<u>original research</u>

Evaluation of Early Psychological Interventions in Patients with Intracranial Aneurysm Embolism: A Nursing Business Process Reengineering Perspective

He Peng, BS; Guohua Lin, BS

ABSTRACT

Objective • This study examines the impact of early psychological intervention for patients undergoing nursing process modification through a business process reengineering (BPR) approach in preventing intracranial aneurysm embolism.

Methods • A randomized controlled trial (RCT) design was employed in this study. A randomized method was utilized to allocate a total of 201 cases into two distinct groups. 10 patients experiencing delirium and coma due to drug sedation were excluded from the analysis. Consequently, the final distribution included 96 cases in the nursing group and 95 cases in the routine group.

Results • In the nursing group, waiting time, nursing staff working hours, and hospital stay were significantly lower compared to the routine group (t = 50.916, 28.893, 4.298, P < .05). No substantial difference in actual running time between the groups was observed (t=0.289, P > .05). Scores for physical pain, psychological well-being, material

He Peng, BS; **Guohua Lin**, BS; Neurological Intensive Care Unit; Zhoukou Central Hospital; Zhoukou; China.

Corresponding author: He Peng, BS E-mail: penghedr@yeah.net

INTRODUCTION

Intracranial aneurysms pose significant medical challenges due to their intricate etiology, often leading to elevated morbidity and mortality rates.¹ As medical technology continues to advance, the predominant method for intervention in aneurysm cases has shifted towards embolization.² This approach, characterized by its small surgical footprint, prompt recovery, and commendable treatment efficacy, represents a substantial step forward in aneurysm management.³ Despite these advancements, the complexities surrounding the causes of intracranial aneurysms persist, necessitating a comprehensive understanding of the relationship between intervention methods, patient outcomes, and overall healthcare effectiveness.^{1,2}

life status, and social function were notably higher in the nursing group than in the routine group (*t*=19.109, 20.658, 21.165, 24.014, *P* < .05). Post-intervention, SAS and SDS scores in the nursing group were significantly lower than those in the routine group (*t*=21.910, 25.808, *P* < .05). The complication rate in the nursing group (1.04%) was significantly lower than that in the routine group (8.42%) (χ^2 =5.791, *P* < .05). Furthermore, nursing staff job satisfaction (92.71%) was significantly higher than that in the routine group (78.13%) (χ^2 =7.449, *P* < .05).

Conclusions • The modification of the nursing process demonstrates a positive impact on efficiency and quality of care, ensuring patient safety and meeting patient needs without altering surgical techniques. The findings highlight substantial enhancements and effectiveness of nursing process, providing strong support for the broad implementation of these interventions. (*Altern Ther Health Med.* [E-pub ahead of print.])

However, recent clinical practice has revealed that despite the achievements of interventional embolization surgery, effective recovery after the operation is significantly hampered by factors such as the patient's cognition and the impact of post-treatment trauma.¹⁻³ This limitation gives rise to negative emotions among patients, including anxiety, depression, and fear, consequently elevating the likelihood of complications.³

Therefore, considering these factors, it becomes crucial to enhance nursing intervention during the perioperative period of interventional embolization.^{3,4} However, Aihara et al.⁵ have reported that the implementation of conventional perioperative care shows no distinct intervention effect on the patient's psychological state. Nursing business process reengineering (BPR) involves the analysis of fundamental process concepts based on patient needs, with the process itself as the object of transformation. It aims to reintegrate various components of the process to achieve superior outcomes on the existing foundation.⁶⁷

In nursing, thoughtful process reengineering holds immense significance for improving the quality of care.⁸

Considering this premise, our study aims to analyze the impact of psychological intervention on patients experiencing early intracranial aneurysm embolism. We explored the effects of psychological intervention on patients' mental wellbeing, complications, nurses' job satisfaction, and overall quality of life. This study was focused on optimized nursing strategies for clinical application, enhancing the preventive measures against intracranial aneurysm embolism, and mitigating the adverse effects of patients' conditions.

