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Perioperative Whole-Course Nursing of an Elderly Patient with Right Frontal Glioblastoma Complicated by Type 2 Diabetes: A Case Report Based on the 5A Nursing Model

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Abstract: ***Background:*** ***Glioblastoma (WHO grade IV) is the most aggressive primary intracranial malignancy in adults. Elderly patients often present with comorbid diabetes and multiple postoperative complications, posing substantial challenges to perioperative nursing. This case report summarizes our experience in managing a 68-year-old man with right frontal glioblastoma complicated by type 2 diabetes mellitus using the 5A nursing model (Assess, Advise, Agree, Assist, Arrange).*** ***Case presentation:*** ***Within 24 hours of admission, a five-dimensional advanced health assessment stratified nursing problems into priority, medium-priority, and low-priority. Preoperative interventions focused on intracranial pressure monitoring, constipation management, and glycemic control. During the neurosurgical intensive care unit (NICU) phase, bundle care was delivered to prevent ventilator-associated pneumonia (VAP); early dysphagia screening and stepwise rehabilitation were initiated; and stratified mechanical prophylaxis of venous thromboembolism (VTE) was applied. In the recovery phase, multidisciplinary early mobilization and fall/seizure safety management were provided, followed by a closed loop of short-term follow-up and home care guidance after discharge.*** ***Results:*** ***The patient was hospitalized for 18 days. No cerebral herniation, unplanned extubation, pressure injury, deep vein thrombosis, or aspiration pneumonia occurred. At discharge, the Kubota water drinking test improved from grade 4 to grade 2, right limb muscle strength recovered from grade 2 to grade 4, and fasting blood glucose stabilized at 7-8 mmol/L.*** ***Conclusions:*** ***The 5A nursing model enabled dynamic assessment, precise intervention, and continuity of care throughout the perioperative trajectory in this complex high-grade glioma case. This approach may be valuable for neurosurgery specialty nursing practice.***

Keywords: 5A nursing model, Glioblastoma, Perioperative nursing, Case management, Rehabilitation nursing, Ventilator-associated pneumonia.

1. Introduction

Gliomas are the most common primary malignant brain tumors in adults, and glioblastoma (WHO grade IV) is the most aggressive subtype, characterized by rapid invasiveness, early recurrence, and a dismal prognosis [1]. Right frontal lobe tumors, in addition to producing elevated intracranial pressure, typically manifest early with personality and behavioral changes, urinary incontinence, and gait disturbance [2]. Elderly patients frequently present with underlying diabetes, cardiovascular degeneration, and reduced nutritional reserve. After craniotomy, they are vulnerable to multiple complications—including pulmonary infection, dysphagia, hemiplegia, and VTE—each requiring systematic nursing assessment and targeted intervention.

The 5A model—Assess, Advise, Agree, Assist, and Arrange — is a patient-centered, evidence-based self-management support framework that emphasizes individualized assessment, health belief building, and continuity of care. This case describes an elderly man with right frontal glioblastoma and more than 20 years of type 2 diabetes who developed endotracheal intubation with mechanical ventilation, VAP, dysphagia, and left-sided hemiplegia during the perioperative period. Using the 5A model as the organizing framework, nursing was delivered according to a layered logic of "brain protection in the critical phase — airway and homeostatic management in the transition phase — swallowing and functional rehabilitation in the stable phase." The nursing experience is reported herein.

Compared with younger patients, elderly patients with high-grade glioma often have diabetes, cardiovascular comorbidity, and depleted nutritional reserve. After craniotomy, they are more prone to multi-system instability during the NICU phase, making a single-organ observation approach inadequate for such complex critical illness. Establishing a nursing pathway of "holistic assessment — layered intervention—continuing follow-up" is therefore of practical importance for shortening hospital stay, reducing complication rates, and creating favorable conditions for subsequent chemoradiotherapy.

