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# CONSTRUCT AND EVALUATE REPERFUSION ALGORITHM FOR PATIENTS WITH ST- ELEVATION MYOCARDIAL INFARCTION

[1]KARLEENA THOMAS, [2]FERGANZIA JUBILSON, [3]DR.VISHWAS SATHE

[1] II year MSC. NURSE PRACTITIONER IN CRITICAL CARE,

[2]ASSISTANT PROFESSOR, MGM NEW BOMBAY COLLEGE OF NURSING,

[3] PROFESSOR- CARDIAC ANESTHESIA, DEPARTMENT OF ANAESTHESIOLOGY, MGMIHS

***Abstract:*** .

**Introduction:**

Myocardial Infarction (MI) is a type of heart attack that is caused by a reduction or cessation of blood supply to a specific area of the heart, resulting in myocardial cell necrosis. A blood clot in the epicardial artery, which supplies that area of the heart muscle, is usually the cause. Reduced coronary blood flow is the cause of acute myocardial infarction, as the availability of oxygen supply is insufficient to meet the tissue demand for oxygen, hence myocardial ischemia occurs. According to American Heart Association, the target treatment goal of Thrombolysis is ≤30 minutes and Primary Coronary Intervention (PCI) is ≤90 mins for a patient that arrives in a hospital with PCI facilities or of ≤120 mins for patients reaching at a hospital without PCI capacity according to account for transfer time. An Algorithm is a diagrammatic representation with diverging pathways that leads to a desired end that is a schematic representation of the decision-making process. Optimal use of Algorithms aids the Practitioners and offers a step-by-step, user-friendly methodology that improves healthcare personnel' capacity to make informed clinical decisions for patients with Myocardial Infarction based on the best available resources.

**Methods:**

The Reperfusion Algorithm was developed using a Mixed (quantitative and qualitative) research strategy in accordance with Delphi technique. 15 Delphi experts were chosen using a non-probability convenience sampling method and based on the study's selection criteria. In three rounds, 15 Delphi experts were polled for their opinions. An open-ended questionnaire was provided to Delphi experts in round one.

In round two, an inclusion-exclusion checklist was created based on the experts' recommendations and circulated to the Delphi experts. Finally, a correlation was found between rounds 2 and 3 to indicate major differences in viewpoints, and Delphi experts distributed a five-point Likert scale to determine the level of agreement.

**Results:**

Kendall's tau-b formula was used to compare expert opinions, and it revealed that there is no significant difference in expert opinion in rounds 2 and 3 (P >0.05). Content Validity Index of Experts and Content Validity Index of Inclusion items were utilized in this study to validate the tool Content Validity Index of Experts and Content Validity Index of Inclusion items. The Content Validity Index for inclusion items was 0.94, indicating that the instrument is highly valid overall. The inclusion item was eliminated if it had a score of less than 0.78. The final draught of the Reperfusion Algorithm was pilot tested, and the tool's dependability was 0.932, indicating that it is quite reliable.

**Conclusion:**

The study comes to an end with the construction of a final time-specific reperfusion algorithm, which was constructed and validated using Delphi techniques. The validated reperfusion algorithm was highly reliable for patients affected with ST segment elevated Myocardial infarction.

**Keywords:** Construct, Evaluate, Reperfusion Algorithm, Delphi technique, Myocardial Infarction

## 1 INTRODUCTION

### 1.1 Background of the study

Acute myocardial infarction is one of the top causes of death in the developing world, affecting over three million individuals globally and resulting in over one million deaths in the United States each year. According to the findings of the Global Burden of Disease study, India has an age-standardized cardiovascular death rate of 272 per 100,000 people, which is much higher than the global average of 235. Non-ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI) are the two types of acute myocardial infarction (STEMI). Unstable angina is similar to NSTEMI in that it does not cause an increase in cardiac markers.