DATA AND METHODS

Study Design

This study employed a randomized controlled trial (RCT) design to investigate the impact of nursing business process reengineering (BPR) on patients undergoing intracranial aneurysm embolization. Between January 2020 and April 2021, 201 patients were randomly assigned to either the nursing group (n=96) or the routine group (n=95) after excluding 10 cases of delirium and coma induced by drug sedation. The routine group received joint evidence-based nursing, while the nursing group underwent nursing BPR in addition to conventional care.

Inclusion and Exclusion Criteria

The inclusion criteria for this study included patients with intracranial aneurysm embolization treated at our hospital between January 2020 and April 2021. Exclusion criteria were applied to exclude cases of delirium and coma caused by drug sedation, resulting in the exclusion of 10 patients from the analysis.

Intervention Protocol: Routine Group

The routine group primarily adopts a collaborative approach to evidence-based nursing, involving several key components:

Establishment of the Evidence-Based Nursing Team. Instituting an effective evidence-based nursing team played a pivotal role in the routine group's collaborative approach. Under the guidance of the head nurse, this dynamic team consisted of charge nurses, registered nurses, and nursing assistants. The nursing staff's responsibilities extended to comprehensive training in evidence-based nursing practices, meticulous evaluation of intracranial aneurysm case information, and the implementation of treatments grounded in relevant nursing knowledge. The team leader, assuming a central role, adeptly handled internal challenges, ensuring smooth operations while team members actively carried out evidence-based nursing tasks. This structured formation ensured a cohesive and proficient approach to the delivery of quality care.

Identification of Evidence-Based Issues. The team determined evidence-based problems based on the patient's condition, clinical symptoms, content related to intracranial aneurysm disease, and treatment related to embolization. It involved focusing on key aspects of care throughout the operation, including potential issues and preparations before the procedure, collaboration during the operation, and the emphasis on postoperative care and treatment of complications. Aligning with the patient's specific situation and the difficulties of intracranial aneurysm embolization, the identification of evidence-based issues was a critical component of providing tailored and effective patient care.

Evidence-Based Support. The research was conducted through computer networks and publications to disseminate pertinent information on treatment and nursing practices in China and internationally. The primary objective was to secure research support for the implementation of experimental research. To identify specific evidence-based questions, we utilized professional websites like CNKI, enabling us to grasp relevant literature comprehensively. This approach facilitated the determination of essential topics, the acquisition of highquality original texts, and the development of a targeted nursing plan tailored to meet the actual needs of patients.

Evidence-Based Application. The perioperative conditions of patients with varying diseases exhibit distinct characteristics. Consequently, tailored care is imperative based on their health status. Patients with mild illnesses can be efficiently transferred to general wards, where bed rest and intensive monitoring are fundamental. Conversely, critically ill patients require specialized care within the NICU system.

Psychological Support: a comprehensive approach to psychological support for patients and their families was adopted. This approach involved explaining the objectives of the operation, discussing potential complications, and presenting successful treatment cases. Additionally, assistance in pre-operative examination forms was a crucial aspect of holistic patient care. This nuanced approach to perioperative care ensured the physical well-being of the patient and addressed the psychological aspects, fostering a more comprehensive and patient-centric healthcare experience.

Optimized patient comfort and safety during surgery: Nursing staff played an important role in enhancing the patient's surgical experience. Their responsibilities included assisting the patient in selecting a comfortable posture, securing limbs, and ensuring the appropriate adjustment of temperature and humidity in the operating room. Strict adherence to aseptic surgical practices was maintained throughout, supporting the doctor in the seamless execution of routine procedures.

Particular attention was given to the accurate delivery of surgical instruments and items, ensuring precision and efficiency. Simultaneously, continuous monitoring of the patient's vital signs occurs throughout the operation, enabling the timely identification of any abnormalities. In the event of such findings, the doctor was promptly notified, facilitating immediate intervention. This comprehensive approach to patient care during surgery prioritized patient comfort and safety and contributed to an optimal surgical environment.

Holistic patient care post-surgery: Moreover, the nursing staff was tasked with creating a comfortable room environment for the patient, aiding them in lying down, and providing essential guidance on refraining from coughing or defecating during the recovery phase. Emphasis was placed on fostering

healthy and deep breathing practices. When necessary, the nursing team assisted patients with expectoration, back-patting, turning over, and administering oxygen.