2. Case Presentation

The patient was a 68-year-old man residing in Shantou, Guangdong Province. He was admitted on August 8, 2026, and discharged on August 26, 2026, with a total hospital stay of 18 days. His family reported bradykinesia for more than 3 weeks and behavioral changes for more than 1 year. He was responsive but had difficulty rising from a chair; he was described as paranoid and displaying abnormal behavior. During the week before admission, he developed urinary incontinence and constipation (bowel movements every 3-4 days, Bristol Stool Form Scale [BSFS] type 1). He had a more than 20-year history of type 2 diabetes mellitus treated with oral metformin, with generally suboptimal glycemic control.

On admission, vital signs were: temperature 36.4 °C, pulse 85 beats/min, respiration 18 breaths/min, blood pressure 105/68 mmHg, and SpO2 99%. He was conscious with a Glasgow

Coma Scale (GCS) score of 15 (E4V5M6). Limb muscle strength was grade 4 bilaterally with normal tone and a slow, shuffling gait. Contrast-enhanced cranial MRI revealed a large right frontal mass (approximately 78 mm × 55 mm × 65 mm), with multiple lesions in the left frontoparietal region involving the corpus callosum, accompanied by peritumoral edema and midline shift. PET-CT demonstrated multiple hypermetabolic nodules in both frontal lobes, consistent with primary frontal glioma. Laboratory findings included hemoglobin 85 g/L, albumin 33.3 g/L, and random blood glucose 12.7 mmol/L. On admission, Nutritional Risk Screening 2002 (NRS2002) score was 1, Morse Fall Scale score was 55 (high risk), Braden Scale score was 20 (low risk), Caprini score was 2 (low risk), and Barthel index was 90 (mild dependence).

After preoperative preparation, the patient underwent resection of the right frontal eloquent-area tumor with dural repair and cranioplasty under general anesthesia. Postoperative pathology confirmed right frontal glioblastoma (WHO grade IV). He was transferred to the NICU postoperatively with endotracheal intubation connected to a ventilator, together with an indwelling gastric tube, urinary catheter, and right upper-extremity PICC. On postoperative day 4, when transferred back to the neurosurgical ward, his GCS was 9T (E3VTM6), temperature 38.3 °C, with large volumes of yellow viscous sputum suctioned through the endotracheal tube. Left limb muscle strength was grade 0 and right limb grade 2. CT showed worsening cerebral edema, complicated by heart failure, infection, and anemia. He was treated with anti-infective therapy, dehydrating agents to reduce intracranial pressure, potassium supplementation, and blood transfusion. On August 19, after the pulmonary infection improved, the endotracheal tube was removed and nasal catheter high-flow oxygen was initiated. Following stepwise swallowing training and early rehabilitation, he was discharged conscious and headache-free, with left muscle strength grade 0, right muscle strength grade 4, and stable glycemic control. He was transferred to a local hospital for continued rehabilitation and subsequent chemoradiotherapy.

3. Nursing Process

3.1 Admission Assessment and Prioritization of Nursing Problems (Assess)

Within 24 hours of admission, the responsible nurse completed a five-dimensional advanced health assessment covering disease symptoms, overall health status, physiological function, self-care ability (ICF framework), and risk factors for complications. Nursing problems were classified according to NANDA-ICNP and prioritized as follows: priority problem, elevated intracranial pressure (079F16-08); medium-priority problem, constipation (005S01-05); low-priority problem, hyperglycemia (169F23-98). Health belief interviews with family members simultaneously revealed the patient's marked fear of craniotomy and his reliance on self-administered hypoglycemic health products, which became the targets for health education in the subsequent Advise and Agree phases.

