

## RETROSPECTIVE STUDY OF STROKE PATTERNS AND IT'S TIME OF PRESENTATION IN RURAL THANJAVUR DISTRICT, TAMILNADU

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### ABSTRACT

#### BACKGROUND

This study was conducted in a major neurological Tertiary Care Centre in Thanjavur District of Tamilnadu, India, which is a Tertiary Care Center which covers almost 5-6 Districts which has a population of around 75 lakhs. Around 5000 cases of stroke has been managed successfully in this Tertiary Care Neurology Centre during this time period of April 01, 2011 to December 31, 2016.

#### MATERIALS AND METHODS

In this retrospective study, data was obtained from our hospital stroke registry from April 01, 2011 to December 31, 2016. All patients who presented to our emergency room with symptoms of new onset stroke were included in this study.

#### RESULTS

70% of patients who got admitted had ischemic strokes. Males were predominant. Predominant risk factors included diabetes mellitus, systemic hypertension and dyslipidaemia. 55% patients had large artery stroke in anterior circulation. Out of these ischemic patients 9.5% underwent successful IV thrombolysis. Intra cerebral haemorrhage accounted for 18%. Cortical venous sinus thrombosis accounted for 6.6% of the total stroke population. Sub arachnoid haemorrhage was seen in 16% of total stroke population. Subdural haemorrhage was seen in 16% of total strokes. Subdural haemorrhage was seen in 2.7% of total strokes.

#### CONCLUSION

The incidence of stroke was far higher in the rural population than earlier estimated. The predominant stroke was ischemic. The risk factors encountered were similar except that alcohol and tobacco were the most important risk factors in the younger age group and in people of low socio economic status. The patients eligible for thrombolysis and thrombolysis rates are equivalent to the rates achieved elsewhere.

#### KEYWORDS

Stroke, Thrombolytic Therapy, Hypertension, Tamil Nadu, South India.

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#### BACKGROUND

This study was conducted in a major neurological tertiary care centre in Thanjavur district of Tamilnadu, India which covers almost 5-6 districts which has a population of around 75 lakhs.

It deals with all neurological diseases including neuro emergencies. It is the only centre which has the facilities of treating all acute neurological emergencies including stroke and neuromuscular disorders and other neurological related emergencies.

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Treating facilities includes neuro IMCU, Plasmapheresis, facilities for thrombolytic therapy and for endovascular procedures with advanced cath-lab for performing angiography and related procedures.

Around 5000 cases of stroke has been managed successfully in this tertiary care neurology centre during this time period of April 01, 2011 to December 31, 2016.

Stroke is the most common cause of mortality and morbidity worldwide after coronary artery heart disease. A stroke, or cerebrovascular accident, is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. Thus, the definition of stroke is clinical and laboratory studies including brain imaging are used to support the diagnosis. The clinical manifestations of stroke are highly variable because of the complex anatomy of the brain and its vasculature. Cerebral Ischemia is caused by a reduction in blood flow that lasts longer than several seconds. Neurologic symptoms are manifested within seconds because neurons lack glycogen, so energy failure is

rapid. If the cessation of flow lasts for more than a few minutes, infarction or death of brain tissue occurs. When blood flow is quickly restored, brain tissue can recover fully and the patient's symptoms are only transient. If this occurs spontaneously, it's called transient ischemic attack. This is the goal of thrombolysis and endovascular therapies.<sup>1</sup>

Focal ischemia or infarction is usually caused by thrombosis of the cerebral vessels themselves or by emboli from a proximal artery source or the heart. Acute occlusion of an intracranial vessel causes reduction in blood flow to the brain region it supplies. The magnitude of flow reduction is a function of collateral blood flow, and this depends on individual vascular anatomy (which may be altered by disease), the site of occlusion, and systemic blood pressure. A decrease in cerebral blood flow to zero causes death of brain tissue within 4-10 minutes; values <16-18 ml/100g tissue per minute cause infarction within an hour; and values <20 ml/100 g tissue per minute cause ischemia without infarction unless prolonged for several hours or days. The ischemic penumbra is defined as the ischemic but reversibly dysfunctional tissue surrounding a core area of infarction. The penumbra can be imaged by perfusion-diffusion imaging using MRI or CT. The ischemic penumbra will eventually progress to infarction if no change in flow occurs, and hence saving the ischemic penumbra is the goal of revascularization therapies.