In the late 1980s, thrombolytic therapy was put into action to dissolve intracoronary thrombus that changed the management of acute STEMI. The therapy used injected the thrombolytic agent directly into the affected ot obstructed coronary artery and then infused intravenously, providing a mechanism to reduce mortality by opening the infarct artery and restoring blood flow to the muscle. Balloon angioplasty was established in the 1980s as another approach for opening blocked channels, and later, the use of a stent became the preferred non-surgical method. PCIs are the common name for these types of catheter procedures. Since "time is muscle," randomised studies and registries taught us the necessity of timely reperfusion.[2] The treatment goals (short- and long-term) apparently includes rapid reperfusion of the infarcted artery, but also keeping the vessel open with the help of appropriate adjunctive anti-platelet agents, administering statins to reduce low density lipid(LDL) cholesterol and other medications to improve vessel wall and myocardium healing, reducing the risk of other post-infarction complications like

arrhythmias and heart failure. Patients presenting with persistent symptoms and STEMI should receive mechanical or pharmacological reperfusion attempts. Percutaneous Coronary Intervention (PCI) is the dominant current approach to mechanical reperfusion. Pharmacological reperfusion is obtained by fibrinolytic therapy, that is now improved with adjuvant antiplatelet and antithrombin therapy.

### 1.1 Need for the study

The Researcher selected this study to fulfil the deficiency and the very need of disposition of an Algorithm for patients visiting the emergency department or in-hospital development of Myocardial Infarction. Following a specific Reperfusion Algorithms should also aid with physician knowledge and decision-making, as well as the establishment of uniform STEMI programmes at different sites. They could eventually have an impact on a variety of health-care delivery indices, such as mean door-to-balloon/needle time and even pain-to-door time.

The present study focuses in identifying the existing time taken for reperfusion and accompanying reasons for delay. Based on these information, a Reperfusion Algorithm will be constructed with the opinion of various Delphi experts selected by the researched based on inclusion criteria.

### 1.2 Problem Statement

Construct and Evaluate Reperfusion Algorithm for Patients with ST- Elevation Myocardial Infarction

### 1.3 Objectives of the study

- To identify the various factors causing delay in coronary reperfusion in door-needle and door-to-balloon times.

## 2 DATA AND SOURCES OF DATA

In this study non- probability convenience sampling technique was used to select the sample based on the inclusion and exclusion criteria set by the researcher. All patients who are diagnosed with ST elevated Myocardial Infarction were included for the study.

## 3 RESEARCH METHODOLOGY

### 3.1 RESEARCH APPROACH

In this study, Mixed Approach will be used, that is- qualitative and quantitative. Quantitative approach is based on the factors that cause coronary reperfusion delays, whereas Qualitative approach to develop the Reperfusion Algorithm

3.2 **Research setting of the study-** Teaching hospital in Navi Mumbai with tertiary care centre which has emergency services for cardiac resuscitation along with a Cathlab team and cardiac surgery back-up.

### 3.3 Population, sample and sampling technique

**3.3.1 Study population-**In this study, consecutive patients from 2 months duration of sample collection period, who presented with ST segment elevation Myocardial Infarction were studied prospectively.

**3.3.2 Sampling criteria**

**Inclusion criteria-**

- Patients brought to Emergency Department of the study setting
- Patients diagnosed with ST- Elevation Myocardial Infarction
- Patients in the cardiac window period
- Patients above 18 years of age

**Exclusion criteria-**

- Patients diagnosed with Non- ST Elevation Myocardial Infarction
- Patients given negative consent

#### 3.3.3 Description of instruments

An Observational Checklist with 40 items were covered under 4 subheadings, to identify the factors that causes delay in initiation of reperfusion therapy.

The researcher observes and identifies for the factors affecting the initiation of ongoing Reperfusion strategies which is marked on a pre-set parameters causing delay in therapy. The items were arranged in following order -

1. Patient related factors
2. Healthcare personnel related factors
3. Environment related factors
4. Contraindications of thrombolytic therapy

### 3.4 Plan for data analysis

3.4.1 Distribution of demographic variables of patients is examined by frequency and percentage which is represented in the form of tables and graphs.

3.4.2 Distribution of factors identified that can cause delay in coronary reperfusion is represented in the form of a table using frequency and percentage measures

