

Factors Associated with Discharge Outcomes in Elderly Patients with Glioblastoma

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Acknowledgments

Abstract

【Purpose】 This study aimed to identify factors associated with home discharge among elderly patients with glioblastoma, focusing on activities of daily living (ADL) and the presence of caregivers or cohabitants.

【Methods】 This retrospective study included patients aged ≥ 65 years with newly diagnosed glioblastoma who underwent tumor resection, postoperative chemoradiotherapy, and rehabilitation between April 2021 and March 2024. Baseline characteristics, clinical course, living environment, and Functional Independence Measure (FIM) scores at admission and discharge were collected from medical records. Patients were divided into a home discharge group and a transfer group. Between-group differences were analyzed using the Mann–Whitney U test and chi-square test.

【Results】 Twenty-six patients were included, with 13 discharged home and 13 transferred to other facilities. Parietal lobe involvement was more frequent in the transfer group ($p = 0.01$). Rehabilitation duration was shorter in the home discharge group (44.5 ± 15.6 vs. 57.3 ± 14.4 days, $p = 0.04$). The admission FIM Cognitive Subtotal score was lower in the home discharge group (24.0 vs. 33.0, $p = 0.04$), whereas the discharge FIM Locomotion/Walking score was higher (5.0 vs. 3.0, $p = 0.03$). No significant difference was observed in the presence of cohabitants.

【Conclusion】 Maintaining walking ability may be an important factor associated with home discharge in elderly patients with glioblastoma. Detailed longitudinal assessment of physical and cognitive function and caregiving capacity may help identify patients more likely to achieve home discharge.

Keywords

• Glioblastoma • Elderly Patients • Discharge Outcomes • Rehabilitation

I. Introduction

Malignant brain tumors generally have poor prognosis, and overall survival (OS) and progression-free survival (PFS) are considered critical measures for evaluating treatment outcomes [1]. Among brain

tumors, glioblastoma is classified as Grade 4, which represents the highest level of malignancy. According to the Report of the Brain Tumor Registry of Japan (2005–2008), glioblastomas have a poor prognosis, with a 5-year survival rate of approximately 16% [2]. Recent clinical studies have reported that maintaining and improving the quality of life (QOL) is associated with improved OS [3, 4], leading to high expectations in the field of rehabilitation. Conversely, in clinical settings, many patients fail to achieve sufficient recovery of physical function or Activities of Daily Living (ADL) during hospitalization, making it difficult for them to return to their previous lifestyle [4–7]. Particularly in elderly patients, pre-existing physical and cognitive impairments, reduced ADL capacity, and medical histories or comorbidities exert a substantial impact [8], which is expected to cause even greater disruption to daily living.

In Japan, reports on the functional outcomes of brain tumors are limited [9], and few studies have investigated the factors affecting discharge destinations in elderly patients with glioblastoma at acute care hospitals [5]. Identifying the factors that influence the discharge location is crucial for maintaining patients' QOL and achieving discharge to their preferred living setting.

This study aimed to clarify the impact of ADL and the presence of caregivers on discharge to home among elderly patients with glioblastoma.

II. Methods

Subjects

This retrospective study analyzed medical records from our hospital. The subjects were newly diagnosed glioblastoma patients aged 65 years or older who underwent surgical tumor resection, postoperative chemoradiotherapy, and rehabilitation therapy between April 1, 2021, and March 31, 2024. A flowchart of the patient selection process is shown in Figure 1.

This study was approved by the Ethics Committee of the Asahikawa Medical University (Approval No. 23097). This study was conducted in compliance with the Declaration of Helsinki and the Ethical Guidelines for Medical and Biological Research Involving Human Subjects.