Intracranial haemorrhage is caused by bleeding directly into or around the brain; it produces neurological symptoms by producing a mass effect on neural structures, or by increasing intracranial pressure. It accounts for ~10% of all strokes and about 35-45% of patients die within the first month. Hypertension, coagulopathy, sympathomimetic drugs and cerebral amyloid angiopathy cause the majority of these haemorrhages. Hypertensive ICH usually results from spontaneous rupture of small penetrating artery deep in the brain. ICH generally presents as the abrupt onset of a focal neurologic deficit. Although clinical symptoms may be maximal at the onset, commonly the focal neurological deficit worsening over 30-90 minutes and is associated with a deterioration in the level of consciousness and signs of increased ICP such as headache or vomiting. Although 40% of patients with hypertensive ICH will die and others have a good prognosis if they survive the initial intracranial haemorrhage.

Developing countries, including India are passing through a phase of epidemiological transition with increasing burden of non-communicable diseases (NCD) consequent to transformation of scenario with improvement of health care services in government and private services domain. Stroke is the second major cause of death worldwide.<sup>2</sup> and the fourth major cause of death in India, the death rate being 0.6/1000 in India.<sup>3</sup> It is estimated that by 2020, 10 of 25 million annual stroke deaths will be from developing countries. Of those who survive, approximately 30% require assistance with activities of daily living, 20% require assistance with ambulation and 16% require institutional care.

Risk factors for stroke are classified as modifiable and non-modifiable. Non modifiable risk factors include older age, male gender, family history and prior history of stroke. Modifiable risk factors may be subdivided into lifestyle and behavioural risk factors. Modifiable lifestyle factors include lack of physical activity, cigarette consumption, alcohol abuse and illicit drug use. Non modifiable lifestyle risk factors include low socioeconomic status, arterial hypertension, dyslipidaemia, heart disease and carotid artery disease. Potentially modifiable risk factors include diabetes mellitus, hyperhomocysteinemia and left ventricular hypertrophy. Less well documented risk factors include blood markers like C reactive protein, ankle brachial blood pressure ratios, silent cerebral infarcts, white matter hyper intensities on MRI and degree of carotid artery intima media thickness.

Rapid evaluation is essential for use of time-sensitive treatments such as thrombolysis. However, patients with acute stroke often do not seek medical assistance on their own because they are rarely in pain and also may lost the appreciation that something is wrong with them (Anosognosia); it is often a family member or a bystander who calls for help. Patients and their family members should be counselled to call for emergency medical services immediately when they witness the sudden onset of any of the following like loss of sensory or motor function of one side of the body which is seen in 85% of ischemic stroke patients, change in vision, gait or ability to speak or understand; or a sudden, severe headache.

Once the diagnosis of stroke is made, a brain imaging study is necessary to determine if the cause of stroke is due to ischemia or haemorrhage. Computed tomography (CT) imaging of the brain is the standard imaging modality to detect the presence or absence of intracranial haemorrhage.

This is largely due to poor awareness and lack of infrastructure and trained personnel for round the clock neurological emergencies. In Rural India, Stroke is a fast emerging and the major public health problem.<sup>4</sup> Prevalence of stroke in rural community has been estimated to be from 440 to 270/1, 00,000 rural population.<sup>5</sup> The stroke subtypes in a metropolitan city of south India has been well established. IV thrombolysis and IA thrombolysis have been available only in metropolitan cities<sup>6</sup>

Our aim was to study the incidence of stroke among general neurological patient population. To identify the stroke subtypes, to identify the number of patients arriving within the time window and to identify the number of patients eligible for thrombolysis.

## MATERIALS AND METHODS

In this retrospective study, data was obtained from the hospital registry and stroke registry from Dr. Vanchilingam Neuro Hospital Pvt Ltd, in Thanjavur, Tamil Nadu from April 01, 2011 to December 31, 2016.

All patients who presented to our emergency room with symptoms of stroke were included in the study.

Stroke was confirmed by neurological exam, and a CT scan or MR imaging of the brain. Patients who did not undergo imaging were excluded from the study. All patients

were analysed for Age, Sex, Risk Factors, stroke subtypes and patients who were eligible for thrombolysis and had IV recombinant tissue plasminogen activators.