3.2 Preoperative Phase: Risk Prevention Centered on Intracranial Pressure Management (Advise/Agree)

3.2.1 Early identification and medication management of elevated intracranial pressure

Based on the space-occupying lesion on cranial MRI and frontal lobe dysfunction, the patient was assessed as having a clear indication of elevated intracranial pressure. Level-one nursing was implemented, with GCS, pupil size and light reflex, and vital signs assessed every 6 hours. The head of the bed was elevated 15°-30° [3], with close monitoring for Cushing response (elevated blood pressure, bradycardia, altered respiratory rhythm) and anisocoria as precursors of cerebral herniation. As ordered, 20% mannitol 125 mL was infused rapidly intravenously within 30 minutes, with strict prevention of drug extravasation and vigilance against drug-induced intracranial hypotension. Electrolytes were rechecked regularly, with particular attention to serum potassium and sodium to prevent iatrogenic electrolyte imbalance. Strict fluid management was maintained to avoid circulatory volume overload that could worsen cerebral edema [4].

3.2.2 Comprehensive intervention for constipation

For BSFS type 1 constipation with bowel movements every 3-4 days, the nursing team jointly developed a combined "pharmacological + abdominal massage + dietary" plan with the patient and family: lactulose 15 mL orally three times daily; Bifidobacterium triple viable enteric-coated capsules 0.21 g three times daily with warm water; mosapride citrate 5 mg 30 minutes before meals. The patient was instructed to lie supine with knees bent, and abdominal massage was performed clockwise around the umbilicus for 15 minutes each morning and evening, avoiding massage on an empty stomach or within 2 hours after meals. Daily water intake of approximately 1500 mL was ensured alongside increased dietary fiber. Through co-development during the Agree phase, the patient and family actively participated in bowel management; no Valsalva-induced intracranial hypertension events occurred during the postoperative follow-up period.

3.2.3 Preoperative glycemic management

Given the more than 20-year history of type 2 diabetes and random blood glucose of 12.7 mmol/L, a multi-point blood glucose monitoring regimen was established: fingertip blood glucose was measured before and 2 hours after each of the three meals and at bedtime. Blood glucose >13.9 mmol/L or <3.9 mmol/L was immediately reported to the physician with intensified monitoring [5]. As ordered, metformin 0.25 g was administered twice daily, pioglitazone 15 mg once daily, insulin aspart 8 U subcutaneously before each meal, and insulin glargine 24 U subcutaneously every evening, with injection sites rotated between the abdomen and lateral thigh. All self-administered hypoglycemic health products were discontinued, and meals were timed to prevent hypoglycemia. Preoperative blood glucose stabilized within 8-10 mmol/L, with no diabetic ketoacidosis or severe hypoglycemia.

3.3 Postoperative NICU Phase: Complication Prevention under Multi-system Support (Assist)

On postoperative day 4, when transferred back to the ward, the patient had GCS 9T, fever 38.3 °C, white blood cell count

20.9×10^9/L, and sputum culture positive for Enterococcus faecium. In the context of endotracheal intubation and mechanical ventilation, the priority nursing problem was revised to ventilator-associated pneumonia (242R35-40), the medium-priority problem to dysphagia (186I26-02), and the low-priority problem to VTE risk (206R33-04).

3.3.1 Bundle care for VAP prevention

Postoperatively, head-of-bed elevation of 30°-45° was maintained to reduce reflux aspiration (this postoperative VAP bundle requirement was higher than the preoperative 15°-30° positioning for intracranial pressure management). Oral care was reinforced every 8 hours using a negative-pressure suction toothbrush to suppress oropharyngeal pathogen colonization. Suctioning was performed as needed under strict aseptic technique, with simultaneous observation of sputum volume, color, and viscosity [6]. Anti-infective therapy was administered as ordered and adjusted according to sputum culture results. During medication, temperature trends, white blood cell count, and liver and kidney function were dynamically monitored, with vigilance for antibiotic-associated diarrhea and fungal infection.

