

Knowledge and Practice of Emergency Nurses Regarding Streptokinase and Alteplase Administration at a Tertiary Care Teaching Hospital in Peshawar, Pakistan: A Cross- Sectional Study

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Abstract

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Background: Thrombolytic therapy with streptokinase and alteplase is a cornerstone in the management of acute myocardial infarction (AMI) and acute ischemic stroke (AIS). Emergency nurses play a critical role in the timely and safe administration of these agents. However, limited data exist regarding emergency nurses’ knowledge and practice in this domain within Pakistan. This study aimed to assess the level of knowledge and self-reported practice patterns of emergency nurses concerning streptokinase and alteplase administration at a tertiary care teaching hospital in Peshawar, Pakistan.

Methods: A descriptive, cross- sectional survey was conducted from February to April 2025 among 150 emergency nurses working at A Tertiary Care Hospital, Peshawar. A structured, pretested questionnaire comprising 30 knowledge items (scored 0–30) and 15 practice- related items (Likert scale 1–5) was administered. Demographic data, educational background, and clinical experience were also recorded. Data were analyzed using SPSS v.25.0; knowledge scores were categorized as poor (<50%), moderate (50–74%), or good (≥75%). Practice scores were expressed as mean ± SD. Correlations between knowledge and practice were evaluated using Pearson’s r.

Results: The mean age of participants was 29.4 ± 4.8 years; 68% were female, and 32% male. The mean professional experience was 5.2 ± 3.1 years. Overall, 42% of nurses demonstrated “good” knowledge (mean knowledge score = 24.1 ± 3.5), 38% had “moderate” knowledge (mean = 19.8 ± 2.6), and 20% exhibited “poor” knowledge (mean = 13.4 ± 3.1). Specific gaps were noted in contraindications for streptokinase (correct responses: 54.7%) and alteplase dosing adjustments in renal impairment (correct responses: 48.0%). The mean practice score was 3.8 ± 0.6 (out of 5), indicating generally acceptable self- reported adherence to protocols. Yet only 56% reported always verifying the appropriate door- to- needle time for AMI patients. A moderate positive correlation was observed between knowledge and practice scores (r = 0.46, p < .001).

Conclusion: While a substantial proportion of emergency nurses in Peshawar demonstrate adequate knowledge and acceptable practice behaviors regarding streptokinase and alteplase

administration, critical deficiencies persist—particularly in recognizing contraindications and dose adjustments. Targeted in- service training programs and regular competency assessments are recommended to optimize thrombolytic therapy delivery and improve patient outcomes.

Keywords: Streptokinase, Alteplase, Thrombolytic Therapy, Knowledge, Practice, Nurses, Emergency Department

INTRODUCTION

Thrombolytic agents such as streptokinase and alteplase are vital in the management of life-threatening conditions including acute myocardial infarction (AMI) and acute ischemic stroke (AIS), where timely reperfusion significantly reduces morbidity and mortality (Jaffer, 2015; World Health Organization [WHO], 2017). In emergency settings, nurses are at the forefront of implementing protocols: they calculate dosages, prepare reconstitutions, monitor for complications (e.g., bleeding), and ensure that “door- to- needle” times meet international benchmarks (<30 minutes for AMI) (Huang & Kern, 2018).

Despite clear guidelines from organizations such as the American Heart Association (AHA, 2020) and the American Stroke Association (ASA, 2019), audits from low- and middle- income countries reveal suboptimal adherence to thrombolytic protocols, often attributed to limited knowledge, inadequate training, or resource constraints (Khan et al., 2022; Patel & Ali, 2023). Within Pakistan, scarce literature addresses emergency nurses’ competencies in thrombolysis, particularly in semi- urban regions like Peshawar, where tertiary care facilities face unique staffing and logistical challenges (Mir, 2024).

Accordingly, this study aims to evaluate the baseline knowledge and practice patterns of emergency nurses concerning streptokinase and alteplase administration at A Tertiary Care Hospital, Peshawar. By identifying educational gaps and practice deficiencies, the findings may inform targeted interventions to enhance thrombolytic care quality and patient safety in similar settings.