### Definition of Important Study Variables

Stroke is defined according to WHO criteria as "rapidly developing clinical symptoms and/or signs of focal, and at times global, loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin."<sup>7</sup>

### Hypertension

Patient is taking either antihypertensive drugs or if the blood pressure is >140 mm of Hg systolic and >90 mmHg diastolic in two measurements.<sup>8</sup>

### Diabetes mellitus

Patient is already diagnosed as diabetic or has fasting plasma glucose  $\geq 126$  mg/dl (7.0 mmol/l) or 2-h plasma glucose  $\geq 200$  mg/dl (11.1 mmol/l).

### Current smoker/smokeless tobacco user

Someone who at the time of the study, smokes/uses tobacco in any form either daily or occasionally<sup>9</sup>

### Current drinker

Those who consumed one or more than one drink of any alcohol in the year preceding the study.<sup>10</sup>

### Dyslipidemia

Patient with total serum cholesterol  $\geq 6.2$  (mmol/l) or 240 mg/dl)<sup>11</sup>

### Study Design

Retrospective and analytical study.

### Statistical Analysis

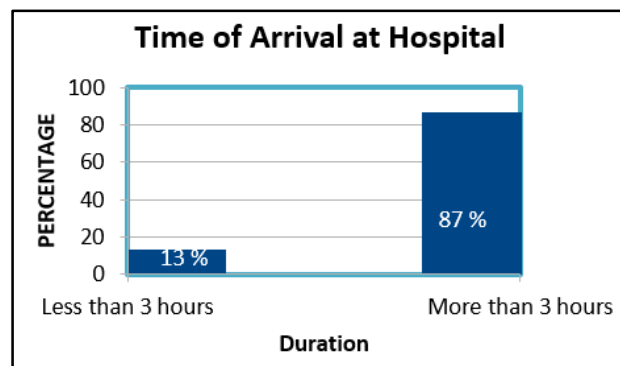
Data obtained in the study were subjected to statistical analysis with Statistical Package for Social Sciences (SPSS) version 11. Bivariate analysis was done to find the risk factors of young stroke using chi-square test. Multivariate analysis was done using logistic regression.

## RESULTS

The study was conducted by Dr. Vanchilingam NeuroHospital Pvt Ltd in Thanjavur, Tamil Nadu in rural south India. It is a tertiary level Neurological and Neurosurgical hospital.

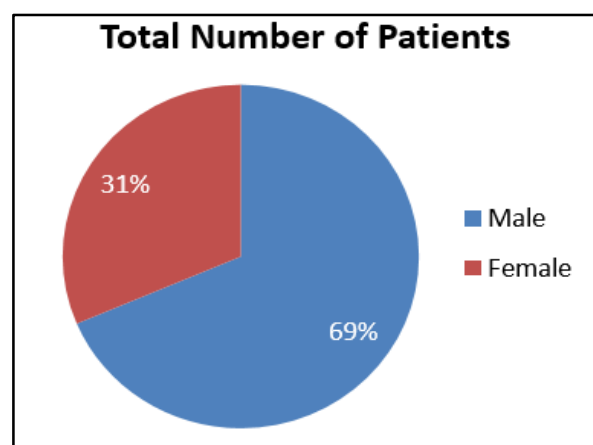
### Socio-demographic Characteristics

The total number of outpatients who had walked or wheeled into our hospital from April 01, 2011 to December 31, 2016 were 10, 7035. Out of which there were 10,420 inpatient admissions. Among these patients 13% reached the hospital within 3 hours of stroke occurrence and remaining 87% patients reached the hospital after 3hrs of incidence (Figure 1).