Airway clearance and breathing training were initiated concurrently: the patient was instructed in diaphragmatic breathing (semi-recumbent position, abdominal expansion on inspiration, slow pursed-lip exhalation; 3 times daily, 5 minutes each session). Family members performed back percussion with a cupped hand from bottom to top and outside to inside (avoiding the renal area and spine), with turning and percussion every 2 hours for 10 minutes each. Pursed-lip breathing was trained by blowing tissue or a balloon, and forceful coughing was avoided to prevent elevated intracranial pressure; the patient was guided to replace forceful coughing with "huffing" to achieve effective airway clearance. Sputum characteristics improved dynamically: on August 16, abundant yellow viscous sputum (viscosity grade III); on August 22, small amounts of thin sputum (grade I); by discharge, essentially no sputum. Temperature decreased from 38.3 °C on August 16 to 36.8 °C on August 21. Sputum culture changed from Enterococcus faecium to no fungal growth, and chest radiograph infiltration did not progress. On August 19, the endotracheal tube was successfully removed and nasal catheter oxygen was initiated.

3.3.2 Early screening and stepwise rehabilitation of dysphagia

During the postoperative indwelling gastric tube period, the Kubota water drinking test and repetitive saliva swallowing test were performed [7]. Results showed Kubota grade 4 and moderate risk on the repetitive saliva swallowing test (1-2 times/30 s). Enteral nutrition nursing via nasogastric tube was provided. On the day of extubation (August 19), repeat assessment showed Kubota grade 3 and mild risk. Multidisciplinary swallowing rehabilitation was immediately initiated in collaboration with the rehabilitation department: repetitive transcranial magnetic stimulation (rTMS) neuromodulation was coordinated, with frequency, intensity, and cortical target adjusted according to tolerance, 10-30 minutes per session [8]. Concurrently, oral motor exercises were conducted to train oral, lingual, mandibular, and pharyngeal musculature. On August 23, repeat assessment showed Kubota grade 2 and normal repetitive saliva swallowing test. Oral semi-liquid intake of pureed food was initiated, strictly following the stepwise dietary protocol of "thickened liquids—small sips of 3-5 mL [9]—maintained head-of-bed elevation for 30 minutes after eating—avoiding suctioning and repositioning within 30 minutes after meals," until gastric tube removal at discharge. No aspiration pneumonia occurred throughout the course.

3.3.3 VTE risk stratification and mechanical prophylaxis

Postoperative Caprini score increased to 8 (high risk), D-dimer was 1.37 mg/L FEU, left limb muscle strength was grade 0 and right grade 2. A VTE high-risk warning sign was placed at the head of the bed. Twelve hours postoperatively, graduated compression stockings (checked for smooth fit to avoid pressure injury) and intermittent pneumatic compression (IPC, treatment pressure 75 mmHg, venous filling time 45 s, used continuously for 7 days) were initiated. Family members were instructed to assist with active or passive ankle pump exercises 3-4 times daily for 10-20 minutes each [10]. A PICC was placed in the right upper extremity to protect the lower-extremity veins. Bilateral lower leg circumference was measured daily; a difference >3 cm immediately prompted physician notification. During hospitalization, bilateral lower extremities had normal skin temperature and color, with no significant circumference difference, and no deep vein thrombosis occurred.

3.4 Recovery Phase: Early Mobilization and Safety Management (Assist deepened)

Given postoperative left muscle strength grade 0, right grade 2, and high fall risk (Morse score 55), the nursing problem was impaired physical mobility (187I27-03). The responsible nurse, in collaboration with the rehabilitation department, developed a stepwise mobilization protocol: blood pressure and heart rate were measured before each activity, immediately rechecked upon completion, and subjective symptoms inquired about during activity. If dizziness, palpitations, cold sweats, chest tightness, or pallor occurred, all activity was immediately stopped with supine rest [11]. Rehabilitation training progressed stepwise through the sequence of "bedside training—finger grasping training — traditional Chinese medicine adjunctive treatment": (1) Bedside training: the patient was guided to independently perform upper extremity lifting, lower extremity straight leg raises, and quadriceps isometric contractions, 10-15 repetitions per set, 2-3 sets daily; (2) Finger grasping-relaxation training: 10-15 minutes per session, completed in 2-3 divided sessions daily to avoid excessive fatigue; (3) Traditional Chinese medicine adjunctive treatment: leveraging the hospital's TCM characteristics, an acupuncturist was coordinated to select points including Zusanli (ST36), Yanglingquan (GB34), Sanyinjiao (SP6), and Jiexi (ST41), with needle retention 20-25 minutes per session, during which subcutaneous hemorrhage or hematoma at needle sites was monitored. Concurrently, the thumb pad was used to press and knead Quchi (LI11), Hegu (LI4), Zusanli (ST36), and Taichong (LR3), to local soreness and distension, 1-2 minutes per point.