Patients were also offered dietary guidance, including a recommendation to consume approximately 500ml of warm water in the morning. Daily water intake exceeding 1000ml was encouraged. Specific guidance on incorporating fruits and vegetables rich in vitamins into their diet was provided, while patients were advised to avoid irritating foods. The nursing staff ensured the timely cleanup of residues in the oral cavity, mitigating the risk of complications and contributing to a comprehensive and supportive postoperative care regimen.

Intervention Protocol for Nursing Group: Business Process Reengineering (BPR)

The nursing group executed nursing business process reengineering (BPR), building upon the foundation of the routine group.

Flexible Scheduling and Task Arrangement. The implementation of flexible scheduling and task arrangement strategies aimed at mobilizing nursing staff effectively. This approach included incentivizing measures to increase awareness and adjusting working hours and staffing based on the department's actual needs. The goal was to address any shortages in nursing human resources. This strategic application of BPR within the nursing group was designed to optimize efficiency, ensure resource adequacy, and enhance overall patient care delivery.

Revitalizing Service Approach. The nursing group underwent a transformative shift in service attitude by prioritizing patient-centric care. This approach involved aligning nursing and treatment services with the unique needs of each patient, fostering a change from a negative service approach to one characterized by proactive and affirmative care. This patient-centered perspective aimed to enhance the overall patient experience, ensuring that care and treatment were tailored to individual requirements and preferences. This shift contributed to a more positive and engaging healthcare environment.

Optimizing Treatment Duration for Enhanced Patient Cooperation. A rational treatment timeframe was actively established for the nursing group to support patient cooperation while upholding surgical safety and enhancing overall work efficiency. During concentrated periods, designated nurses managed nursing tasks, effectively streamlining the workforce and material resources. This strategic allocation of responsibilities provided nursing staff with additional time for meaningful interactions with patients. It facilitated the acquisition of comprehensive information about their conditions, thereby promoting targeted and effective nursing management practices. The refined approach aimed to achieve goals with precision, ensuring a more pertinent and effective patient care experience.

Redesigned Physical Therapy Procedures for Enhanced Patient Experience. We redesigned the physical therapy process for the nursing group by reorganizing the order of patients awaiting treatment. This transformation shifted the previous passive treatment approach to a more proactive and engaged service model. The aim was to mitigate patient impatience, thereby preventing unnecessary extensions of hospitalization time and preventing potential nursing disputes.

In cases where patients were relocated to a room or corridor, those unsuitable for exercise were advised to stay in bed rather than wait in the treatment room. Nursing staff took the initiative to arrange and notify patients in advance, minimizing the likelihood of nursing disputes. This strategic reconfiguration of the physical therapy process prioritized patient comfort and satisfaction while contributing to the overall efficiency of healthcare service delivery.

Enhanced Safety and Quality Management Strategies. The nursing group received a transformation in the safety and quality management approach, different from the traditional model where the head nurse and the quality control team leader unusually carried quality control responsibilities. The revised model involved the joint participation of nurses and the quality control team, with each team assuming responsibility for analyzing nursing records to prevent errors.

During the night shift, nurses conducted thorough checks on aspects overlooked by the day shift, addressing any omissions and refining nursing records. Proactive patient engagement was emphasized, entailing timely medication dispensation and real-time monitoring of patient dynamics to fortify communication between nurses and patients.

Simultaneously, a concerted effort was made to support the collective awareness and capabilities of young nurses. This approach included selecting standout nurses for external learning opportunities, organizing monthly departmental internships to enhance theoretical knowledge and practical skills, and conducting regular spot checks on management staff to mitigate risks and improve the overall quality of nursing care.

Observation Indicators

Evaluating the Impact of Nursing Procedures. The assessment of nursing procedures involved observing key indicators before and after the implementation of two distinct nursing protocols. These indicators involved the actual running time, waiting time, nurse working time, and hospital stay. The actual running time was derived from recorded implementation times on the nursing record sheet. Waiting time was defined as the duration between the doctor's medical supervision order and the execution time by the nurse. Nurse working time represented the daily average working hours per week. This careful strategy was aimed at capturing the impact of changes in nursing procedures on operational efficiency and patient care, facilitating a data-driven approach to refining and optimizing nursing practices.