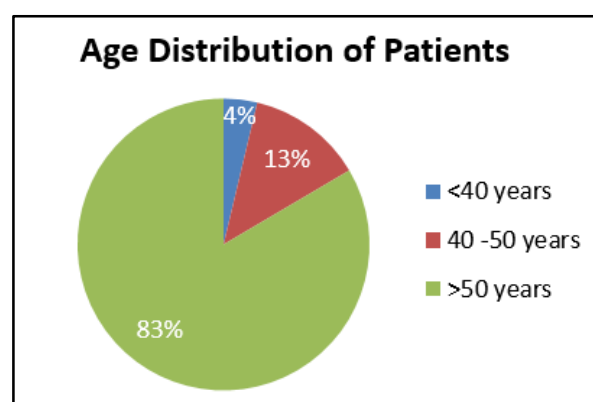


**Figure 1. Time of Arrival at Hospital**

The total number of inpatient admission for stroke was 4295 (41.2% of total), both ischemic and haemorrhagic stroke. The number of patients who got admitted with ischemic strokes were 3014 (70% of total stroke). Males were the predominant with 2068 (69%) and female 946 (31%). Age range was ( $1\frac{1}{2}$  years to 91 years). In this study, 4% (160 patients) were  $\leq 40$  years and 13% (550 patients) aged 40 - 50 years and remaining 83% (3585 were above 50 years. (Figure 2) (Figure 3)

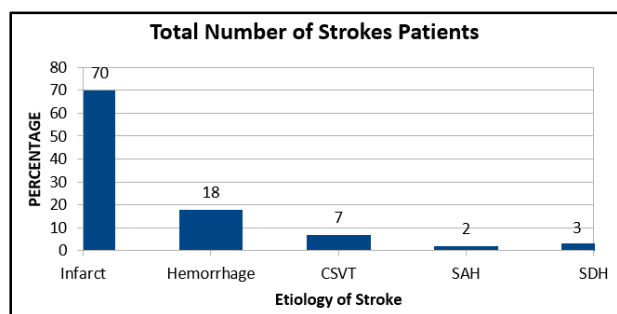


**Figure 2. Gender Distribution**



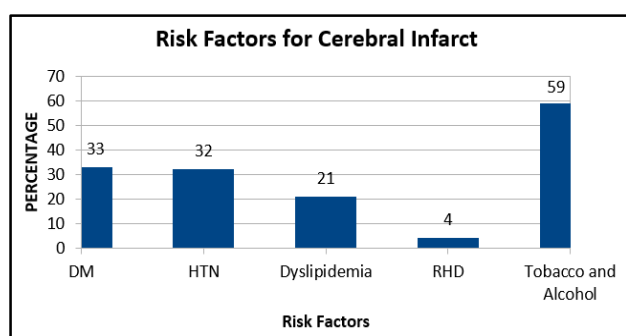
**Figure 3. Age Distribution of Patients**

Among the stroke patients 70% of them had cerebral infarct, 18% had cerebral haemorrhage, 7% had cortical venous thrombosis, 2% had sub arachnoid haemorrhage, and 3% had subdural hematoma based on the CT/ MRI investigations done at the time of admission to the hospital (Figure 4).



**Figure 4. Etiology of Stroke**

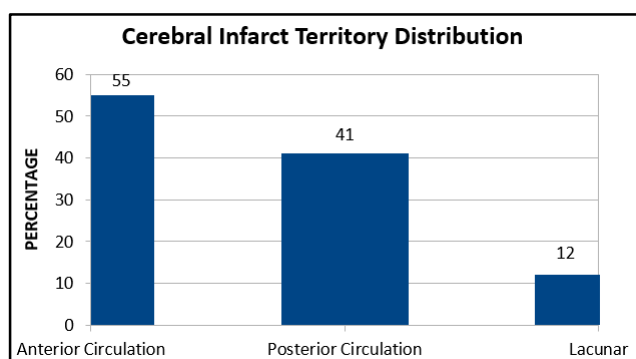
Risk factors included diabetes mellitus in 984 (33%). Systemic hypertension in 965 (32%). Dyslipidaemia in 620 (21%). Rheumatic heart disease in 126 (4%). Out of 2068 male patients, 1212 (59%) patients were tobacco and alcohol users. (Figure 5)