Methods

Study Design and Setting

A descriptive, cross- sectional survey was conducted between February and April 2025 at A Tertiary Care Hospital—a 550- bed tertiary care facility serving as the primary referral center for Peshawar District, Khyber Pakhtunkhwa, Pakistan. The Emergency Department (ED) operates 24/7, providing services to approximately 5,000 patients monthly.

Participants and Sampling

All registered nurses permanently assigned to the ED with at least six months of clinical experience in emergency care were eligible. Exclusion criteria included: (a) nurses on extended leave during data collection and (b) agency/rotational nurses with <6 months’ ED experience. Based on hospital records (N = 180 eligible ED nurses), a target sample size of 150 was calculated using Cochran’s formula (95% confidence, 5% margin of error). Convenience sampling was employed; 150 nurses consented to participate (response rate = 83.3%).

Instrument Development

A structured, self-administered questionnaire was developed after reviewing relevant guidelines (AHA, 2020; ASA, 2019; WHO, 2017) and literature on thrombolytic therapy (Jaffer, 2015; Khan et al., 2022). The instrument comprised three sections:

1. **Demographics and Professional Background (6 items):** Age, gender, highest nursing qualification, years of ED experience, prior in-service thrombolysis training (yes/no), and frequency of managing AMI/AIS cases.
2. **Knowledge Assessment (30 multiple-choice items):** Focused on pharmacodynamics, indications, contraindications, dosing regimens, complication recognition, and door-to-needle protocol. Correct answers were scored as 1; incorrect or unanswered as 0 (total possible = 30). Knowledge levels were categorized as follows:
 - **Poor:** <50% (<15/30)
 - **Moderate:** 50–74% (15–22/30)
 - **Good:** ≥75% (≥23/30)
3. **Self-Reported Practice (15 Likert-Scale Items):** Ranging from 1 = “Never” to 5 = “Always,” items assessed adherence to best practices (e.g., verifying patient weight, checking contraindications, monitoring for bleeding, documentation of door-to-needle time). Possible practice score range = 15–75; higher scores indicate more consistent protocol adherence.

Content Validity and Pilot Testing

The draft questionnaire was reviewed by a panel of three cardiologists, two stroke neurologists, and two senior ED nurse educators for content validity. A pilot test was conducted with 15 ED nurses (excluded from the final sample), yielding a Cronbach’s α of 0.78 for knowledge items and 0.82 for practice items, indicating acceptable internal consistency. Minor language edits were made to ensure clarity.

Data Collection Procedures

Upon obtaining ethical approval from the Hospital, The principal investigator approached ED nurses during shift changes. Written informed consent was obtained. Questionnaires were distributed in sealed envelopes to minimize peer influence; participants completed them during non-peak hours and returned them within one week. Anonymity was preserved by using unique ID codes.

Data Analysis

Data were entered into SPSS v.25.0 (IBM Corp., Armonk, NY). Descriptive statistics (mean $\pm$ SD for continuous variables; frequencies and percentages for categorical variables) summarized demographic characteristics, knowledge scores, and practice scores. Pearson’s correlation coefficient assessed the relationship between knowledge and practice scores. Independent-samples t-tests and one-way ANOVA evaluated differences in mean knowledge/practice scores by demographic factors (e.g., prior training, years of experience). A p-value < .05 was considered statistically significant.

Results

Participant Characteristics

A total of 150 ED nurses participated. Table 1 summarizes their demographic and professional profiles. The mean age was 29.4 ± 4.8 years (range = 22–48), with 68% (n = 102) female and 32% (n = 48) male. The majority held a Bachelor of Science in Nursing (BSN) degree (74%, n = 111), while 26% (n = 39) held a diploma. Mean ED experience was 5.2 ± 3.1 years (range = 0.6–20). Only 40% (n = 60) reported attending formal in- service thrombolysis training within the past two years. Regarding case volume, 56% (n = 84) managed ≥ 10 AMI/AIS cases monthly, while 44% (n = 66) managed fewer than 10.