Quality of Life Scores Assessment Before and After Nursing Interventions. A comprehensive analysis was conducted on the quality-of-life scores of two patient groups, both before and after nursing interventions. The quality-of-life questionnaire comprises four dimensions: physical, mental, material life state, and social aspects, with each item rated on a scale of 100 points. A higher score indicates an enhanced quality of life for the patient. This analytical approach aimed to discern the impact of nursing interventions on the holistic well-being of patients across various life dimensions.

Cognitive Function Scores in Two Patient Groups. In the past, a detailed examination was conducted on the cognitive functional status scores of two patient groups. The assessment primarily utilized the self-rating anxiety scale (SAS) and self-rating depression scale (SDS), both operating on a hundred-point system with respective cut-off scores of 50 and 53. A higher score on these scales correlates with a deteriorating mental state in patients. This assessment aimed to recognize and quantify changes in the mental well-being of patients, offering valuable insights into the effectiveness of interventions and the overall mental health trajectory.

Assessment of Complications and Nursing Satisfaction Levels. A comprehensive observation was conducted on the probability of complications and the nursing satisfaction levels in two distinct patient groups. The assessment of nursing satisfaction levels involved the collection of data through a structured questionnaire. This multi-faceted observation aimed to gauge the likelihood of complications and the degree of satisfaction among patients, providing crucial insights into the effectiveness of nursing interventions and the overall healthcare experience.

Statistical Analysis

For data processing, the SPSS 24.0 software (IBM, Armonk, NY, USA) was employed. Count data were presented as (n) analyzed using the chi-square test (χ^2), while measurement data were represented as ($\bar{x} \pm s$) and subjected to the *t*-test. A significance level of P < .05 was applied to determine the statistical significance of observed differences.

RESULTS

Comparison of Baseline Characteristics

In the routine group, the average age was (56.27 ± 12.24) years, while in the nursing group, the average age was (58.44 ± 11.13) years. No significant differences were observed in all general information between the two groups (P > .05).

Comparing the Effects of the Two Groups Before and After the Nursing Process

After the nursing intervention, notable improvements were observed in the nursing group compared to the routine group, evident in the reduced waiting time for patients, decreased working hours for nurses, and shortened hospitalization stay length (P < .05). However, no statistical difference was identified between the two groups in actual running time (P > .05). Refer to Table 1.

Quality of Life Score Comparison in Two Patient Groups

The quality-of-life scores for patients in the nursing group exhibited a significant improvement compared to the routine group (P < .05). Refer to Table 2 for specific details.

Table 1. Comparative Analysis of Outcomes Pre- and Post-Nursing Process Transformation $(\bar{x} \pm s)$

	Routine Group	Nursing Group		
Project	(n=95)	(n=96)	t	P value
Actual Operation Time (min)	9.19±1.27	9.14±1.06	2.569	.111
Patient Waiting Time (min)	52.23±4.42	24.31±3.04	50.916	<.001
Nurse Working Hours (h)	10.25±1.25	5.53±0.99	28.893	.004
Hospital Stay (d)	15.89±9.80	11.25±4.00	4.298	.004

Note: Values are presented as mean \pm standard deviation. *t*-value represents the result of the *t* test, and the *P* value indicates the statistical significance.

Table 2. Comparison of the Quality-of-Life Scores of the Two Groups of Patients ($\bar{x} \pm s$, points)

		Mental State of		Social	
Group	Body Pain	Psychology	Material Life	Function	
Nursing Group(n=96)	60.39±3.85	63.77±2.98	61.78±3.58	63.751±3.16	
Routine Group (n=95)	49.65±3.92	52.92±4.17	50.76±3.61	52.51±3.17	
t	19.109	20.658	21.165	24.014	
P value	<.001	<.001	<.001	<.001	

Note: Values presented as Mean \pm SD. Statistical analysis was performed using an independent *t* test. *P* < .001 were considered statistically significant.