Fall prevention management was implemented simultaneously across environmental, behavioral, and monitoring dimensions: (1) Environmental modification: the patient was assisted in wearing non-slip shoes; floors were kept dry and free of debris; bed rails were raised as needed; the call bell was placed within easy reach; family members provided 24-hour bedside accompaniment. (2) Behavioral guidance: the patient and family were taught the "lie-sit-stand" three-step positional transition, pausing 30 seconds at each step to confirm no dizziness or visual blackout before proceeding, thereby avoiding orthostatic hypotension induced by sudden posture changes. (3) Dynamic monitoring: orthostatic blood pressure was measured daily; if the systolic blood pressure difference between supine and standing positions exceeded 20 mmHg, the physician was immediately notified and the patient was placed on bed rest [12].

No falls or bed-related falls occurred during hospitalization. Prior to discharge, the Morse Fall Scale score decreased from 55 to 35. Barthel index improved from 45 on August 19 to 60 at discharge, and right limb muscle strength recovered from grade 2 to grade 4. The patient could independently complete bed repositioning, sitting up, and active limb movement, with stable vital signs after activity and no complaints of dizziness or palpitations. After acupuncture, the patient reported reduced heaviness in the left hemiplegic limb; after acupressure, local skin temperature and circulation improved. Concurrently, regarding the risk of delayed epilepsy due to postoperative frontal lobe scarring, valproate sodium was administered on schedule as ordered. A mouth gag, tongue forceps, and oxygen apparatus were kept at the bedside. Family members were educated that during seizure onset, the patient should be placed supine with the head turned to one side, the airway maintained, and forced limb restraint prohibited; seizure duration and symptoms were documented.

3.5 Discharge Preparation and Short-term Follow-up (Arrange)

Before discharge, a swallowing safety and home care manual was provided to the patient and family: easily aspirated foods including hard-boiled eggs, tofu cubes, rice grains, biscuits, and soups containing solids were explicitly prohibited. All water, milk, and soup were thickened with thickener to a pudding-like consistency that does not pour from a spoon. In case of choking, feeding was immediately stopped, the head was turned to one side with back percussion, the oral cavity was cleared, and reassessment was performed after 30 minutes of rest.

Given the postoperative pathology of glioblastoma (WHO grade IV) and relatively poor prognosis, the focus of follow-up was adjusted from "complete neurological recovery" to "short-term complication monitoring + bridging to subsequent chemoradiotherapy + psychological support." One week after discharge, telephone follow-up was conducted regarding wound healing, swallowing, and blood glucose. Two weeks after discharge, outpatient review of complete blood count, liver and kidney function, blood glucose, and suture removal was performed, and a concurrent chemoradiotherapy regimen was established by the neuro-oncology clinic. Family members were explicitly informed of emergency return precautions—including severe headache, worsening vomiting, seizure episodes, decreased consciousness, persistent fever, or wound redness/swelling/discharge—to avoid delayed recognition of recurrence or treatment-related adverse reactions [13].

4. Outcome Evaluation

Key clinical indicators during hospitalization are summarized in Table 1. The tumor was successfully resected. No cerebral herniation, intracranial hemorrhage, or unplanned extubation occurred. Implementation rates of VAP, VTE, and pressure injury key quality indicator (KQI) bundle prevention measures were 100%, with zero unplanned extubations and pressure injuries. Family health education coverage was 100%, with relatively high subjective satisfaction.