Table 1
Demographic and Professional Characteristics of Emergency Nurses (N = 150)

Characteristic	n (%) or Mean $\pm$ SD
Age (years)	29.4 $\pm$ 4.8
Gender	
• Female	102 (68.0)
• Male	48 (32.0)
Highest Nursing Qualification	
• BSN	111 (74.0)
• Diploma	39 (26.0)
Years of ED Experience	5.2 $\pm$ 3.1
Prior Thrombolysis Training	
• Yes	60 (40.0)
• No	90 (60.0)
Monthly AMI/AIS Case Volume	
• ≥ 10 cases	84 (56.0)
• < 10 cases	66 (44.0)

Knowledge Assessment

The overall mean knowledge score was 19.6 ± 4.7 (out of 30). Based on predefined cut- offs, 20% (n = 30) had “poor” knowledge (< 15), 38% (n = 57) had “moderate” knowledge (15–22), and 42% (n = 63) had “good” knowledge (≥ 23). Table 2 displays correct response rates for key knowledge items.

Table 2
Selected Knowledge Items and Correct Response Rates (N = 150)

Knowledge Item	Correct n (%)
Indication: Streptokinase within 6 h of AMI onset	126 (84.0)
Indication: Alteplase within 4.5 h of AIS onset	117 (78.0)
Contraindication: Active internal bleeding	135 (90.0)
Contraindication: Recent major surgery (< 3 weeks)	111 (74.0)
Dose adjustment for streptokinase in renal impairment	82 (54.7)

Dose adjustment for alteplase in renal/hepatic dysfunction	72 (48.0)
Monitoring parameter: Fibrinogen level post- streptokinase	89 (59.3)
Recognizing anaphylactic reaction risk with streptokinase	94 (62.7)
Target door- to- needle time for AMI	132 (88.0)
Recognizing hemorrhagic transformation risk post- alteplase	84 (56.0)

Items with notably low correct response rates (<60%) included dose adjustments for alteplase (48.0%), streptokinase dosing in renal impairment (54.7%), and monitoring fibrinogen post-streptokinase (59.3%).

Practice Patterns

The aggregate mean practice score was 3.8 ± 0.6 (maximum possible = 5). Table 3 summarizes the distribution of responses for key practice behaviors.

Table 3
Self- Reported Practice Behaviors (N = 150)

Practice Behavior	Always n (%)	Often n (%)	Sometimes n (%)	Rarely/ Never n (%)
Verify patient weight and calculate exact dose before preparation	120 (80.0)	18 (12.0)	8 (5.3)	4 (2.7)
Confirm absence of absolute contraindications (e.g., bleeding, stroke)	110 (73.3)	25 (16.7)	10 (6.7)	5 (3.3)
Reconstitute and label medication according to protocol	115 (76.7)	20 (13.3)	10 (6.7)	5 (3.3)
Check door- to- needle time goal (<30 min) for AMI cases	84 (56.0)	30 (20.0)	20 (13.3)	16 (10.7)
Monitor vital signs and bleeding signs every 15 min for first 2 h post-thrombolysis	95 (63.3)	35 (23.3)	15 (10.0)	5 (3.3)
Maintain accurate documentation of medication time, dose, and batch number	125 (83.3)	15 (10.0)	6 (4.0)	4 (2.7)
Educate patient/family regarding signs of bleeding and when to notify staff	90 (60.0)	40 (26.7)	15 (10.0)	5 (3.3)
Participate in post- event debriefing regarding thrombolysis outcome	70 (46.7)	30 (20.0)	30 (20.0)	20 (13.3)

The lowest consistency (“Always”) was observed in checking door- to- needle goals (56.0%) and participating in post- event debriefings (46.7%).

Association Between Knowledge and Practice

A moderate positive correlation existed between knowledge scores and overall practice scores (r = 0.46, p < .001), indicating that higher knowledge was associated with more consistent self-reported adherence to best practices.

Influence of Prior Thrombolysis Training

Nurses who had received formal in- service thrombolysis training ($n = 60$) demonstrated significantly higher mean knowledge scores (22.8 ± 3.2) compared to those without training (17.7 ± 4.3 ; $t = 8.12$, $p < .001$). Similarly, their mean practice scores were higher (4.2 ± 0.5 vs. 3.6 ± 0.6 ; $t = 6.54$, $p < .001$).

