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Disparities in Healthcare Determine Prognosis in Newly Diagnosed Glioblastoma

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Introduction

Glioblastoma (GBM) is an aggressive brain malignancy with dismal survival, yet there remains significant heterogeneity in survival outcomes. While access to healthcare impacts prognosis in several malignancies, this question remains incompletely answered in GBM. Thus, we sought to address this knowledge gap by analyzing the impact of insurance status as well as PCP status on overall survival in adult patients with newly diagnosed GBM.

Methods

Retrospective analysis of 354 newly diagnosed patients with GBM who underwent first resection at our institution (2007–2015).

Results

Table 1. Demographics and socioeconomic status

Variable	Value
No. of patients	354
Sex (no., %)	
Female	133 (37.57)
Male	221 (62.43)
Median age in yrs, range	61, 18–88
Ethnicity (no., %)	
Caucasian	275 (77.69)
Non-Caucasian	58 (16.38)
Unknown	21 (5.93)
Insurance type	
Uninsured	32 (9.04)
Insured	322 (90.96)
Medicare	131 (40.68)
Medicaid	45 (13.98)
Private	146 (45.34)
PCP (no., %)	
Yes	232 (65.54)
No	122 (34.46)
Median household income ($)	
No insurance	45,370.50
Medicare	50,054.50
Medicaid	39,863.00
Private insurance	59,718.00

Presentation and outcomes in patients by insurance status

Insured patients had higher rates of PCPs (72% vs 0%; p<0.001), postop treatment with TMZ (75.2% vs 56.3%; p=0.02), XRT (79.2% vs 56.3%; p=0.003) and lower rates of comorbidities at diagnosis (51.6% vs 75%; p=0.01) versus uninsured patients.

Insured patients survived almost 2-fold longer than those that were uninsured (15.2 vs 8.8 months; HR=2.27[1.49-3.33];p=0.0003) (**Figure 1**).

Figure 1. Kaplan-Meier analysis by insurance status in patients with GBM

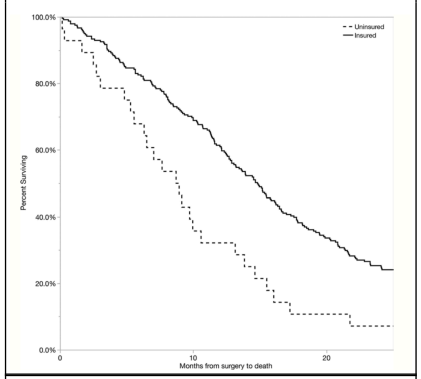


Table 2. Distribution of insured and uninsured patients

Variable	No Insurance	Any Insurance	p Value
No. of patients	32	322	
Sex (no. female, %)	6 (18.75)	127 (39.44)	**0.0218**
Median age in yrs (range)	59 (19–83)	62 (18–88)	0.176
Median household income in $1000s (range)	45.37 (25–128.35)	52.43 (19.95–140.90)	0.676
PCP status (no., %)			
Yes	0 (0)	232 (72.05)	
No	32 (100)	90 (27.95)	**<0.001**
Tumor characteristics			
Mean diameter in cm (95% CI)	4.56 (3.96–5.26)	4.44 (4.26–4.62)	0.72
Extent of resection (no., %)			
Gross-total	15 (46.88)	115 (35.71)	0.40
Subtotal	16 (50)	200 (62.11)	
Biopsy	1 (3.13)	7 (2.17)	
Mean ± SD length of stay in days	4.30 ± 2.09	4.83 ± 3.30	0.39
Reop at first recurrence (no., %)	8 (25)	75 (23.29)	0.82
Comorbidities at diagnosis (no., %)	24 (75)	166 (51.55)	**0.01**
CCI score (no., %)			
0	17 (53.13)	218 (67.7)	0.23
1	8 (25)	63 (19.57)	
≥2	7 (21.88)	41 (12.73)	
Postop adjuvant treatment (no., %)			
Radiation therapy	18 (56.25)	255 (79.2)	**0.003**
TMZ	18 (56.25)	242 (75.16)	**0.02**
Clinical trials	9 (28.13)	86 (26.71)	0.86
Agents in addition to Stupp protocol	13 (40.63)	138 (42.86)	0.81
Median postop survival in mos (95% CI)			
Overall	8.82 (5.55–10.59)	15.22 (13.61–16.64)	**<0.0001**
XRT plus TMZ	9.14 (5.29–16.04)	16.34 (14.9–18.21)	**0.025**
Patients with comorbidities	7.35 (2.73–13.15)	13.18 (11.28–15.22)	**0.007**

Presentation and outcomes in patients by insurance type

The rate of having a PCP was significantly higher in all the insured subgroups when compared to the uninsured cohort (0%; Medicare= 77.1%, Medicaid= 51.11% and private insurance= 74%; p < 0.001).

