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Standards of Value Stream Mapping as a tool supporting logistics processes in the healthcare system in Poland

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Abstract: According to the World Health Organisation (WHO) a health system consists of many components like organizations, institutions, resources, and people whose primary purpose is to improve health. The system is complex and requires staff, funds, information, supplies, transport, communications and overall guidance and direction to function properly. These elements interact with each other and, as in the logistics system, there are uninterrupted physical, decision-making and information flows between its most important elements, which include: service providers, service recipients (patients), a payer (the National Health Fund), control and supervision institutions, the Ministry of Health. The Polish healthcare system is struggling with many problems, such as insufficient access to health services, inefficient system management, shortages of medical staff, or underfunding. The use of Value Stream Mapping (VSM) standards can significantly contribute to the improvement of logistics processes of the Polish healthcare system. The standards can be also used to improve the processes of treatment of other diseases, but also the functioning of healthcare units.The aim of the article is to present the possibility of applying Value Stream Mapping standards in the process of ischemic stroke treatment as the results of the project 'Lean Management in Healthcare', implemented by the consortium consisting of the Medical University of Warsaw, the Institute of Psychiatry and Neurology in Warsaw and the Polish Society of Health Economics, financed by the National Centre for Research and Development under contract no. IS-2/200/NCBR/2015.

1 Introduction

A healthcare system consists of all organizations, institutions, resources, and people whose primary purpose is to improve health by delivering preventive, promotive, curative, and rehabilitative interventions [1]. 'Healthcare is categorized as a service sector, where service in the form of medical aid is provided. It is very important to rigorously upgrade the healthcare system, in terms of efficiency and productivity. As the healthcare is not just merely a business, but a system which has an impact on all lives' [2].

Logistics activities are complicated particularly in hospitals due to the number and complexity of organizational (administration, hospital wards, outpatient clinics, laboratories, hospital pharmacy, sterilization, etc.) and functional (wide range and number of services provided) logistics processes [3].

Due to the large number of existing medical technologies (over 100,000), health care is one of the most complex spheres of the economy [4]. The demand for medical services far exceeds the ability to finance them, and to some extent even satisfy them, due to the fact that modern civilization contributes to the increase in the number of diseases at a faster rate than it is able to keep up with their treatment [4].

According to the 'Results of the nationwide debate on the directions of changes in healthcare, the main challenges faced by the Polish healthcare system include [5]:

- Insufficient access to health services, in particular to specialist doctors, including health inequalities based on socio-economic status and place of residence;
- Inefficient management of the system at all its levels with a lack of coordination between its individual sectors: primary healthcare, outpatient specialist care, hospitals, rehabilitation, long-term care and social care;
- Staff shortages of medical staff and an inadequate model of competence in medical professions and uneven distribution of medical staff;
- Insufficient activities in the field of public health, disease prevention and insufficient involvement of Poles in their own health;
- Underfunding of the healthcare system;
- Insufficient access to innovations in healthcare, including modern therapies;
- Lack of a long-term, coherent and evolutionary vision for the reconstruction of the healthcare system.

The problems identified in the Polish healthcare system indicate the need to look for alternative ways to increase the efficiency of the system, in the face of its long-term underfunding in relation to the ability to meet the health needs of the society [6].

Stroke is currently a major social problem, as it is the third most common cause of death and the main cause of permanent disability [7]. Annually, 15 million people

worldwide suffer a stroke, 5 million die and another 5 million are left permanently disabled, placing a burden on family and community [8]. Stroke is uncommon in people under 40 years, however, also occurs also in about 8% of children with sickle cell disease [8]. In the acute phase of ischemic stroke, two methods of causal treatment are currently recommended: intravenous thrombolytic therapy with recombinant tissue plasminogen activator (rt-PA) and mechanical thrombectomy involving mechanical removal of the clot from the lumen of the cerebral vessel [9].

Time is of the essence when treating a stroke, which confirms the popular statement 'time is brain' (referring to the famous Benjamin Franklin's original aphorism "time is money"), because with each moment that a stroke goes untreated, the nervous tissue in the brain is rapidly and irreversibly damaged [10]. 'Time that the brain does not receive oxygen determines the extent of the brain damage: the shorter the time the less the permanent damage and the longer the time the more permanent or residual brain damage. Thus, treatment is aimed at getting the patient to a hospital and into a stroke treatment protocol as soon as possible' [11]. For this reason, improving the treatment of patients with a stroke is so important.

One of these ways is to optimize the logistics processes that play a key role in ensuring appropriate patient care. Improvements of the logistic processes can reduce healthcare costs and provide better support for clinical processes [12]. One of the main goals of logistics in healthcare is to search for methods that shorten the waiting time and increase the availability of medical procedures that reduce the cost of treatment [2].

The Chartered Institute of Logistics & Transport (UK) defines 7 Rights of Logistics as:

- getting the **Right** product,
- in the **Right** quantity,
- in the **Right** condition,
- at the **Right** place,
- at the **Right** time,
- to the **Right** customer,
- at the **Right** price [13].

