Clinical Outcomes of Stroke Thrombolysis in the Philippine General Hospital: A Five-year Retrospective Study

Pamela Danielle T. Lanuza, MD, Marie Charmaine S. Lukban, MD, MBA, Ena Elizabeth L. Naoe, MD, Iris D. Ditan, MD, Jose Leonard R. Pascual V, MD and Maria Epifania V. Collantes, MD, MSc

Department of Neurosciences, College of Medicine and Philippine General Hospital, University of the Philippines Manila

ABSTRACT

Background. Thrombolysis, or the administration of intravenous recombinant tissue plasminogen activator (IV rTPA) within the narrow therapeutic window following ischemic stroke onset, has emerged as a critical intervention in acute stroke care with the potential to restore blood flow and improve chances of functional recovery.

Objectives. This study aimed to describe the demographic profile, risk factors, ischemic stroke subtypes, clinical course, and outcomes of stroke thrombolysis in a tertiary hospital in the Philippines over the past five years. It also aimed to evaluate key performance indicators in terms of benchmark times in the administration of IV rTPA.

Methods. This study used a retrospective observational design including all adult acute ischemic stroke patients who received IV rTPA at the University of the Philippines - Philippine General Hospital (UP-PGH). Data was collected through census and chart review.

Results. One hundred eighty-eight patients received IV rTPA, majority were males (57.45%) with a median age of 60 years old. Hypertension (76.60%) was the most common risk factor for ischemic stroke. Partial anterior circulation infarcts (67.55%) and large artery atherosclerosis (49.47%) were the most common ischemic stroke subtype and etiology, respectively. The median door to needle time was 48 minutes, and the median length of hospital stay was five days. There was improvement in median NIHSS from 13 to 4, with a median modified Rankin scale of 3 indicating moderate disability upon discharge. Less than five percent (4.79%) had symptomatic intracerebral hemorrhage. The in-hospital all-cause mortality rate among thrombolysed patients was 13.83%, mostly from non-neurologic causes. Nosocomial pneumonia and the need for neurosurgical interventions after thrombolysis were significantly associated with poor outcome ($p < 0.05$).

Conclusion. Our findings support the use of IV rTPA in the treatment of acute ischemic stroke. Existing stroke protocols in our institution are able to achieve the recommended thrombolysis benchmark times, leading to better functional outcomes for stroke patients.

Keywords: thrombolysis, ischemic stroke, Philippines, outcomes

eISSN 2094-9278 (Online)
Published: September 15, 2025
https://doi.org/10.47895/amp.v59i13.11341

Corresponding author: Pamela Danielle T. Lanuza, MD
Department of Neurosciences
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila 1000, Philippines
Email: ptlanuza@up.edu.ph
ORCiD: https://orcid.org/0000-0003-4166-9336

INTRODUCTION

Stroke is a devastating medical condition characterized by the sudden disruption of blood supply to the brain. With its potential to cause long-term disability and death, it poses a significant burden on individuals, families, and the entire healthcare system.[1] Thrombolysis, specifically the use of intravenous recombinant tissue plasminogen activator (IV rTPA), has emerged as a critical intervention in acute ischemic stroke with the potential to restore blood flow and minimize the extent of brain damage.[2] Its administration within the narrow therapeutic window following symptom onset has been shown to significantly improve the chances of functional recovery and reduce the disability burden caused by ischemic stroke.

The use of IV rTPA has been approved in the Philippines since 1999, and has been made available for free in government hospitals since 2015.[2] However, despite its availability in the country for over two decades, there remains to be limited published data on its use in the local setting. Few studies have looked into the treatment safety and feasibility of thrombolysis in the Philippines, but even fewer have specifically examined its effectiveness and clinical outcomes.

