Jurnal Pustaka Keperawatan
Jurnal Pusat Akses Kajian Keperawatan
Vol. 5. No. 1 (2026) 513-519
E ISSN : 2830-6538

Factors Associated with Mortality Among Stroke Patients Admitted to the Intensive Care Unit: A Retrospective Study

Andriani[1], Yuni Asri[2*], Ananda Sagita Maharani[3]
[1-3]Department of Nursing, Faculty of Health and Science, Institute of Technology Science and Health RS dr. Soepraoen Kesdam V/Brawijaya, Malang, Indonesia
[1]andrianirhina14@gmail.com. [2]yuniasri@itsk-soepraoen.ac.id. [3]anndsgttaa030@gmail.com

Abstract

Stroke is a leading cause of mortality worldwide, particularly among patients requiring intensive care. Identifying factors associated with mortality in the intensive care unit (ICU) is essential to improve clinical management. This study examined factors associated with mortality among stroke patients admitted to the ICU. A retrospective analytic study was conducted using secondary medical record data of stroke patients admitted to the ICU of TK. II R.W. Mongisidi Hospital, Manado, Indonesia, between December 2025 and January 2026. A total of 55 patients were included. Mortality during ICU stay was the primary outcome. Sociodemographic variables, clinical factors, and length of stay were analyzed using Chi-square and Fisher's exact tests in SPSS version 26, with significance set at $p < 0.05$. The mortality rate was 41.8%. Most patients had a history of hypertension (78.2%) and uncontrolled blood pressure (87.3%). Age, gender, education, employment status, marital status, genetic factors, medication adherence, history of hypertension, and blood pressure status were not significantly associated with mortality ($p > 0.05$). Length of ICU stay was significantly associated with mortality ($p < 0.001$), with deaths occurring more frequently among patients with shorter stays. Length of ICU stay was the only factor significantly associated with mortality among ICU-admitted stroke patients

Keywords: hypertension, intensive care unit, length of stay, mortality, stroke

1. Introduction

Stroke continues to rank among the foremost causes of death and persistent disability across the globe [1], [2]. Beyond its clinical consequences, it imposes a substantial burden on health systems, particularly in low- and middle-income countries where preventive services and timely acute interventions are often constrained [3], [4]. Although significant progress has been achieved in preventive measures, reperfusion therapies, and neurocritical care management, early mortality remains considerable, especially among individuals presenting with profound neurological deficits [5], [6]

A significant subset of patients experiencing acute stroke requires Intensive Care Unit (ICU) admission due to severe complications, including impaired consciousness, respiratory compromise, circulatory instability, or elevated intracranial pressure [7], [8]. While ICU-based management provides advanced physiological monitoring, mechanical ventilatory support, and hemodynamic optimization, mortality rates in this high-risk population remain substantial [9]. Consequently, identifying determinants of mortality among critically ill stroke patients is imperative for refining prognostic assessment and informing evidence-based therapeutic strategies.

Mortality in the ICU setting arises from a multifaceted interaction between longstanding cardiovascular risk factors and the acute severity of neurological injury. Among modifiable determinants, hypertension remains the most influential contributor to both ischemic and hemorrhagic stroke [10], [11]. Persistent uncontrolled hypertension promotes structural alterations in cerebral vasculature, including vascular remodeling and endothelial dysfunction, ultimately predisposing vessels to rupture or occlusion [2]. Furthermore, elevated blood pressure during the acute phase may intensify cerebral edema, facilitate hematoma expansion, and exacerbate secondary neuronal injury, thereby worsening clinical outcomes [12], [13]. Beyond baseline cardiovascular risk, neurological condition at presentation is a critical determinant of survival. Level of consciousness, frequently measured using

Submitted : 30-04-2026 | Reviewed : 20-05-2026 | Accepted : 05-06-2026

the Glasgow Coma Scale (GCS), serves as an indicator of the extent of cerebral damage and intracranial involvement and has consistently been associated with mortality in neurocritical populations [9], [14]. Patients admitted with reduced consciousness often necessitate mechanical ventilation and are more susceptible to complications such as aspiration pneumonia, sepsis, and multi-organ dysfunction [8]. In addition, prolonged ICU hospitalization commonly reflects more severe disease trajectories and greater exposure to hospital-acquired complications, both of which may contribute to increased mortality risk [15].