These rights are particularly important in the treatment of ischemic stroke, in which a crucial issue is the reaction time and medicating, that have a great impact on the state of health and even life of the patient. Streamlining logistics processes in the treatment of patients with a stroke is possible thanks to the usage of the lean management concept and its tools, such as Value Stream Mapping (VSM).

2 Literature review

The term 'lean' was first applied by John F. Krafcik in 1988 to explain the Japanese system of success and later spread by James P. Womak, Daniel T. Jones and Daniel Ross in their leading book 'The Machine that changed the world' [14]. In their research, they found that the term 'lean' best describes a system that operates on half of its usual resources (space, labor, capital investment, inventory) and has far less than half of accidents and defective products [15]. There are five principles of lean [16]:

- Identify value from the customer's perspective;
- Identify the value stream for each product or service and address all wasteful steps;
- Make the product or service flow continuously and standardise processes around best practice;
- Introduce 'pull' between all steps where continuous flow is impossible;
- Manage towards perfection.

Initially, the lean system developed mainly in the automotive industry, but over the years it has also spread to other areas, including the healthcare sector. According to J. F. Krafcik: 'lean plants are more capable of simultaneously achieving high levels of productivity, quality, and mix complexity' [17]. 'Lean brings benefits for organizations to be more competitive, as it creates value for customers by eliminating all waste from activities and obtaining lean processes with high economic efficiency' [18]. Waste in the healthcare system is no different from waste in manufacturig systems and includes any expenditure of time or resources that does not cotribute to the efficient delivery of quality healthcare to the patient [19]. There are eigth types of waste in a healthcare system [15]:

- Defects (deficiencies and errors), e.g. time spent not doing something right the first time, checks and fixes for errors, and deficiencies caused by lack of tools, equipment, or lack of availability;
- Overproduction (doing more than patients need or taking action too early);
- Transportation (unnecessary movement of patients and products in the system like samples, materials, instruments, devices, apparatus, etc.);
- Waiting (e.g. for the next action, study, decision, or resources necessary for action);
- Inventory (excess stockpiles resulting in frozen financial resources, expired medications and additional disposal costs);
- Motion (unnecessary employee movements and processing);
- (Over)Processing (doing work that is of no value to the patient and other employees);
- Human potential (waste and losses resulting from not engaging employees with knowledge and potential for improvement, ignoring their ideas, not caring about their development).

The healthcare system is not a manufacturing plant but 'a sociotechnical system in which the technical system is closely interrelated to a social system of people and organisation' [20]. Lean manufacturing methodology could be used in healthcare logistics for solving problems and improving its global performance [21].

The application of lean to the treatment of patients is an attempt to eliminate all forms of waste, without undermining any clinically important steps [22].

According to Al-Balushi et al. [23] factors that are important for the successful application of 'lean' in healthcare include:

- Strong leadership team's support for lean;
- Identifying lean with the strategic agenda of the healthcare setting;
- Understanding what value and customer groups exist in healthcare;
- Undertaking the end-to-end process view to identify and eliminate waste;
- Personnel training and involvement in lean principles and methods;
- Measurement and reward systems aligned to lean objectives;
- Matching demand and capacity levels to improve flow.

Lean has many essential tools that can help organize tasks and improve processes [24]. One of them is Value Stream Mapping (VSM), which is particularly important for the identification and elimination of waste. It helps to visualize the patient's path, understand the entire process of medical treatment which can be later simplified by removing delay, unnecessary movements, consultations or other appointments, and the need for remedial clinical intervention [22]. Delay is the most serious problem in service medical provision, especially in in the treatment of patients with a stroke.

3 Methodology

The originator and initiator of the project, resulted in the described standards, was the Polish Society of Health Economics, which was the leader of a consortium whose members also included the Medical University of Warsaw and the Institute of Psychiatry and Neurology in Warsaw, specializing in the development of new methods of treatment and rehabilitation of patients with mental and neurological disorders.

The development of the standards was possible primarily thanks to the involvement of healthcare facilities, which provided both substantive and practical support in the field of mapping the treatment processes of stroke patients and providing information about them. These were the following facilities:

1. Institute of Psychiatry and Neurology in Warsaw,
2. Mazovian Specialist Hospital in Radom,
3. Mazovian Provincial Hospital in Siedlce,
4. Mazovian Brodnowski Hospital in Warsaw,
5. Mazovian Hospital in Plock.

The map of the current state and the map of the future state for the purposes of the standards were developed based on the analysis of the treatment process of patients with ischemic stroke in the 2nd Neurological Clinic at the Institute of Psychiatry and Neurology in Warsaw as a model unit for the analyzed process [6]. Research methods such as unstructured interviewing and participant observation were used to develop the VSM standards. In the study the desk research technique with two types of sources of information were used: primary (including e.g. data made available by medical facilities) and secondary, which include scientific publications, press articles from trade journals and statistical data obtained from online publications**.**

4 Result and discussion

The concept of developing VSM standards was based on the DMAIC (Define, Measure, Analyse, Improve, Control) method, according to which the following procedures were identified [6]:

1. Identification and selection of the value stream (selection of the VSM process),
2. Map of the current state,
3. Analysis of data of the current state map,
4. Future state map and implementation,
5. Evaluation of implementation effects and continuous improvement.

