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## Cooperation between the Doctor and Nursing Staff in the Proces of Diagnosis and Thrombolytic Treatment of Patients in Acute Stroke Period

### Współpraca pomiędzy lekarzem i personelem pielęgniarskim w procesie diagnozowania i leczenia trombolitycznego chorych w ostrym okresie udaru mózgu

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#### Abstract

In accordance with the WHO (World Health Organization) definition applicable since 1980, stroke (BS) is a disease syndrome characterized by a sudden occurrence of focal or generalized cerebral dysfunctions, which last longer than 24 hours, unless they are fatal. Thrombolytic therapy is currently the recommended and most effective method of treatment of recent ischemic stroke. The success of treating stroke equally depends on the appropriate organization of the entire team caring for the patient.

In order to efficiently conduct thrombolytic treatment in a patient with acute ischemic stroke, medical and nursing staff working in the Department of Stroke Treatment should have the following skills: high level of professional responsibility, high professional competence, have the ability to cooperate in a team and establish interpersonal contacts, including those with the patient and their family. Team members should make difficult decisions jointly, analyze and modify their activities so that treatment could be implemented as soon as possible while maintaining the utmost discretion and clinical alertness.

This article was prepared in order to summarize and organize available knowledge on the cooperation between the doctor and nursing staff in the diagnosis and thrombolytic therapy of patients in the acute stroke period. (JNNN 2019;8(1):37–43)

**Key Words:** nursing care, ischemic stroke, thrombolytic therapy

#### Streszczenie

Zgodnie z obowiązującą już od 1980 r. definicją WHO (Światowa Organizacja Zdrowia), udar mózgu (UM) to zespół chorobowy cechujący się nagłym wystąpieniem ogniskowych lub uogólnionych zaburzeń funkcji mózgowia, które utrzymują się dłużej niż 24 godziny, o ile nie doprowadzą wcześniej do zgonu. Leczenie trombolityczne jest obecnie zalecaną i najskuteczniejszą metodą leczenia świeżego udaru niedokrwiennego mózgu. Sukces leczenia udaru mózgu w równej mierze zależy od dobrej organizacji całego zespołu opiekującego się chorym.

W celu sprawnego przeprowadzenia leczenia trombolitycznego u pacjenta z ostrym udarem niedokrwiennym mózgu personel lekarski jak i pielęgniarski pracujący w oddziale Leczenia Udaru Mózgu powinien posiadać następujące umiejętności: wysoki poziom odpowiedzialności zawodowej, wysokie kompetencje zawodowe, posiadać umiejętność współpracy w zespole oraz nawiązywania kontaktów interpersonalnych w tym również z pacjentem i jego rodziną. Trudne decyzje członkowie zespołu powinni podejmować wspólnie, a swoje działania analizować i modyfikować tak aby leczenie wdrażać jak najszybciej przy zachowaniu jak najwyższej rozwagi i czujności klinicznej.

Niniejszy artykuł powstał w celu podsumowania i uporządkowania dostępnej wiedzy na temat współpracy pomiędzy lekarzem i personelem pielęgniarskim w procesie diagnozowania i leczenia trombolitycznego chorych w ostrym okresie udaru mózgu. (PNN 2019;8(1):37–43)

**Słowa kluczowe:** opieka pielęgniarska, udar niedokrwienny mózgu, leczenie trombolityczne

## **Introduction**

Ischemic stroke remains a challenge for both the neurologist as well as the entire therapeutic team, which should be involved in comprehensive treatment of the patient. A dozen of years ago, the chances of surviving and returning to previous capacity were much lower in the number of stroke patients. The treatment of fresh ischemic stroke has significantly changed as a result of the huge development of medicine in the field of diagnostics as well as therapeutic and nursing methods. It ought to be remembered that despite advances in the treatment of stroke, it is still burdened with high mortality and is the main cause of disability among adults. Patient's life depends on how early professional help is provided. It is important to quickly diagnose it by proper collection of the interview already at the stage of the Ambulance Service, then prompt and correct examination of the patient by the emergency medical team, efficient transport to the hospital with a stroke ward and as early as possible performance a neuroimaging examination — most often it is a CT scan. CT scan allows to determine it quickly whether we are dealing with an ischemic stroke, hemorrhagic stroke or other pathology imitating a stroke. Once the ischemic stroke (IS) has been diagnosed, early thrombolytic therapy can be started as long as there are no contraindications for this therapy. Supervision over therapy is performed by a doctor who closely cooperates with the nurse. It is important to educate professional staff and increase staffing in the already existing Stroke Wards, to provide these facilities with monitoring devices, and to expand the diagnostic facilities. At the same time, it is necessary to conduct continuous education of the personnel employed in the Ambulance Service as well as the rescuers themselves concerning the stroke. One should not also forget to educate the society in this respect, so that they could recognize the symptoms that may indicate a stroke and that they would know that in such a situation the Emergency Ambulance must be called immediately.