Table 3. Pre- and Post-Nursing Comparison of SAS and SDS Scores in Two Patient Groups ($x \pm s$, points)

	Number	SA	s	SDS			
Group	of Cases	Before Care	After Care	Before Care	After Care		
Nursing Group	96	34.24±10.34	18.46±1.32	39.52±13.835	19.66±1.75		
Routine Group	95	37.25±9.59	23.35±1.73	42.45±11.34	26.79±2.02		
t		2.0282	21.910	1.60	25.808		
P value		.193	.027	.028	.33		

Note: Values presented as Mean \pm SD. Statistical analysis was performed using an independent *t* test. *P* < .05 were considered statistically significant.

Table 4. Comparison of The Probability of Complications And Nursing Job Satisfaction Between The Two Groups of Patients [n (%)]

			Nurse Job			
	Number	Cerebral	Postoperative	Ruptured	Total	Satisfaction
Group	of Cases	Vasospasm	Infection	Tumor	Incidence	(%)
Nursing Group	96	0 (0.00)	1 (1.04)	0 (0.00)	1 (1.04)	89 (92.71)
Routine Group	95	4 (4.21)	3 (3.16)	1 (1.04)	8 (8.42)	75 (78.13)
χ^2					5.791	7.449
P value					.016	.006

Note: Complication rates are presented as [n (%)] for each specific complication. Nurse job satisfaction was reported as a percentage. Chi-square (χ^2) and *P* values indicate statistical significance.

Comparing the Psychological Functions Before and After Nursing

After nursing interventions, the SAS and SDS scores for patients in the nursing group demonstrated a significant decrease compared to those in the routine group (P < .05). Refer to Table 3 for specific details.

Comparing Complication Rates and Nursing Job Satisfaction Between the Two Groups

Our observations revealed that the nursing group experienced a lower incidence of complications compared to the routine group, coupled with significantly higher levels of nursing job satisfaction (P < .05). Refer to Table 4.

Multifactor Logistic Analysis of Complications After Interventional Embolization of Intracranial Aneurysms

The multifactor logistic analysis of complications after interventional embolization of intracranial aneurysms identified compression time <12h, lack of posture intervention, and limb immobilization time \geq 12h as highrisk factors. Refer to Table 5 for specific details.

DISCUSSION

Intracranial aneurysm tumors arise from abnormal blood vessels within a patient's cerebral arteries. This condition is prevalent in neurosurgery, manifesting with clinical symptoms such as impaired consciousness, vomiting, and neck stiffness. In severe cases, the rupture of blood vessels can pose a life-threatening risk to the patient.⁹ Among the available treatment options, interventional embolization stands as a common approach, necessitating comprehensive care to ensure treatment effectiveness.

Gillani et al.¹⁰ emphasized that nursing quality stands at the heart of nursing management, serving as an important indicator of hospital nursing excellence. Effective nursing practices not only facilitate patient recovery but also contribute to the evaluation and enhancement of a hospital's credibility and sustainability. In the past, nursing care primarily addressed patient needs but lacked a proactive service-oriented approach. Combined with inadequate treatment time and personnel shortages, this led to suboptimal care quality and the emergence of negative caregiving situations, ultimately impacting patient satisfaction and significantly undermining the overall quality of hospital care.¹¹

Research conducted by Ihn et al.¹² has demonstrated that refining existing nursing procedures, addressing any unreasonable or incomplete steps, and actively engaging nursing staff can effectively minimize human resource waste and improve nursing efficiency. The findings of this study highlight a substantial improvement in nursing efficiency following the modification of nursing procedures. It resulted in saved working hours for nursing staff, prevention of human and material resource wastage, and the assurance of nursing quality to address human resource shortages. Our findings align with the outcomes of Ihn et al..¹² highlighting that through the reformation of nursing procedures, adaptability to evolving models and work requirements is achieved. This adaptation, in turn, contributes to elevated nursing quality and mitigates the occurrence of detrimental nursing incidents.

Etminan et al.¹³ assert that the transformation of the nursing process extends from and applies the concept of nursing process reengineering. It represents a continual adjustment process grounded in patient satisfaction. Through methods such as canceling, merging, integrating, simplifying, and other strategic reforms, the old processes are optimized to establish a seamless nursing service capable of resulting in more valuable outcomes. This approach yields substantial benefits for both patients and hospitals.