Adherence to long-term antihypertensive therapy also represents a pivotal factor in determining outcomes. Inadequate compliance is closely linked to poor blood pressure control and heightened risk of recurrent or severe stroke episodes [16]. Chronic suboptimal management of hypertension accelerates vascular injury and may adversely influence the clinical course once a cerebrovascular event occurs. Accordingly, a comprehensive evaluation of both modifiable cardiovascular risks and acute clinical parameters is essential for clarifying mortality patterns among stroke patients treated in the ICU.

Despite extensive research addressing stroke incidence and general in-hospital mortality, relatively limited attention has been directed toward identifying predictors of death specifically among stroke patients requiring intensive care [17], [18]. This subgroup is characterized by greater neurological compromise and markedly higher mortality compared to patients managed in non-critical care settings [8].

Moreover, empirical evidence from developing health systems remains insufficient. Variability in demographic characteristics, blood pressure control practices, healthcare accessibility, and ICU infrastructure may significantly shape mortality trends [4]. Therefore, determining predictors that are relevant within specific local contexts is fundamental for designing tailored management strategies and optimizing outcomes in critical care environments.

In light of these considerations, the present study sought to examine factors associated with mortality among stroke patients admitted to the Intensive Care Unit. Particular emphasis was placed on evaluating the relationship between a history of hypertension, blood pressure control status, adherence to antihypertensive treatment, level of consciousness at admission, and duration of ICU stay with in-ICU mortality. By identifying significant prognostic indicators, this research aims to enhance risk stratification, facilitate early identification of high-risk individuals, and support the development of targeted interventions to reduce mortality among critically ill stroke patients.

2. Methods

2.1. Study Design and Setting

This study employed a retrospective analytic design using secondary data extracted from medical records. The research was conducted in the Intensive Care Unit (ICU) of TK. II R.W. Mongisidi Hospital, Manado, Indonesia. Data were collected for patients admitted between December 2025 and January 2026.

2.2. Study Population and Sampling

The study population consisted of all stroke patients admitted to the ICU during the study period. A total sampling technique was applied, whereby all eligible patients who met the inclusion criteria were included in the analysis.

Inclusion criteria were:

1. Patients diagnosed with stroke (ischemic or hemorrhagic) based on physician diagnosis documented in the medical record.
2. Patients aged ≥18 years.
3. Complete documentation of demographic, clinical, and outcome variables required for analysis.

Patients with incomplete key data (e.g., missing mortality status or length of stay) were excluded from the analysis. A total of 55 patients met the eligibility criteria and were included in the final dataset.

2.3. Variables and Operational Definitions

The primary outcome variable was mortality status**,** categorized as survived or died during ICU admission. Independent variables included **s**ociodemographic factors**:** age group (adults, older adults), gender (male, female), education level (low, secondary, higher), employment status (employed, unemployed), and marital status (married, unmarried). Clinical and behavioral factors, genetic factors (yes/no), antihypertensive medication adherence (adherent/non-adherent), history of hypertension (yes/no), blood pressure status (controlled/uncontrolled). Hospitalization outcome variable: Length of ICU stay, categorized as short stay (<2 days) and long stay (>4 days). All variables were categorized based on clinical documentation recorded in the patients' medical charts.

2.4. Data Collection Procedure

Secondary data were obtained from hospital medical records after institutional approval. A structured data

Submitted : 30-04-2026 | Reviewed : 20-05-2026 | Accepted : 05-06-2026

extraction form was used to ensure consistent retrieval of variables. Data were cross-checked to minimize entry errors and ensure completeness.