Table 1: Evolution of key clinical indicators during hospitalization

Indicator	On admission (Aug 8)	Postoperative NICU phase (Aug 16)	At discharge (Aug 26)
Intracranial pressure	Space-occupying lesion, baseline elevated ICP	Postoperative cerebral edema worsening, headache evident	CSF clear via lumbar puncture, pressure ~100 mmH2O, no headache
Respiration/infection	Respiration 18/min, clear breath sounds bilaterally	Endotracheal intubation with mechanical ventilation, temp 38.3 °C, elevated WBC	Nasal catheter oxygen, SpO2 96%-98%, few bilateral moist rales
Swallowing function	Conscious, oral intake without choking	Indwelling gastric tube, Kubota grade 4	Kubota grade 2, oral semi-liquid intake possible, gastric tube removed
Limb muscle strength	All limbs grade 4-5, slow gait	Left grade 0, right grade 2	Left grade 0, right grade 4, independent bed turning/sitting
Bowel function	Every 3-4 days, BSFS type 1	Spontaneous defecation, stool softened	Every 1-2 days, BSFS type 3
Blood glucose	Random glucose 12.7 mmol/L	8-10 mmol/L	7-8 mmol/L, no hypoglycemic events

5. Discussion

The core nursing challenge in this case was that the patient did not present with a single neurological disease but rather elderly glioblastoma complicated by diabetes, with the superimposition of multiple postoperative problems including VAP, dysphagia, hemiplegia, and VTE. The disease evolved rapidly, and nursing problems were dynamically re-prioritized throughout the stay. Our primary experience is that the 5A model is not a simple sum of five independent steps but rather a continuous closed loop extending from admission to post-discharge follow-up: the Assess phase completed problem prioritization and health belief identification within 24 hours of admission through a five-dimensional advanced assessment; the Advise/Agree phase replaced one-way education with co-developed plans, thereby improving patient and family adherence in constipation management, blood glucose monitoring, and swallowing training; the Assist phase was layered according to the critical, transition, and stable phases, avoiding a "one-size-fits-all" approach; and the Arrange phase ensured inpatient-to-outpatient continuity through explicit return precautions and short-term follow-up nodes.

Second, this case demonstrated the value of independent clinical judgment by neurosurgery specialist nurses in complex critical illness. During the NICU phase, the team did not simply attribute "fever + yellow sputum" to an isolated infectious event; instead, they integrated the three factors of endotracheal intubation, diabetic immunosuppression, and age-related impaired expectoration to simultaneously initiate bundle VAP prevention, dynamic inflammatory marker monitoring, and airway clearance training, ultimately achieving extubation within 4 days. With respect to dysphagia management, evaluation was not deferred until after complete extubation; Kubota water drinking test screening was completed during the intubation period, and rTMS combined with oral motor exercises was initiated on the day of extubation jointly with the rehabilitation department, thereby shortening the window to safe oral intake and reducing aspiration pneumonia risk.

Compared with previously reported glioblastoma nursing cases, the present case was characterized by a multi-system superimposed state of "elderly patient + diabetes + postoperative VAP + dysphagia + hemiplegia + high VTE risk." Most prior reports focused on a single complication (such as VAP prevention, swallowing rehabilitation, or early mobilization). The present case used the 5A model to integrate nursing problems arising at different stages into a single closed-loop management framework, and initiated rTMS combined with oral exercise for swallowing rehabilitation on the day of extubation—advancing the intervention window compared with the traditional "stabilize first, then rehabilitate" model. Furthermore, stepwise dietary modification and home thickener guidance extended inpatient swallowing management into the home care setting, potentially reducing the risk of aspiration-related readmission after discharge.