Preoperative patient comorbidities were significantly higher in uninsured patients compared to the insured (75% vs 51.55%, p = 0.01). The rates of treatments varied significantly between the uninsured, Medicare, Medicaidand private insurance group, with privately insured patients having the highest rates of clinical trial enrollment (36.3%, n = 53; p = 0.003) and treatment with additional agents (55.5%; p = 0.0004).

Table 3. Presentation of patients by different insurance types

Variable	No Insurance	Medicare	Medicaid	Private	p Value
No. of patients	32	131	45	146	
Sex (no. female, %)	6 (18.75)	48 (36.64)	19 (42.22)	60 (41.1)	0.212
Median age in yrs (range)	59 (19–83)	69 (45–88)	58 (21–81)	55 (18–77)	**<0.0001**
Median household income in $1000s (range)	45.37 (25–128.35)	50.05 (19.95–137.19)	39.86 (20.5–92.38)	59.72 (20.78–140.90)	**<0.0001**
PCP status (no., %)					**0.001**
Yes	0 (0)	101 (77.1)	23 (51.11)	108 (73.97)	
No	32 (100)	30 (22.9)	22 (48.89)	38 (26.03)	
Tumor characteristics					
Mean diameter in cm (95% CI)	4.56 (3.96–5.26)	4.25 (3.97–4.53)	4.76 (4.27–5.26)	4.53 (4.27–4.80)	0.274
Extent of resection (no., %)					
Gross-total	15 (46.88)	43 (32.82)	12 (26.67)	60 (41.10)	0.34
Subtotal	16 (50)	86 (65.65)	31 (68.89)	83 (56.85)	
Biopsy	1 (3.13)	2 (1.53)	2 (4.44)	3 (2.05)	
Mean ± SD length of stay in days	4.30 ± 2.09	4.9 ± 3.59	6.55 ± 4.12	4.21 ± 2.50	**<0.001**
Reop at first recurrence (no., %)	8 (25)	19 (14.5)	10 (22.22)	46 (31.51)	**0.011**
Comorbidities at diagnosis (no.,%)	24 (75)	88 (67.18)	19 (42.22)	59 (40.41)	**<0.0001**
CCI score (no., %)					
0	17 (53.13)	76 (58.02)	29 (64.44)	113 (77.4)	**0.0002**
1	8 (25)	25 (19.08)	13 (28.89)	25 (17.12)	
≥2	7 (21.88)	30 (22.90)	3 (6.67)	8 (5.48)	
Median survival in mos (95% CI)	8.82 (5.55–10.59)	15.35 (12.13–17.85)	14.53 (9.6–25.01)	18.64 (16.34–21.40)	**<0.001**
Postop adjuvant treatment (no., %)					
Radiation therapy	18 (56.25)	95 (72.52)	30 (66.67)	124 (84.93)	**0.0005**
TMZ	18 (56.25)	86 (65.65)	29 (64.44)	121 (82.88)	**0.0005**
Clinical trials	9 (28.13)	28 (21.37)	5 (11.11)	53 (36.30)	**0.003**
Agents in addition to Stupp protocol	13 (40.63)	40 (30.53)	17 (37.78)	81 (55.48)	**0.0004**

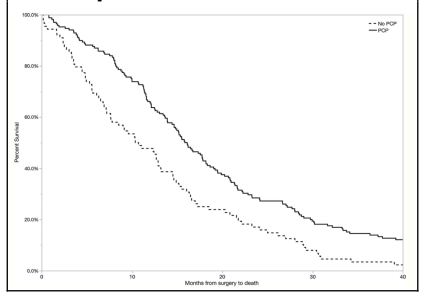
Presentation and outcomes in insured patients by PCP status

62.2%; p=0.0008) versus those without PCPs.

Insured patients with an assigned PCP had a significantly longer survival (by approximately 60%; 16.1 months) compared to those without a PCP (10.7 months; HR 1.65 [95% CI 1.27–2.15] p=0.0001) (**Figure 2**).

Patients with PCPs had a smaller tumor burden at diagnosis (4.3 vs 4.8 cm, p=0.003), higher enrollment in clinical trials postoperatively (18.9% vs 29.7%, p = 0.04), and higher postoperative treatment with XRT (83.6% vs 67.8% , p = 0.003) and TMZ (80.2%,vs

Figure 2. Kaplan-Meier analysis by PCP status in insured patients with GBM



Factors associated with longer overall survival

Table 5. Multivariate analysis of factors associated with GBM patient survival

Factor	HR	p Value	95% CI
Older age at surgery (>65 yrs old vs ≤65 yrs old)	1.36	0.003	1.03–1.76
No insurance	1.81	0.01	1.15–2.72
Higher CCI score (0 vs ≥1)	1.49	0.03	1.03–2.12
XRT plus TMZ therapy	0.60	0.001	0.45–0.81
Postop clinical trial enrollment	0.54	<0.0001	0.41–0.71

Conclusions

Access to healthcare is a strong determinant of prognosis in newly diagnosed GBM. Lack of health insurance and PCP coverage are major challenges within our healthcare system, which, if improved upon, could favorably impact the prognosis of GBM patients.

References

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