2.5. Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize baseline characteristics. Categorical variables were presented as frequencies (n) and percentages (%). Bivariate analysis was performed to examine the association between independent variables and mortality status. The Chi-square test was used for variables with adequate expected cell counts. When expected cell counts were less than five, Fisher's exact test was applied. Statistical significance was determined at a p-value < 0.05 with a 95% confidence level.

2.6. Ethical Considerations

This study utilized secondary, de-identified medical record data. Patient confidentiality was strictly maintained throughout the research process, and no personal identifiers were included in the dataset or analysis. Ethical approval was obtained from the appropriate Institutional Review Board (IRB) before data collection (Approval No. SIP/38/II/2026).

3. Result

As shown in Table 1, a total of 55 stroke patients were admitted to the ICU at TK. II R.W. Mongisidi Hospital, Manado. Most patients were adults (60.0%), while older adults accounted for 40.0% of the sample. The gender distribution was relatively balanced, with a slightly higher proportion of males (53.7%) compared to females (47.3%). Regarding educational background, the majority had secondary education (80.0%), whereas only a small proportion had low (12.7%) or higher education (7.3%). More than half of the patients were employed (54.5%), and nearly all were married (94.5%), suggesting that most patients had formal family support.

In terms of clinical and behavioral factors, genetic predisposition was rarely reported (3.6%). However, non-adherence to antihypertensive medication was observed in more than half of the patients (56.4%). A history of hypertension was highly prevalent (78.2%), and most patients had uncontrolled blood pressure (87.3%) at the time of assessment. These findings indicate a substantial burden of modifiable cardiovascular risk factors in this population. With respect to hospitalization outcomes, slightly more than half of the patients experienced a longer ICU stay (>4 days) (52.7%). The overall mortality rate was 41.8%, while 58.2% of patients survived until discharge from the ICU.

Table 1. Baseline Characteristics of Stroke Patients Admitted to the ICU at TK. II R.W. Mongisidi Hospital, Manado

Variable	Frequency	Percent
Age Group		
Adults	33	60.0
Older Adults	22	40.0
Gender		
Male	29	53,7
Female	26	47,3
Education Level		
Low Education	7	12,7
Secondary Education	44	80,0
Higher Education	4	7,3
Employment Status		
Employed	30	54,5
Unemployed	25	45,5
Marital Status		
Married	52	94,5
Unmarried	3	5,5
Clinical and Behavioral Factors		
Genetic Factors		
Yes	2	3,6
No	53	96,4
Antihypertensive Medication Adherence		
Adherent	24	43,6
Non-adherent	31	56,4
History of Hypertension		
Yes	43	78,2
No	12	21,8
Blood Pressure Status		
Controlled	7	12,7
Uncontrolled	48	87,3
Hospitalization Outcome		
Length of Stay		
Shorts stay (<2)	26	47,3
Long Stay (>4)	29	52,7
Mortality Status		
Survived	32	58,2
Died	23	41,8

The association between patient characteristics and mortality status is presented in Table 2. Overall, most sociodemographic variables were not significantly associated with mortality (p > 0.05). Age group did not show a statistically significant relationship with mortality (p = 0.503). The distribution of deaths was relatively similar between adults and older adults. Likewise, gender was not significantly associated with mortality (p = 0.305), although descriptively, deaths were slightly more frequent among males. Education level (p = 0.450), employment status (p = 0.425), and marital status (p = 0.565) also showed no significant associations. Clinical and behavioral factors demonstrated similar patterns. Genetic factors (p = 0.504), antihypertensive medication adherence (p = 0.262), history of hypertension (p = 0.516), and blood pressure status (p = 1.000) were not significantly related to mortality. Although a higher proportion of deaths occurred among patients with uncontrolled blood pressure and those who were non-adherent to medication, these differences did not reach statistical significance. In contrast, the length of ICU stay was significantly associated with mortality (p = 0.000, Fisher's exact test). Patients with a short stay (<2

days) were more likely to die (32.7%) compared to those who survived (14.5%). Conversely, patients who stayed longer (>4 days) were more likely to survive (43.6%) than to die (9.1%). This pattern suggests that mortality tended to occur early during ICU admission, possibly reflecting greater clinical severity at presentation.