This study aims to determine the clinical outcomes of stroke thrombolysis in a tertiary hospital in the Philippines over the past five years. Specifically, it aims to 1) determine the number of patients who underwent stroke thrombolysis, 2) describe their demographic characteristics and identify risk factors predisposing them to develop stroke, 3) describe the baseline clinical characteristics and ischemic stroke subtypes, 4) describe their hospital course in terms of length of stay and complications encountered during admission, 5) determine outcomes in terms of morbidity, mortality, and functional status upon discharge, 6) identify factors associated with good (mRS 0-2) or poor outcome (mRS 3-6) among these patients, and 7) determine key performance indicators of stroke thrombolysis in terms of benchmark times from hospital admission to administration of IV rTPA.

METHODS

Study Design and Setting

This study used a retrospective observational study design and adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The University of the Philippines - Philippine General Hospital (UP-PGH) is a stroke-ready hospital and remains to be the only national referral center for tertiary care in the country.

Study Population

Inclusion and Exclusion Criteria

All adult patients (i.e., aged 19 years and above) who were admitted under or referred to the UP-PGH Department of Neurosciences from January 1, 2019 to May 31, 2024, clinically and radiologically diagnosed to have acute ischemic stroke and received IV rTPA regardless of dose were included in the study. Patients who did not receive IV rTPA were excluded.

Case Identification and Sampling

Cases were identified using a review of the Brain Attack Team (BAT) census of the UP-PGH Department of Neurosciences from January 1, 2019 to May 31, 2024. All cases which fulfilled the inclusion criteria above were included in the study.

Data Collection

Physical and electronic inpatient records, as well as available neuroimaging were retrieved. Data was extracted by at least two independent reviewers per chart and was encoded into a pre-made abstraction form using unique patient codes.

Demographic characteristics such as age, sex, civil status, educational attainment, occupation, and place of residence were recorded. Risk factors such as known medical comorbidities and vices were also included. Ischemic stroke subtypes were categorized according to the Oxfordshire and Trial of ORG 10172 in Acute Stroke Treatment (TOAST) systems. Baseline stroke severity was evaluated in terms of Glasgow Coma Scale (GCS), National Institutes of Health Stroke Scale (NIHSS), and Alberta Stroke Program Early CT Score (ASPECTS) scores on admission. Diagnostics such as fasting blood sugar, lipid profile, 2D echo, 24-hour Holter monitoring, and carotid duplex scan were reviewed. Thrombolysis-related factors included the dose of IV rTPA given and the NIHSS scores 4 hours post-rTPA, 24 hours post-rTPA, and upon discharge. In terms of clinical course, the duration of admission, nosocomial infection, antiplatelet and anticoagulant medications taken, and co-managing services were recorded. Outcomes such as mortality, symptomatic intracerebral hemorrhage (sICH), need for neurosurgical interventions after thrombolysis, bleeding in extracranial sites, and Modified Rankin scale (mRS) score upon discharge were assessed. Lastly, key performance indicators for stroke thrombolysis included time from stroke symptom onset (or ictus) to emergency room (ER) arrival, door to first MD, door to BAT activation, door to BAT team arrival, door to cranial imaging and interpretation, and door to needle times.

Data Analysis

The clinical profile and outcomes of acute ischemic stroke patients who received IV rTPA in UP-PGH from January 1, 2019 to May 31, 2024 were summarized by descriptive statistics. The non-normally distributed continuous numerical variables and discrete numerical variables were described as median and range. The categorical variables were described as frequency and percentage. The key performance indicators for stroke thrombolysis of the UP-PGH Department of Neurosciences were described as median and range.

The association of demographic and clinical factors of interest, and key performance indicators with poor outcome (mRS >2) was determined by Chi-square or Fisher exact test of association. Data analysis was performed using Stata version 17. Missing values were not replaced nor inputted. The distribution of continuous numerical data was assessed by the Shapiro-Wilk test of normality. The significance level was set at α=0.05.

Ethical Considerations

This study adhered to the National Ethical Guidelines for Research Involving Human Participants 2022.

The protocol was approved by the UP-PGH Department of Neurosciences Technical Review Board and the UP Manila Research Ethics Board (UPMREB 2024-0277-01).