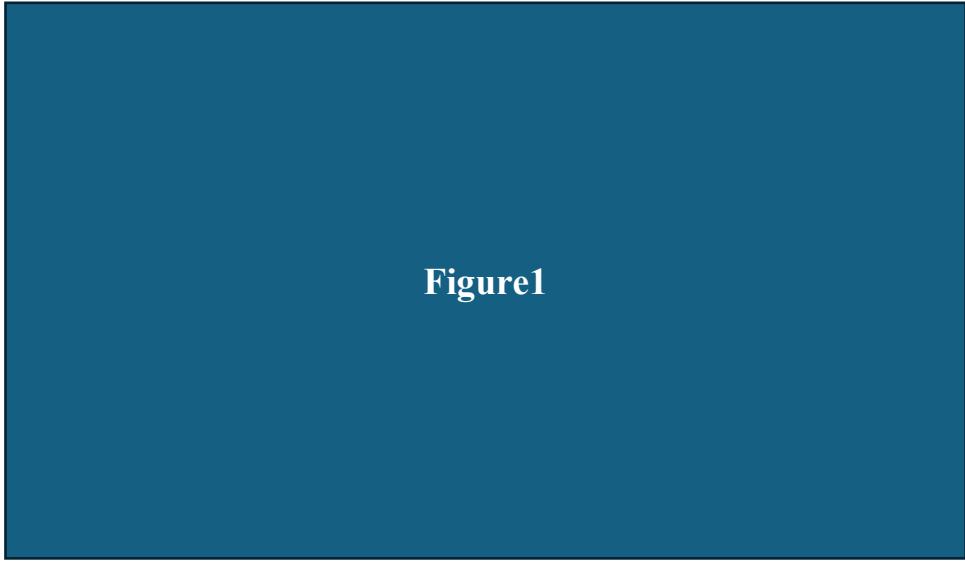


Figure1

Data Collection & Assessment

Baseline characteristics collected included age at admission, sex, body mass index (BMI), lesion location, comorbidities, and living environment (i.e., presence of cohabitants, spouse, or children; pre-admission living situation [home or facility]). The clinical course variables included length of hospital stay, duration of rehabilitation therapy (days), and discharge outcome (home vs. transfer to another facility). Functional status was evaluated using the Functional Independence Measure (FIM) and BMI at admission and discharge.

Statistical Analysis

Patients discharged to home were defined as the "Discharged home group," and those transferred to other facilities as the "Transfer group." The baseline characteristics, clinical course, and ADL progress were compared between the two groups. For statistical analysis, the Mann–Whitney U test was used for age, BMI, length of stay, duration of rehabilitation, and FIM scores. The chi-square test was used to analyze sex, lesion location, comorbidities, and living environment.

All statistical analyses were performed using SPSS Statistics 22 (IBM Corp.), with the significance level set at 5% ($p < 0.05$).

III. Results

1. Baseline Characteristics

Baseline characteristics of the subjects are shown in Table 1.

There were 13 patients in the Discharged home group and 13 patients in the Transfer group. No significant differences were observed between the two groups regarding age, sex, BMI, comorbidities, or living environment. Regarding lesion location, parietal lobe involvement was significantly more frequent in the Transfer group ($p = 0.01$).

2. Clinical Course

The clinical course of the patients is presented in Table 2. The duration of rehabilitation therapy was 44.5 ± 15.6 days in the Discharged home group and 57.3 ± 14.4 days in the Transfer group, which was significantly longer in the Transfer group ($p = 0.04$).

3. ADL Progress

The median FIM scores at admission and discharge are presented in Table 3. At admission, the "Cognitive Subtotal" score was significantly higher in the Transfer group (33.0 [27.0–35.0]) than in the Discharged home group (24.0 [20.0–30.0]) ($p = 0.04$). At discharge, the "Locomotion/Walking" item score was significantly higher in the Discharged home group (5.0 [4.0–5.0]) than in the Transfer group (3.0 [1.0–6.0]) ($p = 0.03$). No significant differences were found in other items between the two groups.

Table 1

Table 2

Table 3

IV. Discussion

Brain tumors have a lower incidence and prevalence than stroke [10], resulting in a limited number of research reports. However, functional impairments accompanying brain tumors share many similarities with post-stroke deficits [11]. In cases of malignant brain tumors with poor OS, in addition to physical function and caregiving support, achieving discharge to home as early as possible during stable periods is highly emphasized. Below, we discuss our findings, along with insights from the field of stroke care. However, stroke and brain tumors differ in terms of medical background and life expectancy, indicating that the factors determining discharge destination are not identical. We structured our discussion based on two main aspects: personal factors (physical and cognitive functions) and environmental factors (cohabitants and family support).