Several limitations should be acknowledged. The postoperative pathology was WHO grade IV glioblastoma with an overall poor prognosis; nursing goals should not be confined to "safe discharge during the perioperative period" but should also include creating functional conditions for subsequent concurrent chemoradiotherapy and supporting the psychological adaptation of patients and families to the disease prognosis. Although the follow-up phase bridged to chemoradiotherapy, psychological counseling for the patient and family, caregiver burden assessment, and discussion of advance care planning (ACP) for end-of-life symptoms remained insufficient. The initiation of early postoperative mobilization was relatively conservative. In the recovery phase, this case preliminarily combined acupuncture and acupressure to support hemiplegic rehabilitation, and the patient reported reduced left limb heaviness; however, given the single-case design, the long-term efficacy on motor function recovery requires further observation. Future work should introduce psychological resilience interventions, standardized TCM syndrome differentiation nursing protocols, and evidence-based early mobilization pathways in similar high-grade glioma patients, with the aim of further shortening hospital stay, reducing complication rates, and improving the family caregiving experience.

6. Conclusions

For complex cases of elderly right frontal glioblastoma complicated by diabetes, whole-course management using the 5A nursing model as the organizing framework—layered according to "brain protection in the critical phase—airway and homeostatic management in the transition phase — swallowing and functional rehabilitation in the stable phase" — can effectively reduce perioperative complications, improve neurological function and activities of daily living, and create favorable conditions for subsequent chemoradiotherapy. This approach merits consideration in neurosurgery specialty nursing practice.

References

[1] Ostrom QT, Price M, Neff C, et al. CBTRUS statistical report: primary brain and other central nervous system tumors diagnosed in the United States in 2015-2019. Neuro Oncol. 2022; 24(Suppl 5): v1-v95. DOI: 10.1093/neuonc/noac202.

[2] Chinese Anti-Cancer Association Glioblastoma Committee. Integrated diagnosis and treatment guidelines for glioblastoma by China Anti-Cancer Association (abridged version). Chinese Clinical Oncology. 2022;49(16):811-818.

[3] Liu SP, Sun HY, Jiang KY, et al. Clinical analysis of perioperative intracranial pressure monitoring in brain tumor patients. Chinese Community Doctors. 2023;39(23):86-88.

[4] Liu F, Wang YJ, Cao XB, et al. Expert consensus on nursing prevention and control of intracranial hypertension in adult critically ill patients. Chinese Journal of Nursing. 2024;59(21):2606-2610.

[5] Zhang QH, Xie RR. Effect of intensive nursing measures in perioperative nursing of brain tumor patients with diabetes mellitus. Chinese Medical Journal of Metallurgical Industry. 2025;42(1):36-37.

[6] Triamvisit S, Wongprasert W, Puttima C, et al. Effect of modified care bundle for prevention of ventilator-associated pneumonia in critically-ill neurosurgical patients. Acute Crit Care. 2021; 36(4): 294-299.

[7] Labeit B, Michou E, Trapl-Grundschober M, et al. Dysphagia after stroke: research advances in treatment interventions. Lancet Neurol. 2023;22(8):689-700.

[8] Speyer R, Sutt A, Bergström L, et al. Neurostimulation in people with oropharyngeal dysphagia: a systematic review and meta-analysis of randomised controlled trials—Part II: brain neurostimulation. J Clin Med. 2022;11(15):4351.

[9] Shi LN, Zhang SB, Huo XR, et al. Best evidence summary for aspiration prevention in dysphagia patients after stroke during oral intake. Chinese Evidence-Based Nursing. 2023;9(15):2670-2676.

[10] Lukassen JNM, Groen JL, Jacobs WC, et al. Thromboembolic prophylaxis in neurosurgical practice: a review. Acta Neurochir. 2021;163(8):2191-2201.

[11] Pinto V, Sousa SA, Vaz da Silva F, et al. GET-UP Trial 1-year results: long-term impact of an early mobilization protocol on functional performance after surgery for chronic subdural hematoma. J Neurosurg. 2024; 140(5): 1434-1443.

[12] Schell K, Lyons D, Bodt B. Orthostatic hypotension and falls in hospitalized older adults. J Gerontol Nurs. 2022;48(11):15-22.
[13] Li P, Peng DD, Quan LC. Observation on application effect of comprehensive nursing in postoperative brain tumor patients. Chinese Community Doctors. 2025; 41(15): 127-129.