RESULTS

Baseline Characteristics and Risk Factors

One hundred eighty-eight adult patients with acute ischemic stroke underwent thrombolysis with IV rTPA from January 1, 2019 to May 31, 2024 in UP-PGH (Table 1). The median age was 60 years old, with a range of 20 to 91 years old (Figure 1). Majority were males (57.45%, n = 108), married (61.17%, n = 115), and residing in the National Capital Region (71.28%, n = 134) where the hospital is located. There were missing data on the patients' educational attainment and occupation, but among those with recorded data, most were high school graduates (22.87%, n = 43) and unemployed (20.21%, n = 38).

More than three-fourths were known hypertensives (76.60%, n = 144), while more than a quarter had pre-existing cardiac disease (27.13%, n = 51) and diabetes mellitus (26.06%, n = 49). More than ten percent had a history of ischemic stroke (10.64%, n = 20). Other risk factors included smoking (38.30%, n = 72), drinking alcoholic beverages (32.98%, n = 62), and illicit drug use (6.91%, n = 13). More than three-fourths (76.06%, n = 143) had two or more of these identified risk factors.

Ischemic Stroke Classification and Severity

In terms of stroke classification, majority of patients who underwent thrombolysis had partial anterior circulation infarcts (67.55%, n = 127), followed by posterior circulation infarcts (12.77%, n = 24), total anterior circulation infarcts (11.70%, n = 22), and lacunar anterior circulation infarcts (7.98%, n = 15). In terms of ischemic stroke etiology, the majority were from large artery atherosclerosis (49.47%, n = 93), followed by cardioembolism (35.11%, n = 66), and small artery occlusion (11.17%, n = 21). The median GCS on admission was 15, and the median ASPECTS was 9. The median NIHSS on admission was 13, with majority having moderate stroke severity (37.77%, n = 71).

Diagnostics

A plain cranial CT was the most commonly used imaging modality on admission (63.83%, n = 120) and on subsequent imaging studies (79.26%, n = 149). There was increasing use of CT angiogram and MRI studies during the more recent years. Three-fourths of patients had their fasting blood sugar (FBS) and lipid profile taken during their admission; the median HDL was slightly low, while the median LDL, VLDL, and triglyceride levels were within normal levels based on the hospital laboratory cutoffs. Few patients had 2D echo (36.70%, n = 69), carotid duplex scan (10.11%, n = 19), and 24-hour Holter monitoring (5.85%, n = 11) done during their hospital admission.

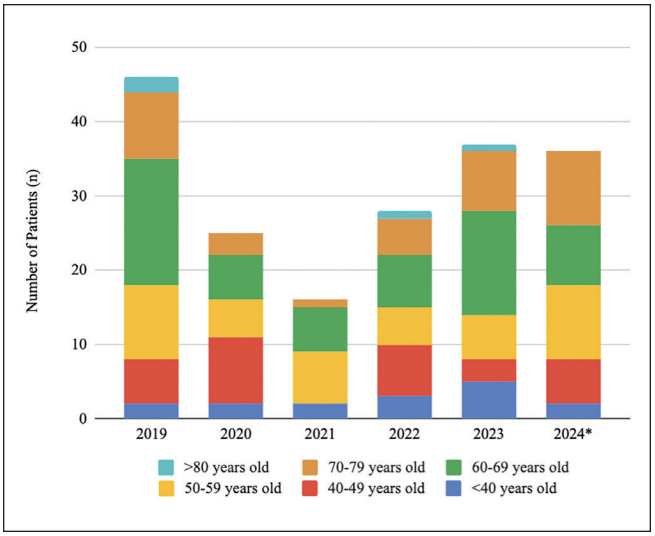

Figure 1. Trends in the number of patients thrombolysed per year per age group in UP-PGH from January 2019 to May 2024.