Personal Factors (Physical and Cognitive Functions)

First, regarding physical function, the locomotion ability at discharge (evaluated via the FIM) was significantly higher in the Discharged home group. Motor function has been reported to influence discharge disposition in both brain tumor and stroke cases [12], with higher FIM motor domain scores and Karnofsky Performance Status associated with higher rates of home discharge [13, 14]. These indices, including walking ability, reflect not only physical function but also the overall activity level and independence, forming the foundation for living at home.

Second, regarding cognitive function, cognitive impairment in stroke patients has also been reported to influence discharge disposition [14, 15]. In the present study, the Transfer group had significantly higher baseline FIM cognitive subtotal scores at admission; however, no significant differences were observed at discharge. Previous stroke studies have reported a cutoff value of 23.5 points on the FIM cognitive domain for home discharge [15, 16]. Although careful interpretation is needed when comparing stroke data to brain tumor data, using this reference indicates that the Discharged home group was near the lower limit of maintaining independent living at admission, whereas the Transfer group had a higher baseline cognitive function.

Differences in discharge outcomes may be attributed to changes in the living environment and support systems during hospitalization. In the Discharged home group, baseline cognitive function was already low, suggesting that family support and living environments had already adapted to this condition prior to admission. Conversely, in the Transfer group, cognitive decline during hospitalization may have necessitated a complete restructuring of the support systems at discharge. Additionally, the lower discharge cognitive scores in the Transfer group may have negatively impacted domestic living. Cognitive decline in stroke patients is known to increase caregiver burden [17]. Furthermore, parietal lesions—which are associated with higher-order cognitive dysfunctions such as neglect, visuospatial

cognition, and body awareness deficits that lead to ADL decline—were significantly more frequent in the Transfer group [18], suggesting that left hemispatial neglect may have influenced outcomes.

Environmental Factors (Presence of Cohabitants and Family Support)

In the present study, the presence of cohabitants did not significantly affect home discharge. However, multiple stroke studies report that living with a spouse or family member is an independent factor promoting return to home [19, 20], and studies on brain tumors also note that a lack of social support and caregiving capability makes home discharge difficult [21].

As the subjects of this study were elderly patients with glioblastoma, even if a spouse was present, the spouse was likely to be elderly as well. Caregivers of patients with brain tumors experience a substantial psychological burden due to disease progression and cognitive/behavioral changes [22]. Given these factors, the mere presence of cohabiting family members does not automatically translate into successful home discharge, and insufficient caregiving capacity is likely to play a critical role.

Clinical Implications and Future Perspectives

The results of this study suggest that while living environment and cognitive status play a role, maintaining walking ability is a key factor in enabling home discharge of elderly patients with glioblastoma. In brain tumor patients, physical and cognitive impairments resulting from disease progression, surgery, radiotherapy, and chemotherapy can exacerbate ADL decline. This impact is likely greater in older adults, emphasizing the need for longitudinal evaluations that track symptom changes from admission to discharge rather than relying solely on cross-sectional assessments at discharge.

This study has clinical significance because it highlights the key factors for home discharge in elderly patients with glioblastoma. Approaches focused on maintaining and improving walking ability are vital for helping patients spend their remaining time authentically, providing valuable insights for future rehabilitation medicine.

V. Limitations

The limitations of this study include the fact that physical and cognitive functions were assessed solely using FIM scores without detailed measurements of muscle strength, motor paralysis, or specific higher-order brain functions; thus, the factors underlying ADL decline were not fully elucidated. Furthermore, the environmental evaluations did not cover specific home layout details, caregiver age, or relationship ties. Future studies with larger sample sizes and comprehensive investigations that incorporate home environment details and caregiver characteristics are warranted.

