Table 1 presents 5-year survival rates for detailed WHO tumor classifications. NCDB and SEER survival estimates were observed to be similar.

Figure 1. Brain Tumor WHO Grade Distribution for NCDB and SEER 18 Registries Cases, 2004-2006

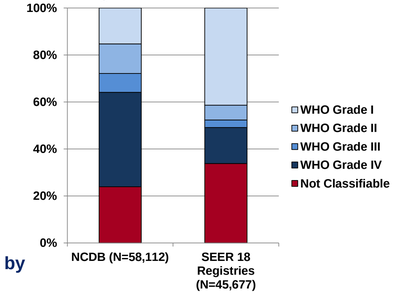
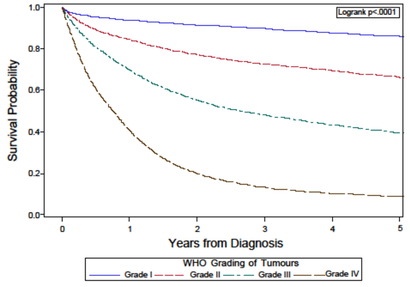


Figure 2. NCDB Five-year Overall Survival by WHO Grade, 2004-2006 Cases



- An inverse relationship was seen between WHO grade and survival. The most favorable survival was observed for WHO grade I with diminishing survival time as WHO grade increased. (Figure 2. Table 2. Figure 3.)
- Histology, gender, race, age, and primary site of tumor location were important factors influencing survival outcomes.

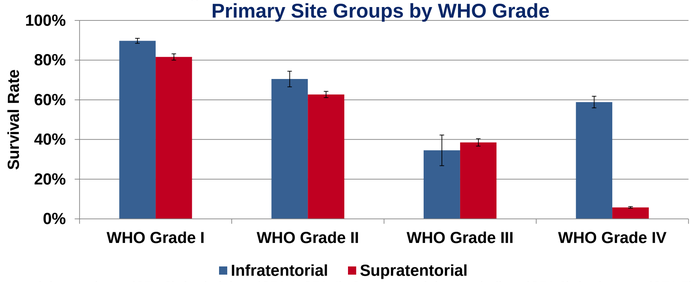
COMMENT:
Our findings are among the first to report survival outcomes for benign and borderline malignancy in addition to malignant brain and CNS tumors after implementation of Public Law 107-206.

Table 1. Five-Year Survival Rates (%) for Selected Histologies by WHO Grade Classification, 2004-2006