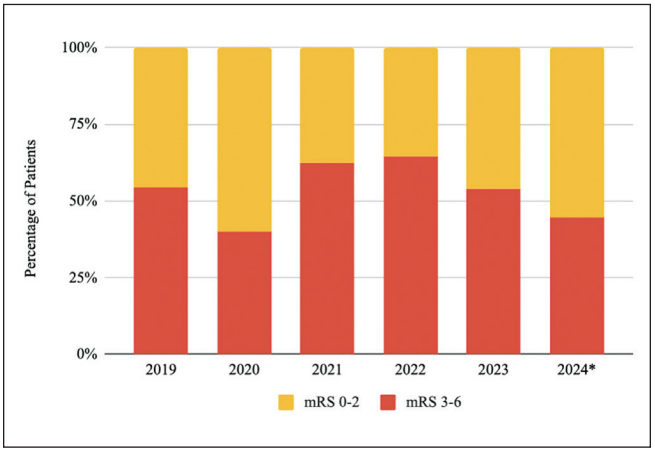

Figure 2. Trends in the functional outcomes of thrombolysed per year in UP-PGH from January 2019 to May 2024.

Clinical Course

The median blood pressure on admission was a systolic of 150 (range: 60-240) and a diastolic of 90 (range: 40-180). The median dose of IV rTPA given was 0.9 mg/kg (range: 0.6-0.9). The median length of hospital stay was five days (range: 0-76 days). Among those with prolonged hospitalization, pneumonia was the most common nosocomial infection (13.83%, n = 26). Only half of the thrombolysed patients were seen by rehabilitation medicine during their admission (51.60%, n = 97).

Outcomes

Clinical improvement in neurologic deficits was generally noted among patients who received IV rTPA, with median NIHSS scores of 13 (range: 3-33) upon admission, improving to 10 (range: 0-21) at 4 hours post-rTPA, 7 (range: 0-36) at 24 hours post-rTPA, and 4 (range: 0-34) upon discharge. Less than five percent (4.79%, n = 9) had symptomatic intracerebral hemorrhage after thrombolysis and required neurosurgical intervention (4.79%, n = 9). Five percent (5.32%, n = 10) had bleeding in other extracranial sites after thrombolysis. The median modified Rankin scale upon discharge was 3 (moderate disability) or requiring some external help but able to walk without the assistance of another individual (Figure 2).

The in-hospital all-cause mortality rate among thrombolysed patients was 13.83% (n = 26). Non-neurologic causes of mortality were more common, namely septic shock (3.19%, n = 6), respiratory failure (2.66%, n = 5), and fatal arrhythmia (2.13%, n = 4). Neurologic causes of mortality, namely brain

Table 1. Clinical Characteristics and Outcomes of Patients who Underwent Thrombolysis in UP-PGH (n = 188)

Parameter	All patients, n (%)
Demographic Characteristics	
Age (median, range)	60 (20-91)
Sex	
Male	108 (57.45%)
Female	80 (42.55%)
Civil status	
Married	115 (61.17%)
Single	33 (17.55%)
Widowed	21 (11.17%)
Separated	8 (4.26%)
No data	11 (5.85%)
Highest educational attainment	
High school	43 (22.87%)
College	25 (13.30%)
Elementary	21 (11.17%)
Postgraduate	2 (1.06%)
No formal education	1 (0.53%)
No data	96 (51.06%)
Occupation, based on ISCO-08	
None	38 (20.21%)
Elementary occupations	21 (11.17%)
Plant/machine operators and assemblers	14 (7.45%)
Craft-related trades workers	13 (6.91%)
Professions	13 (6.91%)
Clerical support workers	12 (6.38%)
Services and sales workers	11 (5.85%)
Skilled agricultural, forestry, and fishery workers	3 (1.60%)
Managers	2 (1.06%)
Armed forces occupations	2 (1.06%)
Technicians and associate professionals	1 (0.53%)
No data	58 (30.85%)
Place of residence	
National Capital Region (NCR)	134 (71.28%)
CALABARZON	33 (17.55%)
Region III	4 (2.13%)
Others	17 (9.04%)