VI. Conclusion

This study demonstrated that maintaining walking ability is a crucial factor in achieving home discharge in elderly patients with glioblastoma. However, the presence of a caregiver alone was insufficient to determine discharge disposition, indicating the need for a detailed analysis of caregiving capacity, including the number of caregivers, relationship ties, and available support hours.

Furthermore, evaluating changes longitudinally from admission, rather than treating physical function at discharge as the sole predictive factor, is essential when considering the discharge destination.

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Declarations

Clinical trial number : not applicable.

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Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Ethics Approval

This study was approved by the Ethics Committee of the Asahikawa Medical University (Approval No. 23097). This study was conducted in compliance with the Declaration of Helsinki and the Ethical Guidelines for Medical and Biological Research Involving Human Subjects.

Consent to Participate

The requirement for informed consent was waived due to the retrospective nature of this study. Information about the study was made publicly available, and eligible patients were provided with an opportunity to opt out of participation.

Author Contributions

HK conceptualized this study. HK and NM contributed to the study design and methodology. HK and NM were responsible for data collection and statistical analysis. HK drafted the original manuscript. NM contributed to data interpretation, manuscript preparation, and supervision. TR, TO, and MK contributed to the study planning and critically reviewed and edited the manuscript. All authors read and approved the final manuscript.

Figure and Table Legends

- Figure 1: Of the 251 patients prescribed with rehabilitation therapy during the study period, 26 patients with glioblastoma were included in the analysis. Non-glioblastoma brain tumor cases, recurrent cases, and patients under 65 years old were excluded.
- Table 1: There were no significant differences in basic patient characteristics, but parietal lobe lesions were significantly more frequent in the Transfer group ($p = 0.01$).
- Table 2: The duration of rehabilitation therapy was significantly longer in the Transfer group ($p=0.04$)

- Table 3: At discharge, the score for the “Locomotion/Walking” item was significantly higher in the Discharged home group ($p = 0.029$).

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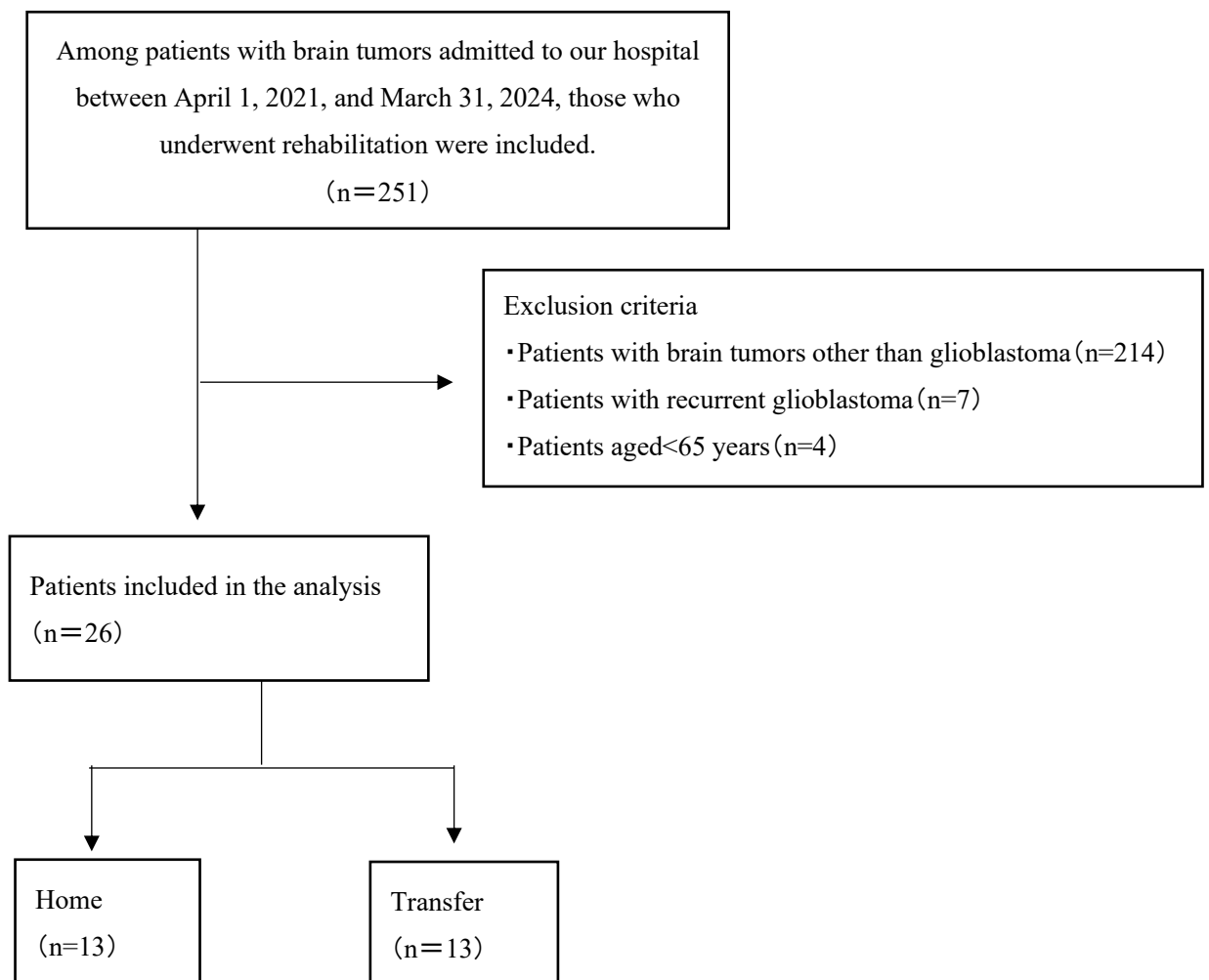


