**Stroke project plan – Memorandum of Understanding**

According to the Professional Guidance of the Ministry of Health of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for the care of patients with stroke in the hyperacute stage is concluded a MEMORANDUM OF COOPERATION between

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (The Hospital)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (The EMS Company)

Stroke is a leading cause of death and one of the leading causes of disability worldwide. However, with good teamwork, coordinated protocols, and a passion for providing patients with the care they deserve; we can prevent death and disability in many of our patients. This serves as the guiding document for the agreed partnership between The Hospital and The EMS Company aimed at the optimisation of the hyper-acute care of patients with suspected stroke.

The primary objective of the Memorandum of Cooperation between the two organizations is to minimize time losses, in particular of institutional diagnosis and treatment, until systemic intravenous thrombolysis is administered to a patient in the hyperacute stage of a cerebral infarction. Systemic intravenous thrombolysis should be administered to the patient within 4.5 hours of developing symptoms of cerebral infarction. The therapeutic effect and success of thrombolysis aimed at curing the patient and preventing permanent disability or death decreases proportionally with the time passed from the onset of symptoms of acute cerebral infarction.

The secondary, but not less serious, objective of the Memorandum of Cooperation between the two organizations is once again to minimize time losses of providing another endovascular treatment, thrombectomy, from the cerebral arteries for eligible patients.

In order to meet both objectives of this Memorandum, the parties to the Memorandum agree to jointly proceed as follows:

**Regional Background**

In our region of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a population of \_\_\_\_\_\_\_\_\_\_\_\_\_\_, when using the average European stroke incidence rates of 230/100,000 we could expect to see around \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ incident strokes per year. As there are \_\_\_\_ Stroke Ready Hospitals in this region, it means that on average each hospital should admit around \_\_\_\_\_\_\_\_\_\_\_ acute stroke patients each year. As things currently stand, our hospital admits around \_\_\_\_\_\_\_\_\_\_ patients a year, which could mean that some stroke patients are admitted to hospitals that are not stroke ready. This is a problem that we must address.

**Focus areas and specific goals**

From the hospital’s perspective, we have specific areas of focus that we will continue working on to ensure our patients have the best chance of surviving their strokes with their lives intact. These include:

1. **Time**: Every minute that a stroke patient’s brain is denied oxygen, 1.9 million brain cells die. The evidence for treating any type of stroke as fast as possible is overwhelming. We will therefore aim to reduce our door-to –therapy time to around **30 minutes.**
2. **Recanalization**: In an acute ischemic stroke, the main treatment goal is to salvage the Penumbra brain tissue. This can be done through pharmacological or mechanical recanalization. Our goal is to have a recanalization procedure rate of at **least 5% with a target rate of 15%.**
3. **Post-acute care**: Intensive monitoring and care for stroke patients for the first 72 hours post stroke has shown to improve outcome. We will therefore aim to treat **at least 85%** of our patients in a dedicated stroke unit or ICU for at least 72 hours.
4. **Quality monitoring:** We believe that only by monitoring our progress and instituting a culture of quality monitoring we can reach the high standards of care our patient deserve. For this reason, we will make use of the RES-Q registry as a quality improvement registry.

The role of the pre-hospital care in the improvement of patient outcome is substantial. From the perspective of the Emergency Medical system, our focus will be on the following areas:

1. **Diagnosis of stroke:** A common problem reported by hospital teams across the world is the rate of false positives or mimics that are delivered to hospitals as suspected stroke. By using a specific scoring system such as the Cincinnati Scale also known as the FAST test and through training of EMS staff, this can improve vastly. EMS personnel demonstrated a sensitivity of 61-66% without stroke assessment training and 86-97% with training.1 Our aim is to have an accuracy rate of at least **85%** in terms of stroke diagnosis
2. **Choosing the correct hospital:** Delivering a stroke patient only to stroke ready hospitals could be the difference between life and death for the patient and could also make a significant difference in post stroke disability rates. We will institute protocols from which we will choose the most appropriate stroke ready hospitals based on the patient’s anamnesis and current position. We will aim for an accuracy rate of **85%** in this regard.
3. **Acting emergently:** We understand the time-critical nature of stoke and will thus aim to act emergently when faced with an acute stroke patient. We will work deliberately and accurately on scene collecting as much information that would be of value for the treating physician to make an informed decision but will aim to not spend more than **25 minute**s on scene. The aim is for us to do as much as possible before hospital arrival to save time for the hospital staff, while being careful not to waste time on scene.
4. **Pre-notification:** We understand that by pre-notifying the stroke team that a suspected stroke patient is on route to them, they can activate a code stoke, get everything ready for a speedy evaluation of the patient thereby leading to faster treatment and better outcomes. It allows hospitals to prepare and mobilize resources such as imaging before the patient arrives, and the stroke team to be present on patient arrival at the door. Appropriate information allows patients to be registered in hospital systems before arrival (information needed include name, date of birth, insurance number). We will aim to achieve a target **of 85%** of all cases to be pre-notified.

**Tasks to be performed by the EMS**

**Tasks related to Diagnosis of stroke**

* In our region, we will make use of the FAST scale to diagnose suspected stoke. We will provide all EMS crew with a checklist containing the FAST scale (sudden onset of a droopy face on one side, weakness of the arm or leg on one side of the body, inability to speak).
* We will also provide all crews with training to improve the accuracy in performing neurological assessments. We will do this by using the Advance Stroke Life Support e-learning provided free by the Angels Initiative and follow this up with regular on-site simulations refresher courses.

**Tasks related to choosing the correct hospital**

* In our protocol, the EMS crew will contact the call centre who will direct the ambulance to the most appropriate hospital based on their availability, treatment options and location.
* The call centre shall at all times maintain an updated list of hospitals in the region that are “Stroke Ready” and shall only direct suspected stroke patients to these hospitals.

**Tasks related to acting emergently**

* Establish an IV access
  + Start 2 large bore IV access (One could be used for thrombolytic therapy and the second to give contrast to identify patients for Thrombectomy).
  + However, transport should not be delayed for this.
  + No strong evidence supports or refutes routinely giving fluid boluses to stroke patients. Patients with low systolic blood pressure and no contraindications should be given a bolus of IV fluids.
* Oxygen saturation
  + Assess airway compromise. This occurs more frequently in older patients, those with a severe stroke, or those with symptoms of dysphagia.
  + Use of supplementary oxygen to maintain oxygen saturation above 95%. Beyond 95%, oxyhemoglobin is saturated and no further physiologic benefit is derived.
* Blood sugar test
  + Hypoglycemia could mimic stroke.
  + Measuring glucose levels can help differentiate between stroke and hypoglycemia.
  + Symptoms such as hemiparesis hemiplegia, speech or visual disturbances, confusion, and poor coordination can all present in patients with hypoglycemia and can be corrected with administration of dextrose.
  + Provide dextrose to those patients with glucose below 60 mg/dL.
  + Pre-existing hyperglycaemia worsens the clinical outcome of acute stroke.
* Blood pressure
  + Abrupt blood pressure lowering should be avoided.
  + Cautious blood pressure lowering is recommended in patients with extremely high blood pressures (>220/120 mmHg) on repeated measurements, or with severe cardiac failure, aortic dissection, or hypertensive encephalopathy.
  + Patients with the highest and lowest levels of blood pressure in the first 24 hours after stroke are more likely to have early neurological decline and poorer outcomes.
  + Blood pressure can usually be raised by adequate rehydration with crystalloid (saline) solutions.
* Patient position
  + Head injuries: bed at 30 degrees alleviates elevated intracranial pressure.
  + Stroke patients typically do not have elevated intracranial pressure.
  + Cerebral blood flow and cerebral perfusion pressure improved with the patient in a supine position.
  + Patients should be laid flat as tolerated, unless precluded by clinical issues such as compromised respiratory status, secretions, or aspiration risk.
* Medical history

Responders must document:

* + Patient last seen normal time
  + Current medication list, pay special attention to medications that treat coagulation disorders
  + Use of specific language, facilitates clear communication

**Tasks related to pre-notification**

* The EMS crew shall contact the acting doctor of the neurological department via the mobile

phone (which will be provided to them by the hospital) and informs them of the patient status, vital function values and estimated time of arrival at the medical facility.