The potential of thrombolytic therapy in Poland is very large. Poland is covered by a network of stroke units and in principle every patient should be given specialist care. In the analyzed literature we look up for the answers to the questions: What is the participation of the doctor and nurse in the diagnosis and recognition of stroke? What is the role of the nurse in thrombolytic therapy at the stroke ward? What does nursing care look like during a stay in the Stroke Ward and during patient's preparation for discharge?

The article refers to Polish and foreign literature as well as to the latest guidelines from 2018 regarding the early treatment of patients with recent ischemic stroke developed by the American Heart Association and the American Stroke Association. In reference to

the previous ones from 2013, the new guidelines contain comprehensive recommendations regarding the treatment of the patient during hospitalization, including the period of early treatment, as well as proceedings protecting patients against another disease.

It stems from the literature that the role of the nurse in the treatment of the patient with ischemic stroke is related to their active participation in the process of: preparing the patient for treatment, preparing the medicine according to the dose calculated by the doctor, direct administration of the medicine, monitoring patient's health condition towards symptoms and side effects of the applied treatment and its effectiveness, education and providing support to the patient and their family, as well as in the nursing process.

The article is devoted to the practical aspects of diagnostic and therapeutic procedures in the acute phase of ischemic stroke including the cooperation of the doctor and nursing staff.

## **In-hospital Diagnostic Procedure**

Patient's life and future health depends on an efficient arrival at the hospital, because only a quick medical intervention creates a chance to limit the area of the stroke. The prevalence of admissions to hospital, excluding the Medical Emergency Rescue Team and probably longer time from the onset of symptoms to the moment of reporting to the hospital, indicates still insufficient knowledge of the public about new, ischemic stroke treatment possibilities conditioned on the moment of reporting [1–3].

A patient with a diagnosed stroke, regardless of its cause, should be hospitalized. Such a patient should arrive at the hospital which is equipped with appropriate diagnostic and therapeutic options as soon as possible (within 1–2 hours at the latest). From now on, such a patient should be accompanied by a doctor and a nurse. The narrow time window from the occurrence of stroke symptoms to specific treatment requires coordinated medical actions. Therefore, diagnostic and treatment activities are carried out simultaneously. From the admission of the patient to the hospital emergency ward (Polish: SOR), the neurologist should review and perform neurological assessment of the patient within 10 minutes. The emergency ward physician preliminarily assesses vital signs and compensates for the identified disorders, while at the same time the neurologist performs neurological assessment and coordinates diagnostic activities, including laboratory and neuroimaging tests. Immediately after the patient has been admitted to the emergency ward, the emergency ward team under the supervision of a physician collects a short interview,

which should include information on the time of onset of symptoms, initial symptoms of stroke and accompanying symptoms, of the patient's medication (with special attention to anticoagulants), surgeries performed in the last 3 months, head injuries, bleeding as well as short information about the circumstances of current disease [2,4].

A properly and accurately collected interview provides data necessary for the patient's qualification for thrombolytic treatment. Due to the time consuming, laboratory tests are ordered immediately after the patient arrives at the emergency ward. The laboratory staff should also be notified about the priority testing (eg: password thrombolysis-cito). The level of glucose (Glu) in the blood, blood morphology, as well as the coagulation system are assessed. In addition, biochemical blood tests, vascular and cardiovascular tests (ie electrocardiogram — ECG) are performed. The list of necessary biochemical tests should be available in the emergency unit. In the meantime, a CT scan of the head is analysed and the patient is undergoing a neuroimaging examination within about 15 minutes from the moment of arrival at the emergency ward. The test should be carried out as soon as possible. This examination answers the question whether we are dealing with hemorrhagic or ischemic stroke. Both the former as well as the latter is a life-threatening condition. For the administration of recombinant tissue plasminogen activator (rt-PA, alteplaza) it is absolutely necessary to know the level of Glu in the blood, which should not be lower than 50 mg/dl before drug administration and should not exceed 400 mg/dl. In addition, the level of platelets should not be lower than 100 K/ $\mu$ l. However, if the patient did not use heparin or oral anticoagulants, it is possible to administer rt-PA before receiving a coagulogram result. If the patient uses anticoagulant drugs, it is always necessary to wait for the coagulogram result, which should be in the normal range before starting the rt-PA injection.