**Section 4.1: Distribution of demographic variables of patients**

**n =10**

| Demographic details of patient | Frequency | Percentage |
|---|---|---|
| **Age** | | |
| 30 to 40 | 1 | 10 |
| 41 to 50 | 3 | 30 |
| 51 to 60 | 3 | 30 |
| 61 to 70 | 2 | 20 |
| 71 to 80 | 1 | 10 |
| **Gender** | | |
| Male | 9 | 90 |
| Female | 1 | 10 |
| **First Medical Contact** | | |
| MGM Hospital | 6 | 60 |
| General Practitioner | 1 | 10 |
| Private Clinic | 2 | 20 |
| Private Hospital | 1 | 10 |
| **Mode of Transportation** | | |
| Ambulance | 7 | 70 |
| Public Transport | 1 | 10 |
| Private Vehicle | 2 | 20 |
| **Thrombolytic Agent used** | | |
| Streptokinase | 9 | 90 |
| Alteplase | 1 | 10 |
| **Most common type of STEMI among patients** | | |

| **Diagnosis** | | |
|---|---|---|
| Anterior Wall MI | 6 | 60 |
| Infefior Wall MI | 3 | 30 |
| Anterolateral MI | 1 | 10 |
| **Chief complaints of reporting** | | |
| Chest pain radiating to left arm | 3 | 30 |
| Palpitations | 6 | 60 |
| Sweating | 5 | 50 |
| Dyspnea on rest | 2 | 20 |
| Retrosternal chest pain | 2 | 20 |
| Heartburn | 4 | 40 |
| Dizziness | 3 | 30 |

**Table 1: Demographic details of MI affected patients**

Table 1 represents the demographic details of the patients diagnosed with STEMI

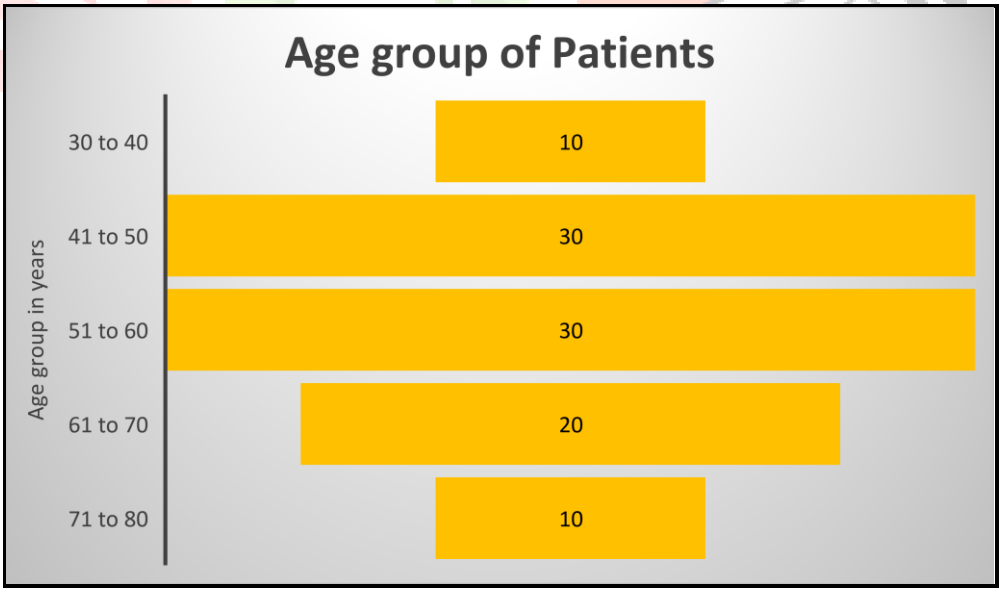


**Figure 3 : Age group of patients**

Figure 3 shows a horizontal bar graph that represents majority of Myocardial Infarction affected age group were 41 – 50 and 51- 60 years of age. Least affected group were 30- 40 and 71- 80 years.

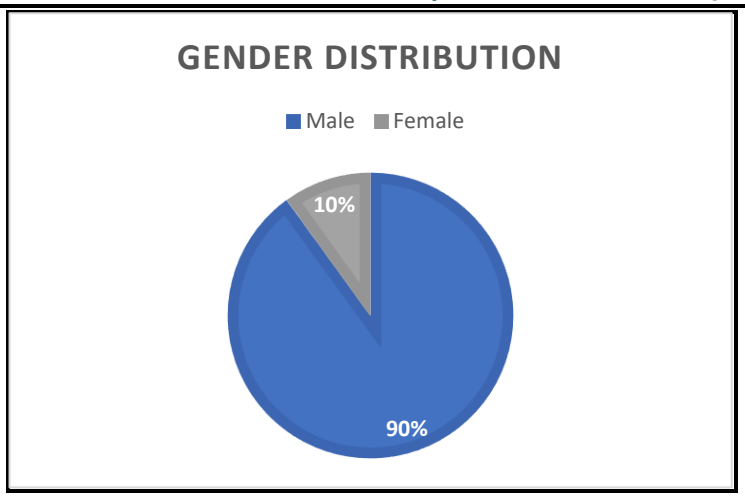


**Figure 4: Distribution of gender differences**

Figure 4 represents the maximum number of patients who developed Myocardial Infarction was Male population (90%) rather than Females (10%)