Figure1 Flowchart of Patient Selection

Table1 Baseline Characteristics of the Patients

		Home (n=13)	Transfer (n=13)	p- value
Age	(years)	78.3 ± 7.1	73.3 ± 5.5	0.06
Male,n	(%)	6 (46.2)	9 (69.2)	0.43
BMI admission		22.3 ± 3.2	22.4 ± 2.9	0.92
BMI discharge		20.1 ± 3.5	20.2 ± 2.0	0.98
lesion location				
(Overlapping categories				
allowed)				
Right		4 (30.8)	8 (61.5)	0.052
Frontal lobe		5 (38.5)	3 (23.1)	0.683
Parietal lobe		2 (15.4)	8 (61.5)	0.014 *
Temporal lobe		6 (46.2)	2 (15.4)	0.216
Insula		1 (7.7)	0 (0.0)	1.00
Comorbidities				
Diabetes mellitus		2 (15.4)	3 (23.1)	0.64
Hypertension		5 (38.5)	4 (30.8)	1.00
Dyslipidemia		2 (15.4)	1 (7.7)	1.00
Cardiovascular disease		4 (30.8)	2 (15.4)	0.65
Cerebrovascular disease		1 (7.7)	1 (7.7)	1.00
Dementia		0 (0.0)	2 (15.4)	0.20
Chronic obstructive pulmonary disease		0 (0.0)	1 (7.7)	0.46
Interstitial pneumonia		0 (0.0)	0 (0.0)	1.00
Connective tissue disease		0 (0.0)	0 (0.0)	1.00

			Liver disease	2 (15.4)	1 (7.7)	1.00
			Kidney disease	0 (0.0)	0 (0.0)	1.00
			Musculoskeletal disease	1 (7.7)	5 (38.5)	0.07
			Cancer	3 (23.1)	1 (7.7)	0.60
Living environment						
		Yes	Living with others	10 (76.9)	9 (69.2)	1.00
		Yes	Living with a spouse	12 (92.3)	8 (61.5)	0.37
		Yes	Children	13 (100.0)	12 (92.3)	0.46
		Home	Pre-admission residence	11 (84.6)	7 (53.8)	0.09

Values in parentheses indicate percentages. Categorical variables were analyzed using the chi-square test.