	NCDB			SEER 18 Registries		
WHO Grade I	**N**	**Rate**	**95% CI**	**N**	**Rate**	**95% CI**
Choroid plexus papilloma 9390/0	237	91.8	(87.1-94.9)	96	88.4	(80.0-93.4)
Craniopharyngioma 9350/1	171	79.8	(72.6-85.3)	255	81.8	(76.4-86.1)
Dysembryoplastic neuroepithelial tumour 9413/0	236	99.5	(96.6-99.9)	102	100.0	(100.0-100.0)
Gangliocytoma 9492/0	51	92.5	(78.5-97.5)	~	~	~
Ganglioglioma 9505/1	586	92.5	(89.8-94.5)	268	91.2	(87.0-94.1)
Haemangioblastoma 9161/1	80	88.5	(86.2-90.4)	387	88.1	(84.4-91.0)
Meningioma 9530/0	269	68.4	(66.2-70.5)	12,573	72.8	(72.0-73.6)
Myxopapillary ependymoma 9394/1	704	95.4	(93.3-96.8)	261	96.9	(93.8-98.4)
Neurofibroma 9540/0	~	~	~	81	92.2	(83.4-96.4)
Paraganglioma of the spinal cord 8680/1	72	93.0	(82.3-97.3)	~	~	~
Pilocytic astrocytoma 9421/3	893	92.7	(91.3-93.8)	710	93.8	(91.7-95.4)
Schwannoma 9560/0	128	90.1	(88.1-91.9)	3,915	93.9	(93.1-94.7)
Subependymal giant cell astrocytoma 9384/1	88	88.6	(79.2-93.9)	58	91.3	(80.4-96.3)
Subependymoma 9383/1	325	88.4	(84.2-91.6)	103	90.3	(82.7-94.7)
	NCDB			**SEER 18 Registries**		
WHO Grade II	**N**	**Rate**	**95% CI**	**N**	**Rate**	**95% CI**
Atypical meningioma 9539/1	155	63.9	(54.6-71.7)	524	73.2	(69.2-76.9)
Central neurocytoma 9506/1	201	89.5	(84.0-93.2)	82	81.2	(70.8-88.2)
Diffuse astrocytoma 9400/3	89	45.7	(43.9-47.6)	964	47.3	(44.1-50.4)
Ependymoma cellular, papillary, clear cell tanycytic 9391/3,9393/3	573	85.9	(84.0-87.6)	509	87.0	(83.7-89.6)
Haemangiopericytoma 9150/1	108	83.6	(74.1-89.8)	54	84.9	(72.0-92.1)
Oligodendroglioma 9450/3	998	78.5	(76.5-80.4)	667	77.0	(73.6-80.1)
Pleomorphic xanthoastrocytoma 9424/3	156	73.0	(64.7-79.6)	56	81.8	(68.8-89.8
	NCDB			**SEER 18 Registries**		
WHO Grade III	**N**	**Rate**	**95% CI**	**N**	**Rate**	**95% CI**
Anaplastic astrocytoma 9401/3	649	25.9	(24.2-27.7)	762	28.0	(24.8-31.2)
Anaplastic ependymoma 9392/3	258	63.9	(57.3-69.9)	83	58.1	(46.6-68.0)
Anaplastic ganglioglioma 9505/3	61	52.1	(37.7-64.6)	~	~	~
Anaplastic haemangiopericytoma 9150/3	71	74.7	(62.4-83.4)	~	~	~
Anaplastic oligodendroglioma 9451/3	834	54.7	(51.1-58.1)	296	50.3	(44.4-55.8)
Anaplastic (malignant) meningioma 9530/3	708	58.0	(54.0-61.9)	239	54.5	(47.9-60.6)
Choroid plexus carcinoma 9390/3	58	70.8	(56.7-81.0)	~	~	~
	NCDB			**SEER 18 Registries**		
WHO Grade IV	**N**	**Rate**	**95% CI**	**N**	**Rate**	**95% CI**
Atypical teratoid / rhabdoid tumour 9508/3	134	21.9	(15.0-29.6)	53	19.7	(10.2-31.4)
CNS primitive neuroectodermal tumour 9473/3	281	39.5	(33.5-45.4)	127	47.7	(38.6-56.2)
Giant cell glioblastoma 9441/3	195	16.6	(11.5-22.5)	74	17.3	(9.6-26.9)
Glioblastoma 9440/3	274	5.0	(4.7-5.3)	6,284	5.0	(4.5-5.6)
Gliosarcoma 9442/3	408	5.3	(3.4-7.9)	129	3.9	(1.4-8.2)
Medulloblastoma 9470/3, 9471/3, 9474/3	98	74.9	(72.1-77.5)	331	70.3	(65.1-75.0)

~ Rates are suppressed for histologies with less than 50 cases. CI – Confidence Interval

Figure 3. NCDB Five-year Survival Rates for Primary Site Groups by WHO Grade



Infratentorial – cerebrum (C71.0), brain lobes (C71.1-C71.4); Supratentorial – cerebellum (C71.6), brain stem (C71.7).

Table 2. NCDB Five-year Survival Rates (%) for Selected Demographic Characteristics by WHO Grade, 2004-2006

	WHO Grade I		WHO Grade II		WHO Grade III		WHO Grade IV	
Gender	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
Male	87.5	(86.4-88.6)	64.5	(62.8-66.0)	36.7	(34.6-38.7)	8.8	(8.3-9.3)
Female	84.5	(83.4-85.6)	67.9	(66.2-69.5)	42.6	(40.5-44.8)	8.8	(8.3-9.4)
Race	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
White	86.0	(85.2-86.9)	65.8	(64.6-67.0)	38.8	(37.2-40.4)	8.1	(7.7-8.5)
Black	81.8	(78.8-84.4)	66.5	(62.1-70.5)	42.3	(36.8-47.8)	15.2	(13.2-17.3)
Other	90.5	(86.6-93.3)	69.0	(62.2-74.7)	50.9	(42.7-58.6)	19.2	(15.8-22.8)
Age (yrs)	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
0-19	96.7	(95.7-97.4)	84.2	(81.4-86.6)	55.6	(49.9-60.8)	54.9	(52.1-57.7)
20-44	94.6	(93.5-95.5)	80.5	(78.9-82.0)	61.9	(59.1-64.6)	25.4	(23.5-27.3)
45-54	91.0	(89.1-92.5)	68.9	(66.2-71.4)	43.2	(39.7-46.7)	8.3	(7.4-9.2)
55-64	85.7	(83.3-87.8)	49.6	(46.2-52.8)	29.0	(25.8-32.3)	4.9	(4.4-5.5)
65-74	73.8	(70.5-76.7)	34.0	(30.3-37.7)	18.2	(15.2-21.4)	2.3	(1.9-2.7)
75+	47.2	(43.7-50.6)	15.1	(11.8-18.7)	11.2	(8.6-14.1)	0.9	(0.6-1.3)

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