### **Nursing Operation in the Process of Diagnosing Patients in the Stroke Treatment Ward**

The fight for the consequences of stroke to be as low as possible forces intensive and quick action in the first hours of stroke. Nursing care for a stroke patient is particularly important, and many of its aspects are due to the specificity of stroke treatment. The success of treatment depends equally on the direct thrombolytic alteplase effect, as well as on the appropriate organization of the entire team caring for the patient. The first stage in the treatment of stroke is the admission of the patient to the ward. The place of the patient's stay in the ward depends on the clinical condition of the patient. In

specialized centers dealing with the treatment of stroke, the nurse admitting the patient with stroke applies the procedure of admitting the patient urgently. She focuses on efficient, fast organized action, where the physical condition of the patient is mainly assessed. The nurse makes contact with the patient and preliminarily assesses the general condition in terms of their nursing needs. Next, the nurse calls the neurologist's doctor, sets the documentation of the patient and helps with the preliminary examination. The nurse measures the blood pressure (on both upper extremities), pulse rate, number of breaths, performs ECG. Sets two peripheral punctures, collects blood for analytical testing, unless it was previously done in the emergency ward. The nurse prepares the patient for thrombolytic treatment by providing simple information and calming the patient down. At the same time, the nurse informs the patient what is being done at the moment without interrupting the actions. Treatment with rt-PA requires careful observation of the patient during the administration of the drug and in the period immediately after its application. The thrombolytic treatment of a patient with acute ischemic stroke should be performed by a neurologist. A nurse exercising intensive supervision of a patient with an acute stroke, according to the method of nursing process can prevent complications and, if they occur, take appropriate action until the doctor arrives. Since the treatment of acute phase of stroke is a race against time, many activities at the patient are performed simultaneously by 2–3 nurses [3–6].

Professional, holistic nursing care is focused on a specific patient, who should be approached individually, compliant with the guidelines. It is very important to calm the patient down so that they could feel safe despite serious illness and sudden hospitalization, which in itself is a big stress for the patient. Such a patient usually feels fear of death and has the feeling of total helplessness and dependence on the care of medical personnel. This anxiety may be additionally intensified by the medical equipment applied. In this situation, the nurse should show the patient interest, care, kindness, listen carefully, explain everything that concerns the patient, inform about the purpose of the treatments, about the use of monitoring equipment and explain the scope of the patient's activity in bed. The source of anxiety may also be a family or professional situation left behind by the patient torn out of the course of daily activities through illness and sudden hospitalization.

The nurse's participation in the process of diagnosing and treating patients with stroke is implemented by the execution of written orders issued by a neurologist's doctor, included in the established and valid documentation. Such an obligatory document is currently an "individual medical orders card". This card belongs to the basic documentation of each patient and should

be legibly filled in, and after the patient leaves the hospital ward — along with other documents transferred to the archive.

## **Thrombolytic Treatment**

In the case of ischemic stroke, the patient goes to the Stroke Treatment Ward, where they are monitored and supervised by professional staff. If the patient qualifies, they are treated with thrombolysis under close supervision of the doctor in charge of the stroke team (a neurologist).

Thrombolytic therapy is currently the recommended and most effective method of treatment of recent ischemic stroke. According to the guidelines and the current registration of the drug — intravenous thrombolysis can be applied within 4.5 hours since the onset of symptoms. A recently published IST-3 (Third International Stroke Trial) study has shown that the thrombolysis applied up to 6 hours after onset of symptoms improves the prognosis in some patients. This study indicates the possibility of a beneficial effect of intravenous thrombolysis in patients going beyond the existing criteria, which was presented in the latest amendment to the Polish guidelines for the treatment of stroke [7–10]. Thanks to this, in exceptional cases, it is reasonable to administer rt-PA up to 6 hours after the onset of the first symptoms of stroke (when there is a high probability that the patient will benefit from treatment). However, it should be remembered that the sooner the treatment is started, the greater the patient will benefit. It also should be remembered that for the treatment of intravenous stroke, the drug is registered up to 4.5 hours from the onset of stroke [11–13]. From the moment of patient's arrival at the hospital to the application of the drug (Door to Needle Time — DNT), it should not be more than 60 minutes, and the goal is to shorten the time to 20 minutes.

Apart from pharmacological treatment and nursing procedure, early physical rehabilitation under the guidance of a physiotherapist and cognitive functions under the guidance of a speech therapist and a psychologist are very important. The family should cooperate closely with the medical staff, participating in the rehabilitation of the patient (after obtaining relevant instructions). Although the rt-PA thrombolysis administered intravenously has been used for over a dozen years, its widespread implementation still encounters difficulties. The reason being mainly organizational problems (therapeutic window) and numerous contraindications as well as doctors' fear of hemorrhagic complications occurrence.