Influence of Experience

One- way ANOVA revealed that nurses with >5 years of ED experience ($n = 65$) had higher knowledge scores (21.5 ± 3.4) than those with ≤ 5 years ($n = 85$; 18.0 ± 4.5 ; $F = 20.17$, $p < .001$). Practice scores followed a similar pattern (4.0 ± 0.5 vs. 3.6 ± 0.6 ; $F = 12.39$, $p = .001$).

Discussion

This study is among the first in Peshawar, Pakistan, to systematically evaluate emergency nurses' knowledge and practice concerning streptokinase and alteplase administration. Overall, 42% of participants achieved "good" knowledge levels, and self- reported practice behaviors were generally acceptable (mean = $3.8/5$). Nonetheless, critical deficiencies were identified, particularly in recognizing dose adjustment requirements and certain monitoring parameters.

Comparison with Prior Studies

Our finding that only 42% of ED nurses demonstrated "good" knowledge is consistent with a recent study from Karachi, where 45% of emergency personnel correctly answered questions regarding thrombolytic indications and contraindications (Patel & Ali, 2023). Similarly, dose- adjustment knowledge deficits (48.0% correct for alteplase) parallel results from a Lahore- based audit, which reported only 50% accuracy in renal impairment adjustments (Khan et al., 2022). Such gaps are concerning given the narrow therapeutic window for alteplase and the high risk of hemorrhagic complications in renal dysfunction (Huang & Kern, 2018).

The moderate practice score aligns with literature indicating that knowledge alone does not guarantee optimal practice—other factors such as workload, resource availability, and institutional protocols play a role (Jaffer, 2015; Lee et al., 2021). Notably, only 56% of our participants "always" verified door- to- needle times, similar to a multicenter study in India where 60% of nurses adhered to target reperfusion times (Sharma et al., 2020). Delays in recognizing or documenting onset times can directly affect patient outcomes, underscoring the need for process improvements.

A comparable study from a public teaching hospital in Khyber Pakhtunkhwa reported higher knowledge (71%) but much lower task performance (49%), with particular weaknesses in pre- administration assessments and documentation (Ullah et al., 2024). That study also found a negative correlation between knowledge and practice ($r = -0.226$), contrasting with our positive correlation ($r = 0.46$). Together, these findings suggest that theoretical understanding does not necessarily translate into consistent clinical performance, especially under procedural and environmental pressures.

Factors Influencing Knowledge and Practice

Formal in- service training and longer ED experience were both significantly associated with higher knowledge and practice scores. This finding supports the premise that structured educational interventions—such as simulation- based workshops—enhance competency in thrombolytic administration (Lee & Dahinten, 2023). Instituting regular refreshers and

incorporating thrombolysis modules into continuing nursing education could address observed deficits.

Implications for Practice and Policy

Given that 60% of nurses lacked recent thrombolysis training, the hospital administration should consider mandatory annual competency assessments for all ED nurses. Protocols should emphasize checklist- driven workflows (e.g., pre- printed order sets, standardized consent forms) to minimize errors in dosing or timing. Furthermore, integrating point- of- care ultrasound (POCUS) protocols to rapidly assess cardiac function or cerebral hemorrhage risk before alteplase use may be beneficial, especially given resource constraints (Mahmood & Rasheed, 2024).

Strengths and Limitations

Strengths: This study's robust sample (n = 150) and use of a pre-validated instrument ensured reliable assessment of gaps in knowledge and practice. By examining both cognitive (knowledge) and behavioral (self- reported practice) domains, the study offers a comprehensive view of emergency nurses' readiness to administer thrombolytics.

Limitations: As a single- center, convenience- sampled study, the findings may not be generalizable to all ED settings in Pakistan. The reliance on self- reported practice data may overestimate actual adherence due to social desirability bias. Additionally, the cross- sectional design precludes determination of causality, and skill competency (e.g., hands- on preparation, infusion pump programming) was not objectively observed. Future research should incorporate multicenter, observational audits and objective performance evaluations.

Conclusion

Emergency nurses at this study setting demonstrated moderate to good knowledge and practice regarding streptokinase and alteplase administration; however, significant deficiencies persist in critical areas, particularly dose adjustment and monitoring parameters. Targeted educational interventions (e.g., simulation- based training, periodic competency assessments) and protocol standardization are recommended to enhance patient safety and optimize thrombolytic outcomes.

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