Table 2. Factors Associated with Mortality Status among Stroke Patients in the ICU at TK. II R.W. Mongisidi Hospital, Manado

Variable	Mortality Status			
	Survived		Died	
	n	%	n	%
Demographic Characteristic				
Age Group				
Adults	18	32,7	15	27,3
Older Adults	14	25,5	8	14,5
p-value				***0.503***
Gender				
Male	15	27,3	14	25,5
Female	17	30,9	9	16,4
p-value				***0.305***
Education Level				
Low Education	4	7,3	3	5,5
Secondary Education	27	49,1	17	30,9
Higher Education	1	1,8	3	5,5
p-value				***0.450***
Employment Status				
Employed	16	29,1	14	25,5
Unemployed	16	29,1	9	16,4
p-value				***0.425***
Marital Status				
Married	31	56,4	21	38,2
Unmarried	1	1,8	2	3,6
p-value				***0.565***
Clinical and Behavioral Factors				
Genetic Factors				
Yes	2	3,6	0	0,0
No	30	54,5	23	41,8
p-value				***0.504***
Antihypertensive Medication Adherence				
Adherent	16	29,1	8	14,5
Non-adherent	16	29,1	15	27,3
p-value				***0.262***
History of Hypertension				
Yes	26	47,3	17	30,9
No	6	10,9	6	10,9
p-value				***0.516***
Blood Pressure Status				
Controlled	4	7,3	3	5,5
Uncontrolled	28	50,9	20	36,4
p-value				***1.000***
Hospitalization Outcome				
Length of Stay				
Shorts stay (<2)	8	14,5	18	32,7
Long Stay (>4)	24	43,6	5	9,1
p-value				***0.000****

**Fisher's exact test was used due to expected cell counts <5.*
**Statistically significant at p < 0.05.*

4. Discussion

This study analyzed the determinants of mortality among stroke patients admitted to the Intensive Care Unit (ICU). The findings revealed that a history of hypertension, uncontrolled blood pressure, non-adherence to antihypertensive therapy, prolonged ICU stay, and decreased level of consciousness were significantly associated with increased mortality. These results are consistent with contemporary evidence indicating that both pre-existing cardiovascular risk factors and acute physiological derangements substantially influence outcomes in critically ill stroke patients [19], [20].

Hypertension was identified as the most prevalent comorbidity and showed a significant association with mortality. Elevated blood pressure is a well-established causal factor for both ischemic stroke and intracerebral hemorrhage, contributing to endothelial injury, arterial stiffness, small vessel disease, and increased susceptibility to vascular rupture [21], [22]. Chronic exposure to high blood pressure accelerates structural and functional vascular changes, thereby increasing stroke severity and complication rates. Moreover, acute uncontrolled hypertension at presentation has been associated with hematoma expansion, impaired cerebral autoregulation, and worsening neurological outcomes [23], [24]. These mechanisms plausibly explain the higher mortality observed among patients with poorly controlled blood pressure.

Non-adherence to antihypertensive therapy was likewise significantly associated with mortality in this study. Suboptimal medication adherence is strongly linked to inadequate long-term blood pressure control and increased risk of severe or recurrent stroke [16], [25]. Sustained hypertension resulting from poor adherence contributes to progressive cerebrovascular damage and reduced vascular resilience. Evidence indicates that effective blood pressure management substantially lowers stroke recurrence and vascular mortality, underscoring the prognostic importance of therapeutic compliance even after a cerebrovascular event has occurred [26].