Parameter	All patients, n (%)
Risk Factors	
Comorbidities	
Hypertension	144 (76.60%)
Cardiac disease	51 (27.13%)
Diabetes mellitus	49 (26.06%)
Dyslipidemia	30 (15.96%)
Obesity	14 (7.45%)
Chronic kidney disease	9 (4.79%)
Malignancy	1 (0.53%)
Other risk factors	
Smoking	72 (38.30%)
Alcoholic beverage drinking	62 (32.98%)
Illicit drug use	13 (6.91%)
History of previous ischemic stroke	
Yes	20 (10.64%)
No	168 (89.36%)
Ischemic Stroke Classification	
Oxfordshire classification	
Partial anterior circulation infarct (PACI)	127 (67.55%)
Posterior circulation infarct (POCI)	24 (12.77%)
Total anterior circulation infarct (TACI)	22 (11.70%)
Lacunar anterior circulation infarct (LACI)	15 (7.98%)
TOAST classification	
Large artery atherosclerosis (LAA)	93 (49.47%)
Cardioembolism (CE)	66 (35.11%)
Small artery occlusion (SAO)	21 (11.17%)
Stroke of other determined cause (SOC)	6 (3.19%)
Stroke of undetermined cause (SUC)	2 (1.06%)
Baseline Stroke Severity	
GCS score on admission (median, range)	15 (3-15)
NIHSS score on admission (median, range)	13 (3-33)
Mild stroke (NIHSS ≤8)	52 (27.66%)
Moderate stroke (NIHSS 9-15)	71 (37.77%)
Severe stroke (NIHSS ≥16)	65 (34.57%)
ASPECTS on admission (median, range)	9 (0-10)
ASPECTS 6-10	146 (77.66%)
ASPECTS 4-5	14 (7.45%)
ASPECTS 0-3	28 (14.89%)

Table 1. Clinical Characteristics and Outcomes of Patients who Underwent Thrombolysis in UP-PGH (n = 188) *(continued)*

Parameter	All patients, n (%)
Diagnostics	
Cranial imaging initially used	
Plain CT scan	120 (63.83%)
CT angiography	22 (11.70%)
CT perfusion	0
Plain MRI	25 (13.30%)
MR angiography	21 (11.17%)
Cranial imaging subsequently used	
Plain CT scan	149 (79.26%)
CT angiography	52 (27.66%)
Plain MRI	43 (22.87%)
MR angiography	22 (11.70%)
Fasting blood sugar	141 (75.00%)
Glucose level (in mg/dL) (median, range)	97.20 (44.64-325.00)
Lipid profile	146 (77.66%)
LDL level (in mg/dL) (median, range)	114.08 (16.56-387.00)
VLDL level (in mg/dL) (median, range)	20.08 (6.13-109.05)
HDL level (in mg/dL) (median, range)	39.00 (11.97-85.83)
Triglyceride level (in mg/dL) (median, range)	101.78 (10.98-519.02)
2D echo	69 (36.70%)
Carotid duplex scan	19 (10.11%)
24-hour Holter monitoring	11 (5.85%)
Clinical Course	
Systolic blood pressure on admission (in mmHg) (median, range)	150 (60-240)
Diastolic blood pressure on admission (in mmHg) (median, range)	90 (40-180)
Dose of IV rTPA given (in mg/kg) (median, range)	0.9 (0.6-0.9)
Length of hospital stay (in days) (median, range)	5 (0-76)
Nosocomial infection during admission	
Pneumonia	26 (13.83%)
Urinary tract infection	1 (0.53%)
Antiplatelet or anticoagulant medications given	
Aspirin	132 (70.21%)
Apixaban	35 (18.62%)
Enoxaparin	22 (11.70%)
Clopidogrel	15 (7.98%)
Cilostazol	10 (5.32%)
Warfarin	7 (3.72%)
Co-managing services	
Rehabilitation Medicine	97 (51.60%)
General Medicine	62 (32.98%)
Cardiology	52 (27.66%)
Neurosurgery	16 (8.51%)
Others	39 (20.74%)