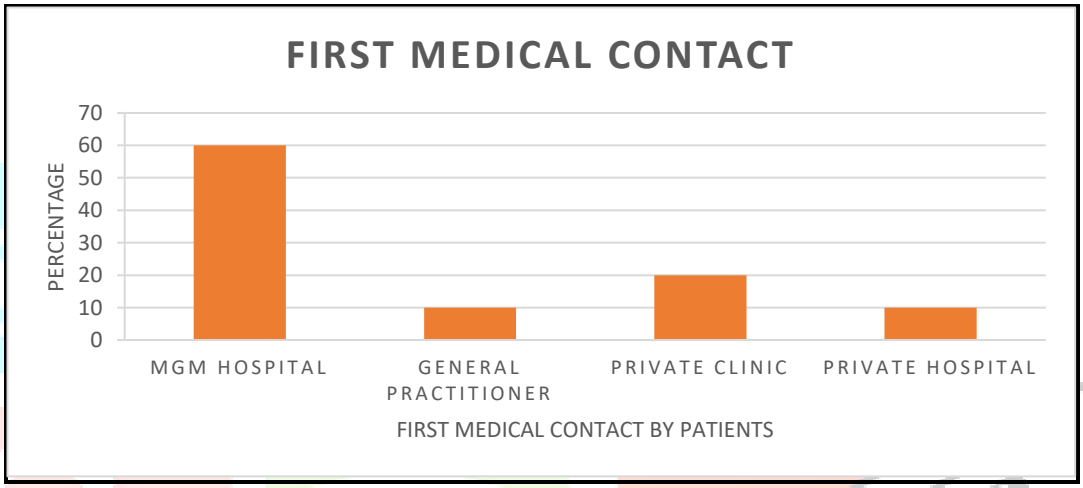


**Figure 5: First medical contact by MI affected patients**

Figure 5 depicts the First medical encounter of the patients with Myocardial Infarction. MGM Hospital (60%), Private clinic (20%), General practitioner and Private hospital (10%) respectively.

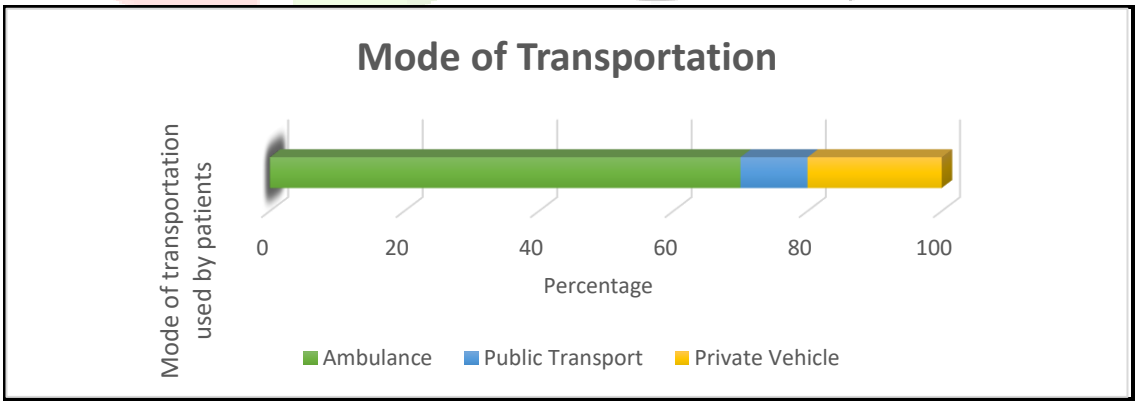


**Figure 6: Mode of transportation used by patients**

Figure 6 illustrates the frequently used mode of transportation by the patients to reach hospital, which were Ambulance ( 70%), Public transport ( 10%) , and Private vehicle ( 20%).