* The doctor on duty of the neurological department shall determine the direction of the patient (CT department).
* The doctor on duty of the neurological department by callback confirms to the crew of the EMS company the readiness of the CT scanner. If the CT scanner is not ready for immediate CT scan of the patient, the crew shall deliver the patients to the neurological department.
* If the crew of the EMS cannot reach such doctor through the designated mobile phone of the neurological department (e.g. no one answers the phone), the EMS crew directs the patient to the neurological department and the non-response to a call shall be reported to the management of the department after the exit is completed by e-mail to the project email address.
* The crew of the EMS company shall hand over the patient to the neurologist. Transfer, eventual examination and presentation of the patient's state of health must be carried out maintaining the protection of personal data and information according to the healthcare compliance regulations.

**Tasks related to implementation of the project**

* Stroke cards (Checklists for EMS crews)
  + It is agreed that each EMS car will have a booklet with the agreed protocols for the EMS crews to follow. This checklist will guide EMS crew members in terms of what to do, and what information to capture.
* If possible, EMS crews will wait until the results of the CT and CT Angiogram have been completed before leaving, as the patient may need additional transport to another centre for more advanced treatment.
* Quality monitoring
  + EMS crews will use the Angels EMS awards spreadsheet to monitor their performance in the various aspects of this agreement. This data could be analysed and discussed at previously scheduled quarterly meetings between the EMS and the hospital’s stroke team.

**Tasks to be performed by the hospital stroke teams**

* Procure a dedicated Stroke Phone that is held by the neurologist on duty. This will be the only number that will be used by EMS crews for Pre-notification.
* Hospital stroke teams will perform the following actions:
* Keep the EMS company informed about the availability and working order of CT scanner.
* Answer all calls to the stroke phone in a timely manner
* Check the availability and pre-order the CT scan
* Pre-admit the patient
* The doctor of the neurological department should wait for the patient at the door of the hospital/ at the CT scanner. In the event that the EMS crew has to wait for more than 15 minutes to hand the patient over to the neurologist, this deviation to the agreement should be reported by e-mail to the project’s feedback email address.
* All hospital stroke team members must receive initial and ongoing training on the agreed stroke protocols and tasks expected of them.
* Stroke teams will implement the protocols through training in hospitals that will be followed by an in-situ simulation involving the EMS teams as well. This will be followed up by regular trainings to keep sure the agreed actions are implemented by all Stroke team members.

**Communication channel**

An email chain will be created containing the email addresses of the Head of the Stroke unit, the Call Centre Director and the Head of the EMS service. This email chain will be used to provide ongoing feedback of what works, and challenges faced doing implementation. The project email address that will be used for all feedback regarding successful or lack of implementation of the agreed tasks will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Quarterly feedback meetings**

The EMS Company and the hospital shall carry out a joint collection and evaluation of data on the practical application of this Memorandum, no later than 6 months after the date of signature of the Memorandum, with a view to further improve the procedure for the management of patients with acute stroke.

A quarterly meeting will be scheduled with the different role players that have an impact on this procedure. Representatives from the neurological department, Call Centre representatives and representatives from the EMS service will provide feedback in terms of their quality parameters versus the target, as well as feedback in general in terms of the implementation challenges, successes etc.

This Memorandum shall be valid and effective from the date of its signature by the authorised persons from the EMS Company and for the hospital. Amendment of the Memorandum is possible only by written agreement of both parties to the Memorandum. Unilateral withdrawal from this Memorandum must be made in writing and is effective from the moment of its delivery to the other party of this memorandum.

Signed on behalf of the EMS Company

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Name Company Date Place

Signed on behalf of the Neurology Department of the Hospital

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Name Hospital Date Place