Parameter	All patients, n (%)
Outcomes	
NIHSS after thrombolysis	
NIHSS score 4 hours post-rTPA (median, range)	10 (0-21)
NIHSS score 24 hours post-rTPA (median, range)	7 (0-36)
NIHSS score upon discharge (median, range)	4 (0-34)
Symptomatic intracerebral hemorrhage (sICH) after thrombolysis	
Yes	9 (4.79%)
No	179 (89.89%)
Need for neurosurgical interventions after thrombolysis	
Yes	9 (4.79%)
No	179 (95.21%)
Bleeding in other extracranial sites after thrombolysis	
Yes	10 (5.32%)
No	178 (94.68%)
Modified Rankin scale (mRS) score upon discharge (median, range)	3 (0-6)
Overall outcome	
Discharged	158 (84.04%)
Expired	26 (13.83%)
Home against medical advice	4 (2.12%)
Cause of mortality, if applicable	
Septic shock	6 (3.19%)
Respiratory failure	5 (2.66%)
Fatal arrhythmia	4 (2.13%)
Brain herniation	4 (2.13%)
Brainstem failure	3 (1.60%)
Cardiogenic shock	2 (1.06%)
No data	2 (1.06%)
Key Performance Indicators for Stroke Thrombolysis (median, range)	
Time from stroke symptom onset (or ictus) to emergency room (ER) arrival (in minutes) (median, range)	130 (0-305)
Door (i.e., ER arrival) to first MD time (in minutes)	0 (0-6)
Door to BAT activation time (in minutes)	2 (0-47)
Door to BAT team arrival time (in minutes)	4 (0-85)
Door to cranial imaging (CT scan or MRI) time (in minutes)	15 (0-90)
Door to cranial imaging interpretation time (in minutes)	19.5 (0-91)
Door to needle (i.e., administration of IV rTPA) time (in minutes)	48 (8-149)

ISCO-08 – International Standard Classification of Occupations
GCS – Glasgow Coma Scale
NIHSS – National Institutes of Health Stroke Scale
ASPECTS – Alberta Stroke Program Early CT Score

Table 2. Clinical Factors Associated with Good or Poor Outcomes (n = 187)

Parameter	mRS ≤2 (n = 86)	mRS >2 (n = 101)	*p*-value
Sex (male)	50 (58.14%)	58 (57.43%)	0.922
Comorbidities			
Hypertension	62 (72.09%)	81 (80.20%)	0.193
Diabetes mellitus	27 (31.40%)	21 (20.79%)	0.098
Malignancy	1 (1.16%)	0	0.460
Other risk factors			
Smoking	35 (40.70%)	37 (36.63%)	0.569
History of previous ischemic stroke	9 (10.47%)	10 (9.90%)	0.899
Nosocomial infection			
Pneumonia	6 (6.98%)	20 (19.80%)	0.012
Urinary tract infection	0	1 (0.99%)	>0.999
Outcomes			
SICH after thrombolysis	1 (1.16%)	7 (6.93%)	0.071
Need for neurosurgical interventions after thrombolysis	0	8 (7.92%)	0.008
Bleeding in other extracranial sites after thrombolysis	2 (2.33%)	8 (7.92%)	0.111

herniation (2.13%, n = 4) and brainstem failure (1.60%, n = 3), occurred in less than three percent of patients.

Key Performance Indicators for Stroke Thrombolysis

The median duration from stroke symptom onset to emergency room arrival was 130 minutes (range: 0 or in-hospital to 305 minutes). The median door to first MD time was 0 minutes (range: 0-6 minutes), door to BAT activation time was 2 minutes (range: 0-47 minutes), door to BAT team arrival time was 4 minutes (range: 0-85 minutes), door to cranial imaging time was 15 minutes (range: 0-90 minutes, including coordinated transfers from other hospitals with imaging done prior to transfer), and door to cranial imaging interpretation time was 19.5 minutes (range: 0-91 minutes). The median door to needle time was 48 minutes (range: 8-149 minutes).

Factors Associated with Poor Outcomes

Poor outcome was defined as an mRS score of greater than 2 (Table 2). Nosocomial pneumonia and need for neurosurgical interventions after thrombolysis were significantly associated with poor outcome ($p < 0.05$). Factors such as male sex, previously diagnosed hypertension, diabetes mellitus, malignancy, previous ischemic stroke, smoking, nosocomial UTI, sICH and bleeding in other extracranial sites after thrombolysis were also associated with poor outcomes, but the differences were not statistically significant.