The findings of this study revealed that the transformation of the nursing process has led to notable improvements in

Table 5. Logistic Analysis of Multiple Factors AffectingComplications After Interventional Embolization ofIntracranial Aneurysms

Variables	β	Wald	P value	OR	95%CI
Oppressive Time <12h	1.624	0.524	<.05	1.816	1.521-3.167
No Posture Intervention	1.905	1.206	<.05	1.649	1.306-2.915
Immobilization Time of the Affected Limb ≥12h	2.305	1.109	<.05	1.716	1.419-3.209

Note: Wald statistic, *P* value, Odds Ratio (OR), and 95% Confidence Interval (CI) are reported for each variable. A significance level of <0.05 was considered statistically significant.

shift work methods, enhanced working hours for nurses, and increased patient satisfaction with hospital care. These outcomes align with the results presented in past studies.^{12,13} The restructured nursing process has significantly elevated nursing efficiency, resulting in saved working hours for the nursing staff, avoidance of human and material resource wastage, and a dual improvement in the experience for both patients and nursing staff.

The study's findings highlight key factors contributing to complications in patients undergoing intracranial aneurysm interventional embolization, including compression time, postural intervention, and immobilization time. Notably, these results align with the research outcomes of Suzuki et al.¹⁴ This finding emphasizes the importance of nursing staff playing a critical role in safeguarding patient prognoses, effectively mitigating complications, and enhancing overall patient safety.

Our results suggest that compression time is crucial to prevent issues like bleeding or bruising at the puncture site due to inadequate compression. To ensure prompt healing of the puncture point, nursing staff must exert sufficient pressure after sheath removal, ensuring a compression time between 30-45 minutes. Postural intervention addresses the need for scientific intervention in the patient's physical condition during postoperative care. Insufficient intervention may lead to bleeding in the patient's area, resulting in complications such as vascular rupture. Therefore, adopting a scientific approach to postoperative care is essential to minimize risks and enhance patient outcomes.

Our findings suggest that to optimize patient outcomes, nursing staff should instruct patients to lie on their backs, promoting improved blood circulation within the skull. Additionally, paying attention to immobilization time is crucial, as prolonged difficulty in immobilization may contribute to the development of venous thrombosis in the lower limbs. This risk is particularly elevated in elderly patients or those with higher blood density, increasing the likelihood of irregular venous blood enhancement and potential complications, such as deep venous blood reflux.

After surgery, nursing staff systematically monitored the patient's recovery process. Within the initial 12 hours postsurgery, regular monitoring and inspection of the skin on the lower extremities were essential. Subsequently, implementing a full-body massage was an integral part of guiding the patient in changing positions. Furthermore, it was evident in our findings that patients in the nursing group exhibited significantly better mental states and quality of life scores compared to those in the routine group (P < .05). These results underscore the importance of implementing a structured and attentive postoperative care routine to enhance patient well-being and overall outcomes.

The nursing BPR emerges as a transformative intervention, resulting in substantial benefits in patient care and overall healthcare outcomes.¹⁵ In comparison to the routine group, the nursing group exhibited significantly lower probabilities of complications and reduced lengths of hospital stays (P < .05). This substantial reduction in complication rates directly correlates with heightened nursing satisfaction (P < .05).

These results unequivocally demonstrated that the reform of the nursing process plays a pivotal role in mitigating complications and significantly improving patient satisfaction. This transformative approach contributed to an enhanced quality of life for patients, fostering positive emotional wellbeing and facilitating a more robust recovery while preventing disease progression. The findings emphasize the importance of continuous improvement in nursing methodologies for achieving optimal patient care and satisfaction.

Study Limitations

While this study provides valuable insights, its generalizability is limited due to its focus on a specific patient population undergoing intracranial aneurysm interventional embolization. The relatively short study duration may not capture long-term effects, and reliance on self-reported measures introduces potential bias. Despite these limitations, the research lays a foundation for understanding the impact of nursing process reform on patient outcomes, highlighting the need for future, more comprehensive investigations.

CONCLUSION

In conclusion, addressing deficiencies in conventional nursing care through the thoughtful redesign of nursing procedures offers patients improved quality and efficiency of services, positively impacting their mental well-being and preventing diseases effectively. This approach contributes to enhanced patient satisfaction with nursing care, and fosters improved collaboration between doctors and nurses. This initiative deserves promotion and ongoing refinement.

