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Correlation of the Miami Emergency Neurologic Deficit (MEND) Exam Performed in the Field by Paramedics with an Abnormal NIHSS and Final Diagnosis of Stroke for Patients Airlifted from the Scene.

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**Abstract:**

**Introduction**

Early recognition and rapid transport to a stroke center by prehospital providers is essential in the care of stroke patients. In this study, prehospital providers were trained to perform the Miami Emergency Neurologic Deficit (MEND) exam as part of an 8-hour comprehensive course, Advanced Stroke Life Support (ASLS®). The MEND exam was devised to facilitate communication between healthcare providers throughout the continuum of care for stroke patients. It can provide a baseline exam in the prehospital setting, and then be used by nurses for initial evaluation and subsequent exams in the ED, ICU or hospital floor. The MEND exam incorporates all three components of the Cincinnati Prehospital Stroke Scale (CPSS) and six additional components from the NIHSS (level of consciousness, orientation, commands, visual fields, gaze, leg motor, limb ataxia, sensation). The exam takes less than 2 minutes and requires no tools, making it ideal for the Prehospital environment.

**Purpose**

Determine the correlation of the MEND exam completed by a prehospital provider on scene to the initial NIHSS performed by the neurologist at the receiving facility, and the final diagnosis.

**Methods**

All prehospital providers from three Fire Rescue agencies participated in the training (96 EMT-P, 68 EMT, 5 RN). The Prehospital providers conducted the CPSS, and if abnormal, placed the helicopter team on standby. They then completed the MEND exam and communicated their findings to a receiving hospital stroke neurologist. We retrospectively reviewed the MEND exam performed by the prehospital providers to determine the correlation with the same components of the initial NIHSS at the hospital. While the NIHSS assigned a numerical value to those specific components, the MEND exam did not. Additionally, we examined the final discharge diagnosis to determine how many patients had a stroke or transient ischemic attack (TIA).

**Results**

From Sept. 2008 to June 2011, 51 patients met the criteria of having both a MEND exam and NIHSS completed. There were 32 males (63%) and 19 females (37%) with a median age of 67 years (44-98 years). The average NIHSS score was 9 (range 0-30). 90.2% (46 of 51) of patients had a NIHSS that correlated to the findings on the MEND (95% C.I. 90.1-90.3). Of the 5 remaining patients, 1 completely recovered on the flight (diagnosed with a TIA), and 3 had a NIHSS score of 0 and were diagnosed with other conditions. Stroke or TIA was diagnosed in 40 patients (78.4%). Of 37 strokes, 32 were ischemic (86.5%) and 5 hemorrhagic (13.5%). The 11 patients not diagnosed with a stroke had several other pathologies (e.g. seizure, hypertensive crisis, viral encephalitis, complex migraine).

**Conclusion**

The MEND exam completed in the Prehospital setting correlated well with the initial NIHSS performed at the receiving facility. The MEND exam is a valuable tool when assessing stroke patients and determining need for air transport.

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# Correlation of the Miami Emergency Neurological Deficit (MEND) Exam performed in the field by paramedics with an abnormal NIHSS and final diagnosis of stroke for patients airlifted from the scene

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## Introduction

- Early recognition and rapid transport to a stroke center by prehospital providers are essential in the care of stroke patients.
- We trained prehospital providers to perform the Miami Emergency Neurological Deficit (MEND) exam as part of an 8-hour comprehensive course, Advanced Stroke Life Support (ASLS®).
- The MEND exam incorporates all three components of the Cincinnati Prehospital Stroke Scale (CPSS) (speech, droop, drift) and eight additional components from the NIHSS:
  - Level of consciousness
  - Gaze
  - Orientation
  - Leg motor strength
  - Commands
  - Limb ataxia
  - Visual fields
  - Sensation
- The MEND can provide an expanded baseline exam in the prehospital setting without delaying scene times.
- Additionally, the exam can be used as an initial evaluation tool by nurses and for subsequent exams in the ED, ICU or floor.

## Purpose

- To determine the correlation of the MEND exam completed in the prehospital setting to the initial NIHSS performed by a neurologist at the receiving facility.

## Methods

- All prehospital providers from three fire rescue departments in Monroe County participated in the 8-hour ASLS® course and stroke protocol training.
- We trained a total of 169 first responders (96 EMT-Ps, 68 EMTs, 5 RNs).
- The prehospital providers conducted the CPSS on scene, and if abnormal, placed the helicopter team on standby.
- Providers then performed the MEND exam and relayed findings to the stroke neurologist at the receiving facility.
- Patients meeting air transport criteria (Fig. 1) were flown from the scene to the receiving hospital.
- We conducted a retrospective review of the MEND exam performed by the prehospital providers.
- We then correlated these results to the same components of the initial NIHSS performed by the neurologist at the receiving hospital.
- Additionally, we reviewed the final discharge diagnosis to determine whether the patient had a stroke or TIA versus other diagnosis.

## Monroe County Fire Rescue Prehospital Stroke Program

Figure 1: Stroke checklist used by prehospital providers



Figure 2: Air Ambulance "TraumaStar" that provides transport of stroke patients

## Correlation between the MEND exam and the NIHSS

MEND Correlation to NIHSS n=51		
	Yes	No
NIH	46	5

Figure 3: Correlation of the MEND exam with the NIHSS

Patient	MEND	NIHSS	CT Result	Final Diagnosis
1	L sided facial droop	0	No acute intracranial abnormality	Sepsis (UTI) & EtOH abuse
2	Aphasic	0	No acute intracranial abnormality	Hypoglycemia in the setting of Parkinson's Disease with speech arrest
3	L facial droop, LLE weakness	Normal except 4+/5- L abductor pollicis brevis	L frontal lobe encephalomalacia	Seizure and Bell's Palsy
4	Abnormal LOC, RUE weakness	0 (Patient improved in helicopter en route)	No acute intracranial abnormality	TIA L hemisphere
5	RUE weakness	8 Visual fields=1, Facial palsy=1, RUE=1, RLE=1, Ataxia=1, Language=2	L frontal and temporal lobe encephalomalacia. Clips in the left temporal lobe inferiorly with a left temporal craniectomy defect.	Seizures, Old Left MCA Hemorrhage- s/p aneurysm clipping

Figure 4: Details of cases in which findings from the MEND exam and NIHSS did not correlate

## Results

- From September 2008 to June 2011, 51 airlifted patients met the criteria for undergoing both a MEND exam and the NIHSS.
- There were 32 males (63%) and 19 females (37%), with a median age of 67 years (44-98 years).
- The MEND exam performed on scene by paramedics correlated with the initial NIHSS performed in the hospital by the stroke team in 46 of the 51 (90.2%) patients. Details of the five patients whose exams did not correlate are provided in Fig. 4.
- The average NIHSS score was 9 with a range from 0 to 30.
- A total of 40 patients (78.4%) were diagnosed with stroke (37) or TIA (3). Of the 37 strokes, 32 were ischemic (86.5%) and 5 hemorrhagic (13.5%).
- The 11 patients who were not diagnosed with TIA or stroke had several different conditions including seizure (in settings of old L MCA hemorrhage and Bell's Palsy), hypertensive crisis, viral encephalitis, and complex migraine. Noticeably, seven of these patients had NIHSS scores that correlated with paramedic findings' on the MEND exam on scene. Therefore, the paramedics were correct in activating the stroke alert protocol in these patients.

## Conclusion

- The MEND exam completed on scene by paramedics correlated well with the same components on the initial NIHSS performed by the neurologist at the receiving hospital.
- The MEND exam is a valuable tool when assessing stroke patients in the field and determining the need for air transport.