DISCUSSION

To the best of the authors' knowledge, this is the largest retrospective study on the clinical profile and outcomes of acute ischemic stroke patients who received IV rTPA in the Philippines over the past five years. Findings from our study provide insights on stroke thrombolysis in terms of improving outcomes and optimizing acute stroke protocols in the local setting to provide the best quality of care for our patients.

Among the 188 acute ischemic stroke patients who received thrombolysis in UP-PGH over the past five years, majority were males with a median age of 60 years old from the National Capital Region. Hypertension was the most common ischemic stroke risk factor present in more than 75 percent, whereas smoking, drinking alcoholic beverages, cardiac disease, and diabetes mellitus were present in more than 25 percent. This is consistent with findings from a recent systematic review on stroke incidence, prevalence, and risk factors in the Philippines, which showed a higher prevalence in males, and hypertension, diabetes, and smoking as the most commonly recorded stroke risk factors.[3]

Functional outcomes after thrombolysis are critical indicators of treatment effectiveness and overall patient well-being. Findings from this study show significant improvement in stroke severity from a median NIHSS of 13 upon admission to a median NIHSS of 4 upon discharge. However, despite this improvement in neurologic deficits, most patients still had moderate disability (mRS 3) upon discharge. In the landmark trial by the National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group, although no immediate significant difference was noted between those given IV rTPA and placebo, benefit was observed at three months in terms of all four outcome measures, namely the Barthel index, mRS, Glasgow outcome scale, and NIHSS; patients who received rTPA were also found to be at least 30 percent more likely to have minimal to no disability at three months.[4] Further research looking into these long-term outcomes may be necessary to better evaluate improvement in terms of functional independence among patients receiving rTPA.

Symptomatic intracerebral hemorrhage is one of the most severe complications of thrombolytic therapy. The American Stroke Association reports a sICH incidence ranging from

2% to 7% after alteplase administration at a dose of 0.9 mg/kg based on clinical trials and prospective stroke registries.[5] A local retrospective cohort on stroke thrombolysis in the Philippines from 2014 to 2016 showed a sICH incidence of 12.1%; findings from our institution show a lower sICH rate of 4.79%, consistent with global data. Our study also reports an in-hospital all-cause mortality rate of 13.83%, only slightly lower than the 14.6% mortality rate reported in the earlier cohort.[2] These findings support the effectiveness and safety of IV rTPA as a therapeutic option for patients with acute ischemic stroke.

Pneumonia is a frequent complication among stroke patients due to impaired cough reflexes resulting in increased susceptibility to aspiration.[6] A recent retrospective analysis of prospectively collected patient data from the Virtual International Stroke Trials Archive (VISTA) assessed the incidence and temporal profile of pneumonia in the first 90 days after stroke, and noted a pneumonia incidence of 9.4% with a median time of onset of four days post-stroke. Interestingly, treatment with alteplase was identified as a statistically significant predictor of pneumonia in the first 90 days after stroke. Consistent with our findings, pneumonia has been significantly associated with poor functional outcomes and increased 90-day mortality.[7]

The need for neurosurgical interventions after thrombolysis, but not sICH, was also found to be significantly associated with poor outcomes. This may be attributed to a number of cases that need surgical decompression due to cerebral edema from failure of recanalization, in addition to those with hemorrhagic conversion.[8] Endovascular thrombectomy, which has only been initiated in UP-PGH in April 2024, might be a more suitable therapeutic strategy for these cases.

UP-PGH has been a premier institution for addressing life- and limb-threatening emergencies such as stroke. Our data reflect the institution's efficiency in attending to acute ischemic stroke patients, with door to first MD, door to BAT activation, door to BAT team arrival, and door to cranial imaging times of 0, 2, 4, and 15 minutes, respectively. The institution's median door to needle time of 48 minutes is also within the global recommendation of less than or equal to 60 minutes. Timely intervention in acute stroke is critical, with studies showing a 5% reduction in in-hospital mortality for every 15-minute reduction in door to needle time.[9]

This study has limitations. First, it is a retrospective study mainly relying on chart review, hence, data collection was limited by the availability and completeness of inpatient records. Second, it is limited to a single center, with cases mostly coming from the nearby regions. This may affect the generalizability of the results to the experience of other stroke centers in the country. Lastly, since data collection was limited to inpatient chart review, long-term outcomes after discharge could not be assessed. Future research on these outcomes can be done to prospectively explore patients' functional status and independence at 30 and 90 days after thrombolysis.