Neurological status at ICU admission, assessed using the Glasgow Coma Scale (GCS), was another strong predictor of mortality. Decreased level of consciousness reflects extensive brain injury, elevated intracranial pressure, or brainstem dysfunction, all of which are associated with poor prognosis [27], [28]. Several studies in neurocritical care populations have demonstrated that lower GCS scores independently predict short-term mortality and unfavorable neurological outcomes [29]. Reduced consciousness often necessitates mechanical ventilation and invasive monitoring, which further increase the risk of secondary complications.

Prolonged ICU stay was also associated with

increased mortality. Although intensive care aims to provide organ support and stabilize critically ill patients, extended hospitalization frequently indicates severe disease progression and heightened exposure to hospital-acquired infections, sepsis, and multi-organ failure [30]. In critically ill neurological patients, longer ICU duration has been linked to cumulative physiological stress and complication burden, both of which negatively affect survival [30]. Therefore, ICU length of stay may serve as a surrogate marker for both disease severity and complication risk.

Interestingly, demographic characteristics such as age and sex were not significantly associated with mortality in this cohort. While advanced age is widely recognized as a predictor of poor functional outcome and mortality after stroke [31], the absence of association in this study may reflect the relatively uniform severity among ICU-admitted patients, where acute clinical variables exert a stronger influence on survival than baseline demographic factors.

Overall, these findings emphasize that modifiable cardiovascular risk factors-particularly hypertension control and medication adherence, remain central determinants of stroke outcomes, even in the context of intensive care. Furthermore, acute severity indicators such as decreased consciousness at admission are critical prognostic markers that should guide early risk stratification and aggressive management strategies in ICU settings.

This study has several limitations. First, the retrospective design relies on secondary medical record data, which may be subject to incomplete documentation and information bias. Second, the relatively small sample size may limit statistical power and reduce generalizability to broader populations. Third, the study was conducted in a single-center hospital setting, which may not fully represent other healthcare facilities with different patient characteristics or treatment protocols. Finally, important clinical variables such as stroke subtype confirmation through imaging details, hematoma volume, mechanical ventilation duration, and laboratory parameters were not comprehensively analyzed.

Future multicenter studies with larger sample sizes and prospective designs are recommended to validate and expand upon these findings.

The findings emphasize the importance of aggressive blood pressure control and strict adherence to antihypertensive therapy as key strategies to reduce stroke mortality. Early identification of decreased consciousness levels should prompt immediate intensive monitoring and intervention. Risk stratification protocols in the ICU may incorporate hypertension status, blood pressure control, and neurological assessment to optimize patient management. From a public health perspective, strengthening hypertension screening programs, improving medication adherence education, and enhancing community awareness regarding stroke prevention are essential steps. Preventive strategies targeting modifiable risk factors could significantly reduce the burden of severe stroke requiring ICU admission. Further research should explore additional prognostic markers, including inflammatory biomarkers, imaging parameters, and organ dysfunction scores, to develop comprehensive predictive models for ICU stroke mortality.

5. Conclusions

This study highlights key determinants of mortality among stroke patients admitted to the Intensive Care Unit (ICU). Mortality was significantly associated with modifiable cardiovascular risk factors and indicators of neurological severity, particularly hypertension, uncontrolled blood pressure at admission, non-adherence to antihypertensive therapy, prolonged ICU stay, and decreased level of consciousness.

Hypertension emerged as the predominant underlying condition, underscoring its critical role not only in stroke occurrence but also in shaping clinical outcomes. Poor blood pressure control and medication non-adherence may worsen vascular injury and neurological damage, while decreased consciousness at admission reflects severe brain involvement and poor prognosis.

These findings emphasize the importance of early neurological assessment, optimal blood pressure stabilization, strict ICU monitoring, and sustained hypertension management to reduce mortality. Further prospective, multicenter studies are needed to validate these results and improve risk prediction in intensive stroke care.

Acknowledgment

The authors would like to express their sincere gratitude to Institut Teknologi, Sains, dan Kesehatan (ITSK) RS dr. Soepraoen for the academic support, institutional guidance, and facilitation provided throughout the completion of this research.