## **Preparation and Supply of the rt-PA Drug**

1. The recommended dose of alteplase is 0.9 mg/kg body weight (maximum 90 mg) by intravenous infusion using an infusion pump within one hour, with 10% of the total dose initially given as a bolus (for 1–2 minutes).
2. Applying aseptic principles, the drug should be dissolved (vial with powder — 10 mg, 20 mg, or 50 mg of alteplase) in an injection solution included in the package (10 ml, 20 ml or 50 ml respectively) in order to obtain a concentration of 1 mg of alteplase in 1 ml.
3. The drug (vial with powder) should be stored at the temperature below 25°C, protected from light (It is recommended to be stored in a refrigerator at 2°–8°C).
4. The alteplase preparation can be diluted in a solution of 0.9% sodium chloride (0.9% NaCl =physiological saline). The medicine is given immediately after preparation. It is worth knowing, however, that the prepared solution can be stored for 24 hours in a refrigerator at 2°C to 8°C or for 8 hours at a temperature below 25°C. This is important because sometimes for various reasons it turns out that the patient cannot be given the medicine and then it can be properly stored and given to another patient at the right time. If the drug is not used within 24 hours after its preparation, it should be properly discarded.
5. There are a lot of contraindications for thrombolytic therapy: coagulation disorders, recent surgeries, injuries, some eye diseases such as hemorrhagic retinopathy (relative contraindication), drug allergy, childbirth 10 days before, heart massage 10 days before, bacterial endocarditis, pancreatitis and others.
6. In the case of sudden deterioration of the patient's condition during rt-PA treatment, the rt-PA infusion should be stopped immediately, and the doctor ought to be notified if they are not at the patient's at the moment.
7. Patients being treated with rt-PA should be maintained intravenously, therefore it is advisable to apply fluid slowly (e.g. 0.9% NaCl) after medicine administration. Cannulas should preferably be applied to peripheral veins of uninfected upper limb, most often to the vein of the hand, forearm or elbow flexion. Lower limb vessels should not be used because of slow blood flow and the risk of thrombosis. The place of the cannula insertion should be monitored twice a day and in addition: before, during and after the next administration of the drug (assessment for possible local infection: edema, changes in skin colour, excessive warmth).

8. Avoid violation of skin continuity (inserting a cannula into a vein, inserting a Foley catheter, probe, etc.) in a patient during the first 24 hours after rt-PA application.
9. Do not administer acetylsalicylic acid (ASA) or heparin for the first 24 hours after infusion.
10. Perform computed tomography 24 hours after administration of rt-PA [14–16].

### **Nurse’s Activities in Monitoring Disorders of the Cardiovascular System**

The patient must be monitored — ECG recording is constantly monitored in order to detect cardiac arrhythmias, the blood pressure and partial pressure of oxygen in the capillary blood are measured. NIHSS neurological assessment (including the National Institutes of Health Stroke Scale) and patient’s reactivity using the Coma Glasgow Scale (CGS), which is a sensitive clinical indicator which indirectly evaluates whether there is increased intracranial pressure. Thanks to the monitoring and careful observation of the patient, most often by the nurse, superficial bleeding can be noticed immediately, and one can also observe a deterioration of the state of consciousness and growing paresis which may suggest bleeding into a cerebral ischemic stroke. In this situation, the alteplase infusion must be stopped immediately and a CT scan of the head must be performed to confirm or rule out intracerebral bleeding. The physician decides about further treatment: sometimes it is enough to stop the infusion, sometimes freshly frozen compliant plasma is administered. Appropriate symptomatic treatment is also carried out according to medical orders [17–19].

### **Principles and Diagnosis of Stroke Treatment**

1. ECG monitor, which should be in the stroke room, is used for continuous monitoring of the heart. The self-adhesive electrodes of the ECG monitoring equipment are placed on patient’s chest in a set order. The electrocardiographic curve, heart rate, body temperature, number of breaths, blood pressure measurement and oxygen saturation of the hemoglobin are presented on the monitor screen.
2. Measurement of hemoglobin saturation with oxygen is currently the standard method of monitoring a patient in a stroke room. The pulse oximeter sensor is placed on a finger or on the earlobe, so that the transmitted light from the transmitter could pass through the tissues. Pulse oximetry provides information about saturation of arterial blood with oxygen (SaO<sub>2</sub>) displaying its values in digital form and wave charts.