CONCLUSION

Our findings support the use of IV rTPA as a safe and effective therapeutic strategy for acute ischemic stroke. One hundred eighty-eight patients underwent thrombolysis in our institution over the past five years, majority of whom were males and hypertensives with partial anterior circulation infarcts from large artery atherosclerosis. Significant improvement in neurologic deficits was noted in our patients, although most were still discharged with moderate disability. Complications such as symptomatic intracranial hemorrhage still occur, with incidence similar to those of other countries. Poor outcomes have been associated with the development of hospital-acquired pneumonia and the need for neurosurgical intervention, and mortality was mostly from non-neurologic causes. Overall, existing stroke protocols in UP-PGH are able to achieve global recommendations for thrombolysis benchmark times.

Acknowledgments

The authors would like to thank Ms. Aubrey Louise B. Baltazar and Mr. Patrick Lawrence T. Lanuza for assisting in the data collection process. They would also like to thank Dr. Emilio Q. Villanueva III for assisting in the data analysis process.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

The study was funded by the authors.

REFERENCES

1. Navarro JC, Baroque AC 2nd, Lokin JK, Venketasubramanian N. The real stroke burden in the Philippines. Int J Stroke. 2014 Jul;9(5):640-1. doi: 10.1111/ijs.12287. PMID: 24844610.
2. Navarro JC, San Jose MC, Collantes E, Macrohon-Valdez MC, Roxas A, Hiyadan J, et al. Stroke thrombolysis in the Philippines. Neurol Asia. 2018 Jun;23(2):115-120.
3. Collantes MEV, Zuñiga YMH, Uezono DR. Incidence and prevalence of stroke and its risk factors in the Philippines: a systematic review. Acta Med Philipp. 2022 Aug 15;56(14):26-34. doi: 10.47895/amp.vi0.1753.
4. National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. Tissue plasminogen activator for acute ischemic stroke. N Engl J Med. 1995;333(24):1581-7. doi:10.1056/NEJM199512143332401.
5. Yaghi S, Willey JZ, Cucchiara B, Goldstein JN, Gonzales NR, Khatri P, et al. Treatment and Outcome of Hemorrhagic Transformation After Intravenous Alteplase in Acute Ischemic Stroke: A Scientific Statement for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2017;48(12):e343-e361. doi: 10.1161/STR.0000000000000152.

6. Grossmann I, Rodriguez K, Soni M, Joshi PK, Patel SC, Shreya D, et al. Stroke and Pneumonia: Mechanisms, Risk Factors, Management, and Prevention. Cureus. 2021;13(11):e19912. Published 2021 Nov 26. doi:10.7759/cureus.19912.
7. de Jonge JC, van de Beek D, Lyden P, Brady MC, Bath PM, van der Worp HB. Temporal profile of pneumonia after stroke. Stroke. 2022;53(1):53-60. doi:10.1161/STROKEAHA.120.032787. Erratum in: 2022 Mar;53(3):e129. doi: 10.1161/STR.0000000000000404.
8. Thorén M, Dixit A, Escudero-Martínez I, Gdovinová Z, Klecka L, Rand V, et al. Effect of Recanalization on Cerebral Edema in Ischemic Stroke Treated With Thrombolysis and/or Endovascular Therapy. Stroke. 2020;51(1):216-223. doi:10.1161/STROKEAHA.119.026692.
9. Fonarow GC, Smith EE, Saver JL, Reeves MJ, Hernandez AF, Peterson ED, et al. Improving door-to-needle times in acute ischemic stroke: the design and rationale for the American Heart Association/ American Stroke Association's Target: Stroke initiative. Stroke. 2011;42(10):2983-2989. doi:10.1161/STROKEAHA.111.621342.