* : $p < 0.05$

Table2 Clinical Course

		Home (n=13)	Transfer (n=13)	p- value	
Length of hospital stay	(days)	52.2 ± 12.5	60.8 ± 13.6	0.11	
Duration of rehabilitation therapy	(days)	44.5 ± 15.6	57.3 ± 14.4	0.04	*

* : p<0.05

Table3 FIM Score at Admission and Discharge/Transfer

	Home		Transfer		p-value
	(n=13)		(n=13)		
FIM at admission					
Eating	7	[5.0-7.0]	7	[5.0-7.0]	0.84
Grooming	5	[2.0-7.0]	5	[3.0-7.0]	1.00
Bathing	1	[1.0-5.0]	3	[1.0-7.0]	0.65
Dressing-Upper body	1	[1.0-1.0]	1	[1.0-1.0]	1.00

Dressing-Lower body	1	[1.0-1.0]	1	[1.0-1.0]	1.00
Toileting	4	[2.0-5.0]	4	[2.0-5.0]	0.92
Bladder control	7	[3.0-7.0]	7	[1.0-7.0]	0.92
Bowel control	7	[4.0-7.0]	7	[7.0-7.0]	0.51
Bed,chair,wheelchair transfers	5	[4.0-5.0]	4	[4.0-5.0]	0.65
Transfer to toilet	5	[4.0-5.0]	4	[3.0-5.0]	0.58
Transfer to tub/shower	3	[1.0-4.0]	4	[1.0-5.0]	0.36
Walking/wheelchair locomotion	4	[3.0-5.0]	4	[2.0-5.0]	0.55
Stairs	1	[1.0-1.0]	1	[1.0-1.0]	0.76
Motor FIM	48	[28.0-60.0]	49	[40.0-60.0]	0.96
Comprehension	5	[5.0-7.0]	7	[5.0-7.0]	0.34
Expression	5	[4.0-7.0]	7	[5.0-7.0]	0.17
Sosial intraction	7	[5.0-7.0]	7	[7.0-7.0]	0.31
Problem solving	3	[2.0-6.0]	7	[5.0-7.0]	0.13
Memory	5	[3.0-6.0]	7	[5.0-7.0]	0.11
Cognitive FIM	24	[20.0-30.0]	33	[27.0-35.0]	0.04 *
Total FIM	71	[53.0-81.0]	76	[70.0-95.0]	0.42
FIM at discharge					

Eating	7	[6.0-7.0]	7	[5.0-7.0]	0.45
Grooming	7	[3.0-5.0]	4	[3.0-7.0]	0.29
Bathing	4	[1.0-5.0]	3	[1.0-7.0]	0.51
Dressing-Upper body	1	[1.0-1.0]	1	[1.0-1.0]	1.00
Dressing-Lower body	1	[1.0-1.0]	1	[1.0-1.0]	1.00
Toileting	5	[3.0-7.0]	4	[2.0-7.0]	0.51
Bladder control	7	[5.0-7.0]	7	[6.0-7.0]	0.84
Bowel control	7	[3.0-7.0]	7	[7.0-7.0]	0.29
Bed,chair,wheelchair transfers	5	[4.0-5.0]	4	[3.0-6.0]	0.20
Transfer to toilet	5	[4.0-5.0]	4	[3.0-6.0]	0.20
Transfer to tub/shower	4	[1.0-5.0]	4	[1.0-5.0]	0.76
Walking/wheelchair locomotion	5	[4.0-5.0]	3	[1.0-6.0]	0.03 *
Stairs	1	[1.0-4.0]	1	[1.0-4.0]	0.69
Motor FIM	53	[39.0-61.0]	48	[39.0-67.0]	0.48
Comprehension	5	[3.0-7.0]	6	[5.0-6.0]	0.20
Expression	5	[3.0-7.0]	6	[5.0-6.0]	0.10
Sosial intraction	6	[3.0-7.0]	6	[5.0-7.0]	1.00
Problem solving	4	[1.0-5.0]	5	[3.0-7.0]	1.00

Memory	5	[4.0-6.0]	4	[3.0-7.0]	0.84
Cognitive FIM	24	[19.0-31.0]	27	[22.0-29.0]	0.51
Total FIM	86	[59.0-87.0]	69	[64.0-95.0]	0.76

* : p<0.05