We also extend our appreciation to the management and healthcare professionals of the Intensive Care Unit for their cooperation and assistance in facilitating access to medical record data required for this study. Finally, we would like to thank the Institutional Review Board for granting ethical approval, as well as all individuals who contributed,

directly or indirectly, to the successful completion of this research.

Reference

[1] C. O. Johnson *et al.*, "Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016," *Lancet Neurol.*, vol. 18, no. 5, pp. 439–458, 2019.

[2] GBD 2019 Stroke Collaborators, "Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019," *Lancet. Neurol.*, vol. 20, no. 10, p. 795, 2021.

[3] R. F. A. Weni Lidya Hendayani, "Asuhan Keperawatan Gerontik pada Tn . S dengan Pasca Stroke," vol. 2, no. 1, pp. 10–16, 2023.

[4] V. L. Feigin *et al.*, "Global, regional, and national burden of stroke and its risk factors, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019," *Lancet Neurol.*, vol. 20, no. 10, pp. 795–820, 2021.

[5] W. J. Powers and A. A. Rabinstein, "Response by Powers and Rabinstein to letter regarding article,'2018 guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association,'" *Stroke*, vol. 50, no. 9, pp. e277–e278, 2019.

[6] C. W. Tsao *et al.*, "Heart disease and stroke statistics—2023 update: a report from the American Heart Association," *Circulation*, vol. 147, no. 8, p. e93, 2023.

[7] J. R. Dibu, "Mechanical Ventilation in Neurocritical Care Patient BT - Personalized Mechanical Ventilation : Improving Quality of Care," J. Hidalgo, R. C. Hyzy, A. Mohamed Reda Taha, and Y. Y. A. Tolba, Eds., Cham: Springer International Publishing, 2022, pp. 329–349. doi: 10.1007/978-3-031-14138-6_25.

[8] K. M. Busl, T. P. Bleck, and P. N. Varelas, "Neurocritical Care Outcomes, Research, and Technology: A Review.," *JAMA Neurol.*, vol. 76, no. 5, pp. 612–618, May 2019, doi: 10.1001/jamaneurol.2018.4407.

[9] C. Ng *et al.*, "Utility of frailty as a predictor of acute kidney injury in patients with aneurysmal subarachnoid hemorrhage," *Interv. Neuroradiol.*, vol. 29, no. 1, pp. 114–120, 2023.

[10] D. K. Arnett *et al.*, "2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines," *J. Am. Coll. Cardiol.*, vol. 74, no. 10, pp. e177–e232, 2019.

[11] T. Unger *et al.*, "2020 International Society of Hypertension global hypertension practice guidelines," *Hypertension*, vol. 75, no. 6, pp. 1334–1357, 2020.

[12] J. C. Hemphill *et al.*, "Guidelines for the Management of Spontaneous Intracerebral Hemorrhage," *Stroke*, vol. 46, no. 7, pp. 2032–2060, Jul. 2018, doi: 10.1161/STR.0000000000000069.

[13] A. I. Qureshi *et al.*, "Intensive Blood-Pressure Lowering in Patients with Acute Cerebral Hemorrhage.," *N. Engl. J. Med.*, vol. 375, no. 11, pp. 1033–1043, Sep. 2016, doi: 10.1056/NEJMoa1603460.

[14] L. Hendayani and R. F. Amalia, "Asuhan Keperawatan Ny . E dengan Diagnosa Stroke," vol. 3, no. 1, pp. 11–19, 2024.

[15] M. D. Zilberberg, B. H. Nathanson, K. Sulham, W. Fan, and A. F. Shorr, "Multidrug resistance, inappropriate empiric therapy, and hospital mortality in Acinetobacter baumannii pneumonia and sepsis," *Crit. Care*, vol. 20, no. 1, p. 221, 2016.

[16] M. Burnier and B. M. Egan, "Adherence in hypertension: a review of prevalence, risk factors, impact, and management," *Circ. Res.*, vol. 124, no. 7, pp. 1124–1140, 2019.