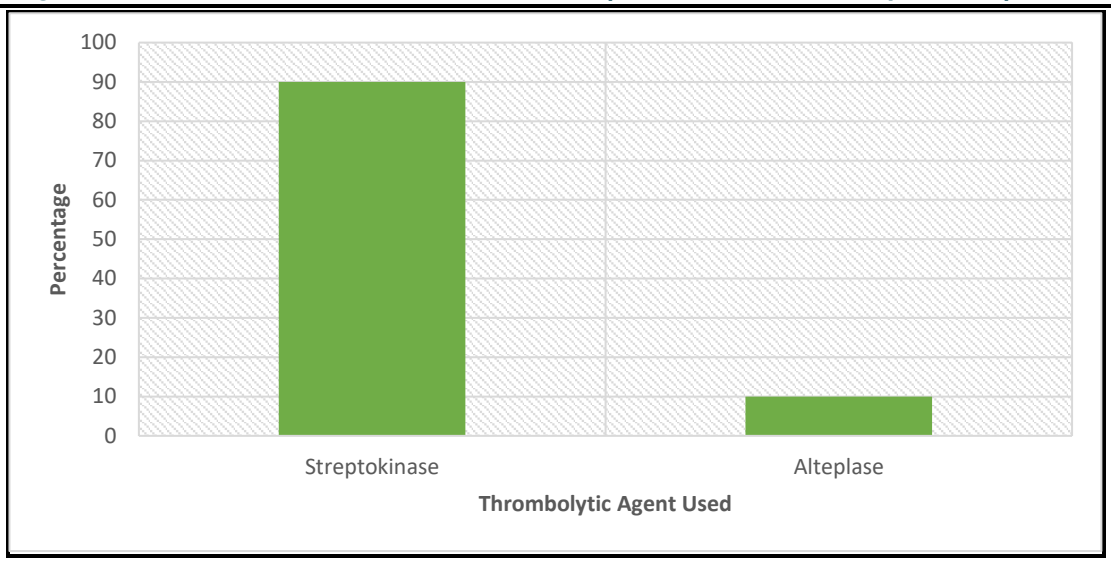


**Figure 7: Commonly used thrombolytic agents**

Figure 7 Bar diagram denotes the commonly used thrombolytic agents for thrombolytic therapy in Myocardial Infarction patients were Streptokinase (90%) and Alteplase (10%)

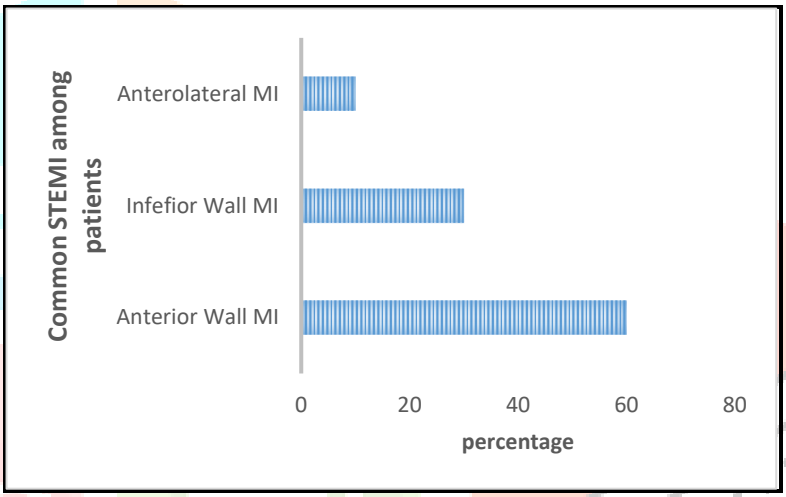


**Figure 8: Distribution of common STEMI among patients**

Figure 8 shows, out of 10 patients majority of patients had Anterior wall MI (60%), Inferior wall MI (30%) whereas only 10 % had Anterolateral MI during the period of data collection