3. During the infusion the patient is monitored: control of blood pressure every 15 minutes for the first 2 hours after starting thrombolysis, then every 30 minutes for the next 6 hours and then every hour for 16 consecutive hours.
4. Observing the patient, one can notice symptoms that can only be seen visually, e.g. swelling of the lips or tongue that are characteristic of Quincke’s edema [20].
5. The participation of nursing staff in pharmacotherapy consists in the preparation and administration of hypodense medicines ordered by a doctor.
6. Oxygenation of blood can be improved by administering oxygen at 2–4 liters per minute via nasal catheters (so-called oxygen whiskers). Oxygen treatment is effective when oxygen saturation of hemoglobin measured with a pulse oxymeter is 94–98%, and the clinical symptoms of hypoxia (cyanosis, dyspnea) subside.
7. Each patient should be monitored for the level of sugar in the first days of stroke, while all patients with diabetes should have a continuous glycemic profile. The measurement of the full glycemic profile is performed in patients with acute phase of stroke four times a day (eg about: 6 a.m., 11 a.m., 4 p.m., 9 p.m. from capillary blood) [21].
8. Monitoring body temperature in a stroke patient should be performed several times a day. Body temperature above 37.5°C. should be immediately lowered both by means of hectic and physical methods (eg: cold wraps on the forehead and in places where large vessels run, bathing in cool water, lowering the room temperature, etc.).
9. The nurse takes blood on doctor’s orders for laboratory tests that clearly show electrolyte disturbances. The nurse supervises the patient’s oral prescription and runs the fluid balance card. The nurse waters the patient intravenously if ordered by the doctor. Before starting watering, it should be checked whether the patient has dysphagia — if it occurs, then drinking and feeding should be carried out by gavage. If the swallowing reflex is abolished for a long time, a percutaneous gastrostomy should be considered.
10. Patients who require treatment with parenterally administered fluids should have an accurate record of the amount of fluids administered and their losses for proper treatment. In the balance sheet, the nurse notes the amounts of fluids accepted and excreted, taking into account conditions that increase the body’s demand for water, i.e.: high ambient temperature, high humidity, fever states, rapid breathing, vomiting, diarrhea [19,20,22,23].

## The Process of Preparing the Patient to Leave Hospital — General Comments

The nurse is the person who directly helps the patient in the performance of some biological needs (execution of the body hygiene or help in the toilet, bedding, assistance in eating meals, providing bed pans). Diametrically different problems appear when the acute period of stroke has passed and the patient is transferred from the stroke room to the general room. Then, the process of preparing the patient for life and leaving hospital begins. At the moment of transition to the general room, patients signal anxiety for their own health resulting from the transfer to the room without close nursing supervision. In order to calm the patient down and increase the sense of security, the nurse should make the patient aware that the immediate threat to life has passed and there is no need to constantly monitor their condition. The patient should be made aware of the need to signal disturbing symptoms and how to behave in this situation. The patient ought to be assured that they are still under professional care and, if necessary, they can count on immediate response and help.

Secondary prevention is an equally important field of medicine as diagnostics and therapy. Prevention should be carried out jointly by a doctor and nursing staff so that every patient after a stroke who is discharged home is aware of his or her illness and the need for further treatment to minimize the risk of stroke recurrence. An important element is the family or caregivers of the patient who suffered a stroke. They should be informed about the essence of the disease from the very beginning and it would be good if during the patient's stay in the ward they learnt how to deal with the patient properly. The family must be aware that treatment of the patient for secondary prevention will last virtually until the end of life [24–26].

## Conclusions

The most numerous professional groups among professional medical employees are doctors and nurses. The representatives of these professional groups work in close cooperation with each other, taking care of the patient. The basis of their professional activities are separate laws regulating the performance of doctor's and nurse's professions. The issues of cooperation between doctors and nurses seem to be omitted in Polish medical literature, although there are publications indicating the interest of researchers in this matter [25].

When dealing with patients with ischemic stroke, the doctor and nurse should work closely together to provide the patient with the best possible treatment and care. The medical and nursing staff working in the Ward

of Brain Stroke Treatment should have the following skills: high level of professional responsibility, high professional competence, have the ability to cooperate in a team and establish interpersonal contacts also with patients and their families.

Conducting an efficient rescue operation with the implementation of appropriate and effective thrombolytic treatment brings not only enormous benefits to the patient but also a lot of satisfaction for medical staff. Due to the rapid development of medicine, continuous progress and improvement of qualifications by medical personnel is very important. In modern therapy of ischemic stroke, an important role is played by the cooperation between the patient or the patient's environment, the emergency medical team (EMT), the employees of the Hospital Emergency Ward and the neurologist and nurse of the stroke treatment ward. Proper communication, cooperation can contribute to the most appropriate treatment of the patient who suffered a stroke.

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