Status of WHO Grade as a Collaborative Stage Site Specific Factor for Brain Tumors

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Introduction:

The World Health Organization has developed a grading system for primary brain tumors in the WHO Classification of Tumours of the Central Nervous System.[1] Clinicians use this grading system to guide treatment options, as well as to estimate outcomes. As a result, clinicians and researchers are very interested in the classification of population-based brain tumor data according to the WHO grading system. In 2004, WHO Grade was added to formal data collection procedures as Collaborative Stage Site Specific Factor 1 for brain tumors. The study objective was to examine the initial quality of this variable.

Methods:

Data from the SEER 17 registries research data set for the years 2004-2007 were used.[2] Brain and central nervous system tumors were selected based on ICD-O-3 site codes C70.0-72.9 and C75.1-75.3. Brain tumor categories that could be easily specified by ICD-O-3 histology and behavior and for which WHO grade could be definitively identified were selected for analysis (see Table 1).

Statistical Methods: Counts and proportions were generated using Seer*Stat 6.5.2.

Table 1. Percent of Brain and CNS tumors classified by WHO grade[1] (CS Site Specific Factor 1) using SEER 17registries research data, 2004-2007[2].

Histology (ICD-O-3 code)	WHO Grade[1]	Count	% unknown WHO grade	% with matching WHO grade	% with differing WHO grade
Pilocytic Astrocytoma (9421)	I	896	53.2	43.2	3.6
Anaplastic Astrocytoma (9401)	III	1,024	20.1	63.9	16.0
Glioblastoma/Giant Cell Glioblastoma/Gliosarcoma (9440-9441, 9442/3)	IV	9,538	47.3	50.5	2.2
Oligodendroglioma (9450)	II	893	24.1	62.9	13.0
Anaplastic Oligodendroglioma (9451)	III	382	17.0	60.7	22.3
Oligoastrocytoma/Anaplastic Oligoastrocytoma (9382)	II-III	622	18.6	72.3	9.0
Ependymoma (9391, 9393)	II	673	70.3	26.4	3.3
Anaplastic Ependymoma (9392)	III	105	28.6	60.0	11.4
Medulloblastoma (9470-9471, 9474)	IV	446	56.3	40.8	2.9
Craniopharyngioma (9350-9352)	I	514	89.1	10.9	0.0
Haemangioblastoma (9161)	I	523	88.1	11.3	0.6
Meningioma (9530/0, 9531-9534, 9537)	I	18,723	82.6	16.6	0.8
Atypical Meningioma (9530/1, 9538-9539/1)	II	886	51.5	44.2	4.3
Anaplastic/Malignant Meningioma (9530/3, 9538-9539/3)	III	382	59.9	19.6	20.4

References:

[1]Louis DN, Ohgaki H, Wiestler OD, Cavenee WK (eds): WHO Classification of Tumours of the Central Nervous System. IARC: Lyon, 2007.

[2]SEERSurveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 17 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2009 Sub (2000-2007) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total U.S., 1969-2007 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2010, based on the November 2009 submission.

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Results:

- The percent of unknown/missing WHO grade ranged from 17% to > 89% depending on the histology.
- Of those with WHO grade recorded in the dataset, the percent with a WHO grade that differed from the WHO grade specified in WHO 2007[1] ranged from a low of 0% for craniopharyngioma to a high of 22% for anaplastic oligodendroglioma.
- For glioblastoma (GBM), the WHO grade specified in WHO 2007[1] is IV; however, of 9,538 GBM, only 50% were reported with WHO grade IV, while 2.2% were reported with lower WHO grades and 47% were coded as unknown WHO grade.
- Anaplastic oligodendroglioma is defined in WHO 2007[1] as a WHO grade III tumor. Almost 61% of these tumors were reported as WHO grade III, while 20% were classified as a higher WHO grade and 2% were classified as a lower WHO grade.
- Anaplastic or malignant meningioma is defined in WHO 2007[1] as a WHO grade III. Approximately 20% were coded as WHO grade III, while 60% were reported as unknown. 20% of the tumors were recorded with other (primarily lower) WHO grades.

Conclusion:

The usefulness of this data element will require more precise coding and a focus on assuring greater completeness (i.e. fewer unknown) and will involve educating the clinicians and pathologists in their role to assure that WHO Grade is included in the pathology reports and medical records utilized by the tumor registrars.