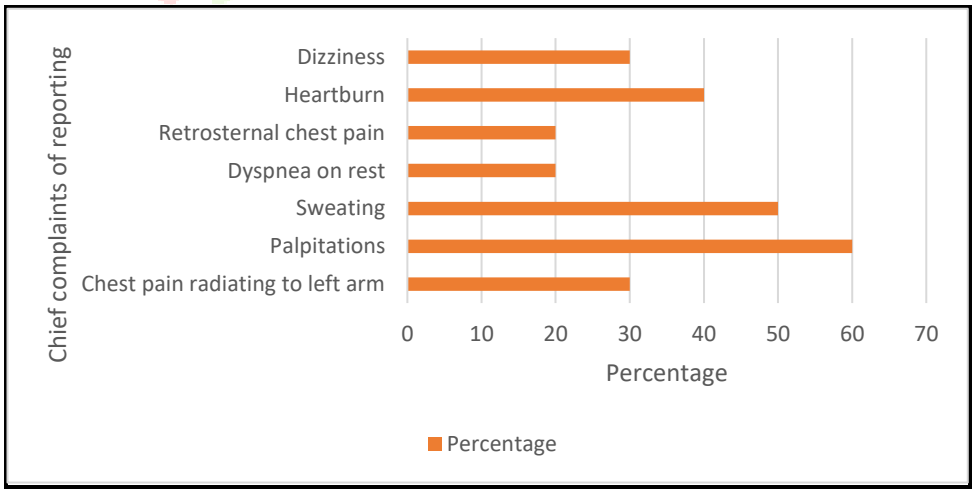


**Figure 9: Chief complaints of MI affected patients**

Figure 9 represents a group of complaints reported by patients with active MI. Out of patients 60% had palpitations, 50% had sweating, 40% has heartburn, 30 % had dizziness and chestpain radiating to left arm and only 10 % reported of retrosternal pain and dyspnea on rest.

**Distribution of factors identified that can cause delay in coronary reperfusion** **n =10**

| Sr.No. | Factors | Frequency (*f*) | Percentage (%) |
|---|---|---|---|
| **I** | **Patient related factors** | | |
| **1** | Delay in patient presentation -Transportation problem | 1 | 10% |
| **2** | Delay in Patient's Consent | 1 | 10% |
| **3** | Patient brought after 12 hours from the onset of symptoms (Misinterpretation/ negligence of symptoms) | 2 | 20 % |
| **4** | Financial Issues | 2 | 20 % |
| **5** | Advanced age ≥75 years | 1 | 10% |
| **6** | Lack of knowledge of patient regarding Heart Attack | 2 | 20 % |
| **II** | **Healthcare personnel related factors** | | |
| **7** | Delay in time taken for the decision | 1 | 10% |
| **8** | Laboratory investigations related delay | 1 | 10% |
| **9** | Patient transfer delay (wheelchair, stretcher, lift) | 1 | 10% |
| **IV** | **Environment related factors** | | |
| **10** | Readiness of Cath lab team | 3 | 30 % |
| **11** | Shortage of Healthcare personnel | 2 | 20 % |
| **12** | Cath lab pre-occupied | 2 | 20 % |
| **V** | **Contraindications of Thrombolytic therapy** | 0 | 0 % |

**Table 3: Distribution of factors causing delay in coronary reperfusion**

Table 3 depicts the prime factors identified for the factors that cause delay in coronary reperfusion which were mainly more than a single cause such as 30% due to Readiness of Cath lab team, 20% for reasons like Patient brought after 12 hours from the onset of symptoms, Financial Issues, Lack of knowledge of patient regarding Heart Attack, Shortage of Healthcare personnel and Cath lab pre-occupied.

**Discussions**

This study investigated the reasons for factors causing delay in coronary reperfusion after patient presentation to the hospital or within the hospital. the prime factors identified for the factors that cause delay in coronary reperfusion which were mainly more than a single cause such as 30% due to Readiness of Cath lab team, 20% for reasons like Patient brought after 12 hours from the onset of symptoms, Financial Issues, Lack of knowledge of patient regarding Heart Attack, Shortage of Healthcare personnel and Cath lab pre-occupied whereas 10 % had reasons like Delay in patient presentation -Transportation problem, Delay in Patient's Consent, Advanced age ≥75 years, Delay in time taken for the decision, Laboratory investigations related delay, Patient transfer delay (wheelchair, stretcher, lift). These

parameters were identified during the period of sample collection among the 10 samples. There are certainly other reasons such as Discharge against medical advice, Patient expired within half hour of first medical contact, Delay in time taken for the decision, Unavailability of thrombolytic agents, Referral from other hospital, Ischemic CVA within 3 mts (except acute CVA<3hr), Severe uncontrolled hypertension on presentation (SBP>180 mmHg or DBP >110 mmHg), which do not occur much frequently but verbally reported by the frontline workers during the time of content validity and Delphi discussions.

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