CONFLICTS OF INTEREST

The authors report no conflict of interest

FUNDING None.

ACKNOWLEDGEMENTS Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

- Research guidelines for the Delphi survey technique.Hasson F, Keeney S, McKenna H. J Adv Nurs. 2020;32(4):1008-1015.
- Foth T, Lange J, Smith K. Nursing history as philosophy-towards a critical history of nursing. Nurs Philos. 2018;19(3):e12210. doi:10.1111/nup.12210
- Nariai Y, Kawamura Y, Takigawa T, Hyodo A, Suzuki K. Pipeline embolization for an iatrogenic intracranial internal carotid arterypseudoaneurysm after transsphenoidal pituitary tumor surgery: Case report and review of the literature. *Interv Neuroradiol.* 2020;26(1):74-82. doi:10.1177/1591019919874943
- Sugiu K, Hishikawa T, Murai S, Takahashi Y, Kidani N, Nishihiro S, Hiramatsu M, Date I, Satow T, lihara K, Sakai N. Treatment Outcome of Intracranial Tumor Embolization in Japan. Japanese Registry of NeuroEndovascular Therapy 3 (JR-NET3). *Neurol Med Chir (Tokyo)*. 2019;59(2):41-47.
- Aihara M, Naito I, Shimizu T, Fujimaki H, Asakura K, Miyamoto N, Yoshimoto Y. Preoperative embolization of intracranial meningiomas using n-butyl cyanoacrylate. *Neuroradiology*. 2018;57(7):713-719.
- Promlek K, Currey J, Damkliang J, Considine J. Evidence-practice gaps in initial neuroprotective nursing care: A mixed methods study of Thai patients with moderate or severe traumatic brain injury. *Int J Nurs Pract.* 2020;••••e12899.
- Raw RK, Wilkie RM, Mon-Williams M, Ross SA, Deniz K, Goddard T, Patankar T, Kinematic measures provide useful information after intracranial aneurysmtreatment. J Rehabil Assist Technol Eng. 2017;4:2055668317744999.
- von Vogelsang AC, Svensson M, Wengström Y. Cognitive, physical, and psychological status after intracranial aneurysmrupture: a cross-sectional study of a Stockholm case series 1996 to 1999. *Forsberg C. World Neurosurg.* 2017;79(1):130-135.
- Qureshi AI, Chaudhry SA, Rahim B. Psychological stress and unruptured intracranial aneurysms. *Neurosurgery*. 2019;73(1):E194-E195.
- Gillani RL, Podraza KM, Luthra N, Origitano TC, Schneck MJ. Factors Influencing the Management of Unruptured Intracranial Aneurysms. *Cureus*. 2018;8(5):e601.
- Otawara Y, Ogasawara K, Kubo Y, Tomitsuka N, Watanabe M, Ogawa A, Suzuki M, Yamadate K. Anxiety before and after surgical repair in patients with asymptomatic unruptured intracranial aneurysm. Surg Neurol. 2019;62(1):28-31.
- Ihn YK, Shin SH, Baik SK, Choi IS. Complications of endovascular treatment for intracranial aneurysms: management and prevention. *Interv Neuroradiol.* 2018;24(3):237-245. doi:10.1177/1591019918758493
- Etminan N, Rinkel GJ Unruptured intracranial aneurysms: development, rupture and preventivemanagement. Nat Rev Neurol. 2018;12(12):699-713.
- Suzuki T, Kamio Y, Makino H, Hokamura K, Kimura T, Yamasaki T, Hiramatsu H, Umemura K, Namba H. Prevention EffectofAntiplatelets on Aneurysm Rupture in a Mouse Intracranial Aneurysm Model. *Cerebrovasc Dis*. 2018;45(3-4):180-186.
- Shimizu K, Kushamae M, Mizutani T, Aoki T. Intracranial Aneurysm as a Macrophage-mediated Inflammatory Disease. *Neurol Med Chir (Tokya)*. 2019;59(4):126-132. doi:10.2176/nmc.st.2018-0326