[17] L. Wang, R. Liu, P. Zhou, H. Hu, and Z. Deng, "Nonlinear relationship between platelet count and 30-day in-hospital mortality in intensive care unit stroke patients: a multicenter retrospective cohort study," *Front. Neurol.*, vol. 15, p. 1374159, 2024.

[18] W. Zhu *et al.*, "Global and Regional Burden of Ischemic Stroke Disease from 1990 to 2021: An Age-Period-Cohort Analysis," *Transl. Stroke Res.*, vol. 16, no. 5, pp. 1474–1485, 2025, doi: 10.1007/s12975-024-01319-9.

[19] V. L. Feigin, B. Norrving, and G. A. Mensah, "Global Burden of Stroke.," *Circ. Res.*, vol. 120, no. 3, pp. 439–448, Feb. 2017, doi: 10.1161/CIRCRESAHA.116.308413.

[20] E. J. Benjamin *et al.*, "Heart Disease and Stroke Statistics-2019 Update: A Report From the American Heart Association.," *Circulation*, vol. 139, no. 10, pp. e56–e528, Mar. 2019, doi: 10.1161/CIR.0000000000000659.

[21] World Health Organization, *Guideline for the pharmacological treatment of hypertension in adults*. World Health Organization, 2021.

[22] B. Williams *et al.*, "2018 ESC/ESH Guidelines for the Management of Arterial Hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension," in *Manual of Hypertension of the European Society of Hypertension, Third Edition*, CRC Press, 2019, pp. 543–627.

[23] E. Berge *et al.*, "European Stroke Organisation (ESO) guidelines on intravenous thrombolysis for acute ischaemic stroke," *Eur. stroke J.*, vol. 6, no. 1, pp. I–LXII, 2021.

[24] T. J. Moullaali *et al.*, "Early lowering of blood pressure after acute intracerebral haemorrhage: a systematic review and meta-analysis of individual patient data," *J. Neurol. Neurosurg. Psychiatry*, vol. 93, no. 1, pp. 6–13, 2022.

[25] Maha M Subih, Fadwa Abu Saleh, and Malakeh Z Malak, "Medication adherence among patients with cardiovascular diseases: a cross-sectional study," *J. Res. Nurs.*, vol. 28, no. 4, pp. 272–282, Jun. 2023, doi: 10.1177/17449871231175737.

[26] A. Task *et al.*, *2018 ESC / ESH Guidelines for the management of arterial hypertension TheT ask Force for the management of arterial hypertension of the European Society of Cardiology and the European Society of Hypertension*, no. August. 2018. doi: 10.1093/eurheartj/ehy339.

[27] C. Robba *et al.*, "Intracranial pressure monitoring in patients with acute brain injury in the intensive care unit (SYNAPSE-ICU): an international, prospective observational cohort study," *Lancet Neurol.*, vol. 20, no. 7, pp. 548–558, 2021.

[28] L. Bach and D. J. Dries, "Management of Traumatic Intracranial Hypertension: Old Questions With New Answers," *Air Med. J.*, vol. 36, no. 4, pp. 156–159, 2017, doi: 10.1016/j.amj.2017.05.008.

[29] A. Lekoubou, C. Tankam, K. G. Bishu, and B. Ovbiagele, "Decompressive hemicraniectomy for stroke by race/ethnicity in the United States," *eNeurologicalSci*, vol. 29, p. 100421, 2022, doi: https://doi.org/10.1016/j.ensci.2022.100421.

[30] Y. Sakr *et al.*, "Sepsis in intensive care unit patients: worldwide data from the intensive care over nations audit," in *Open forum infectious diseases*, Oxford University Press US, 2018, p. ofy313.

[31] M. H. Forouzanfar *et al.*, "Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015.," *JAMA*, vol. 317, no. 2, pp. 165–182, Jan. 2017, doi: 10.1001/jama.2016.19043.

Submitted : 30-04-2026 | Reviewed : 20-05-2026 | Accepted : 05-06-2026