**Figure 5. Risk factors for cerebral Infarct**

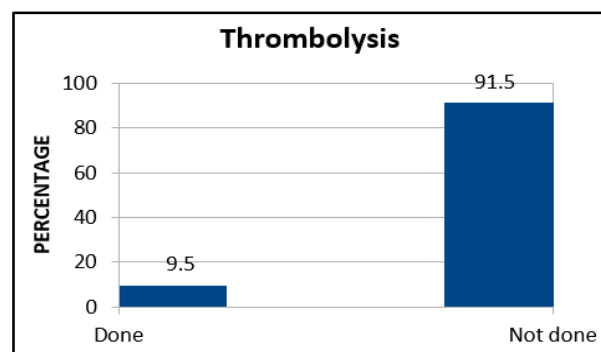
### Ischemic Stroke

Out of 3014 total ischemic stroke, 1657.7 (55%) of patients had large artery stroke in anterior circulation, 1235.7 patients (26%) had posterior circulation strokes and 365 (12%) had lacunar strokes. (Figure 6)



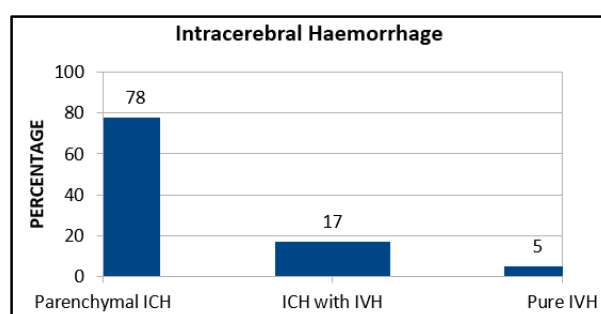
**Figure 6. Cerebral Infarct Territory Distribution**

Out of these ischemic cerebral infarct patients 177 (9.5%) of them came to the hospital within the window period and underwent successful IV thrombolysis with tPA and the remaining 1687 (91.5%) patients were not thrombolysed due to late presentation to the hospital (Figure 7)



**Figure 7. Number of Patients Thrombolysed Haemorrhagic Stroke**

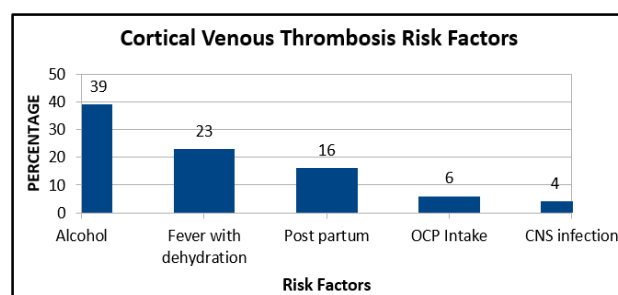
Intra cerebral haemorrhage accounted for 781 patients (18%) with an age range of (14 years to 80 years). Hypertension was present in 504 (64.5%) and diabetes mellitus in 174 (22.2%). Out of the 781 cases of ICH, 611 (78 %) were pure parenchymal ICH, ICH with IVH was seen in 133 (17%). Pure IVH in 37 (5%) patients. (Figure 8)



**Figure 8. Pattern of Intracerebral Haemorrhage**

### Cortical Venous Sinus Thrombosis

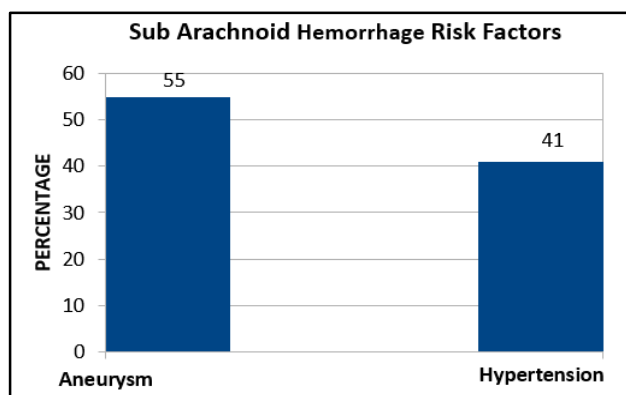
Cortical venous sinus thrombosis accounted for 284 (6.6%) of the total stroke population. Age range of (6 years to 73 years). Risk factors seen were post-partum in 46 (16%). Alcoholism was seen in 110 (39%) patients. Fever with dehydration was seen in 64 (23% of patients). OCP intake in 18 (6%) and CNS infection in 11 (4%) patients. (Figure 9)



**Figure 9. Risk Factors for Cortical Venous Thrombosis**

### Sub Arachnoid Haemorrhage

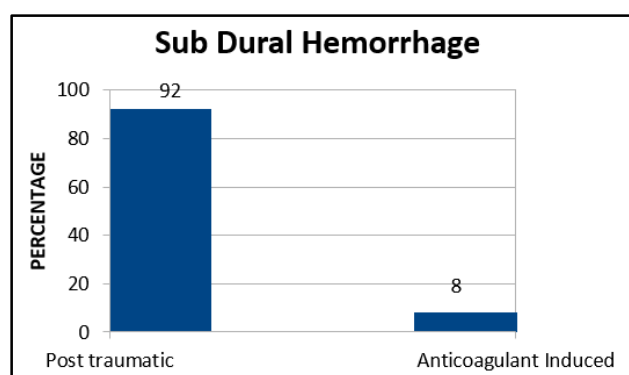
Sub arachnoid haemorrhage was seen in 100 patients (16%) of total stroke population. Age range (22 years to 80 years). Out of 100 patients 55 patients were aneurysmal bleed (55%) and 41 patients (41%) had systemic hypertension. (Figure 10)



**Figure 10. Risk Factors for Sub Arachnoid Hemorrhage**

### Subdural Haemorrhage

Subdural haemorrhage was seen in 117 patients (2.7%) of total strokes. Age range was (26 years to 80 years). Out of 117 patients, 108 (92%) patients were post traumatic and 9 (8%) patients were anticoagulant induced. (Figure 11)



**Figure 11. Sub Dural Hemorrhage**

### DISCUSSION

In this study we gathered information from 4295 Stroke patients admitted in a rural Tertiary care hospital at Thanjavur District in Tamilnadu, India.

Currently, the stroke incidence in India is much higher than western countries. Large vessel intracranial atherosclerosis is the commonest cause of ischemic stroke in India. Other well known risk factors like hypertension, diabetes, smoking, alcohol and dyslipidaemia are prevalent and are poorly controlled in India because of limited resources and poorly established infrastructure. Only a very small number of ischemic stroke cases arrive within the window period and very few centres have the facilities for thrombolytic and endovascular procedures.

On analysing the data we found out that the incidence of stroke was far higher in the rural population than earlier estimated.

Predominant (70%) of stroke patients admitted were with Ischemic stroke with sex ratio showing a male preponderance of 69%.

The predominant risk factors included were Systemic hypertension in 32% and Diabetes Mellitus in 33%. 59% of male patients were tobacco and alcohol users.

13% of the ischemic stroke patient came within the time window and were eligible for thrombolysis and 9.5% of them had successful thrombolysis. The patients eligible for thrombolysis and thrombolysis rates are equivalent to the rates achieved elsewhere. In India IV thrombolysis was not possible due to lack of awareness and lack of infrastructure. As per the surveys done in various cities in India it was found that only 8% to 25% of stroke patients arrived at the hospital within 3 hours.<sup>11</sup> Published data shows that, only 5% to 11% of ischemic stroke patients got thrombolysed in USA and western Europe.<sup>12,13</sup>

Cortical venous sinus thrombosis contributing to stroke accounted for 6.6% and alcohol was a major risk factor for venous thrombosis. ICH accounted for 18% of the strokes and systemic hypertension was the commonest risk factor. Sub arachnoid haemorrhage in 16% and sub Dural haemorrhage in 2.7%.

### CONCLUSION

This study was helpful in understanding the prevalence, patterns and risk factors of stroke in a rural setting with a tertiary care facility for advanced thrombolysis treatment.

The predominant stroke was ischemic accounting for around (70%) of total strokes. The risk factors encountered were similar except that alcohol and tobacco were the most important risk factors in the younger age group and in people of low socio economic status. Hypertension and Diabetes remained the most common risk factors with RHD. The number patients who had successful thrombolysis were comparable to rest of India.

This study shows that the incidence of strokes and stroke sub types not very different from other parts of India. Cortical venous thrombosis has a higher incidence. The higher proportion of stroke in rural population and the higher prevalence of risk factors of stroke, point towards the need for more active interventions in the community for prevention of young stroke.

Advanced and effective interventions like IV thrombolysis and endovascular therapies can be achieved in rural India with comparable rates with proper infrastructure and trained personnel.

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