The standard, as the basis for any activities aimed at improving the current state, requires a process approach. The process mapping technique is one of the specialized tools enabling process identification, necessary for the effective and efficient operation of an entity from the healthcare sector [6]. Due to the fact that healthcare professionals are accustomed to follow instructions, the VSM standards have been prepared in accordance with the principles of rules for creating procedures. Procedures can be defined as an established way of carrying out an action or process defining rules in a specific area of the organization's operation, responsibility for activities and conditions for their supervision. They also specify the types of input documents (to be taken into account by the actions regulated by the procedure) and output documents (to be taken into account by the activities described by the procedure) [25]. The design of the procedure should ensure its transparency and ease of application [25] that is why the VSM standards described the procedures with the following elements:

1. Title.
2. Purpose (What does the procedure regulate?).
3. Scope (Which activities, processes, resources, etc. the procedure is related to?).
4. Liability and rights.
5. Description of the activities (at a relatively general level, with reference to operational documents, e.g. instructions, templates; it is advisable to use graphical forms of notation, e.g. in the form of a flowchart).
6. Records (documents in which the results of the actions indicated in the procedure are recorded).
7. Attachments.

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Each procedure contains a process diagram. As an example, Figure 1 shows a diagram for creating a map of the current state, while Figure 2 shows a diagram for creating a map of the future state and implementation.

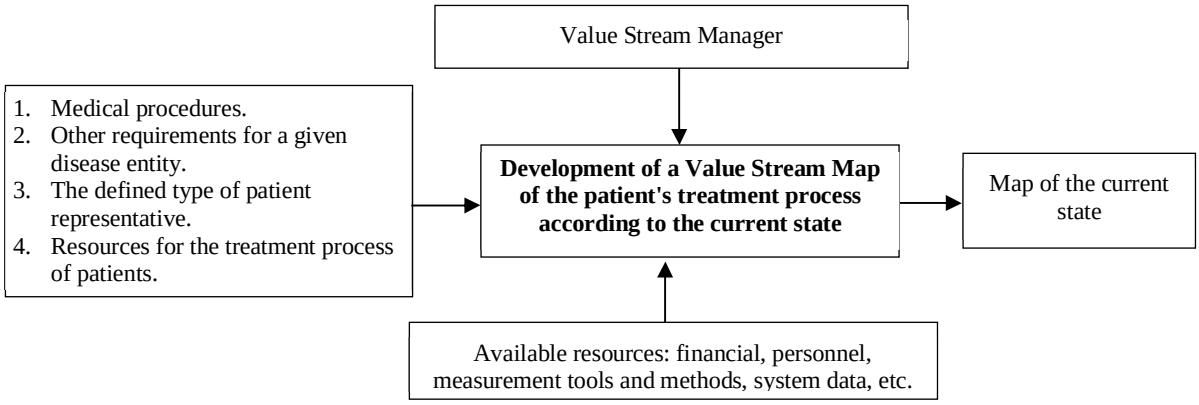

Figure 1 Diagram for creating a map of the current state [6]

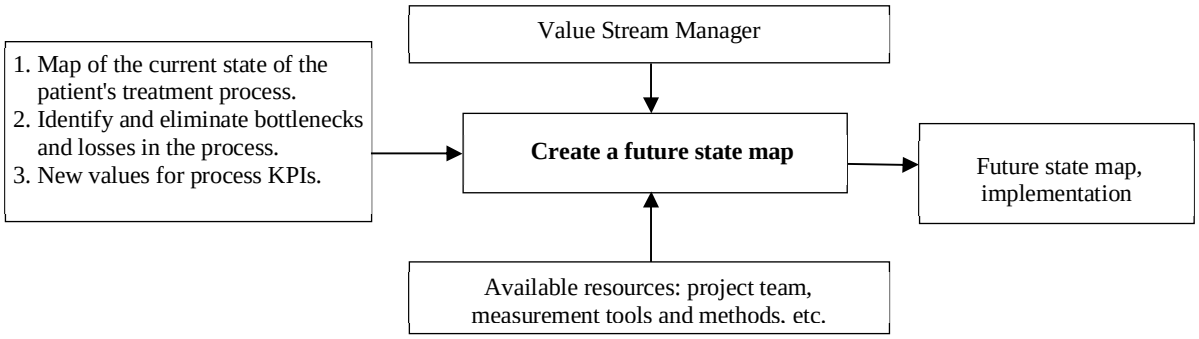

Figure 2 Diagram for creating a future state map and implementation [6]

While creating a map of the current state it is advisable to involve representatives of all departments and organizational units participating in a given value stream in order to correctly identify the path of the patient flow, activities in the process, bottlenecks and potential losses and improvements. The development of a map of the current value stream is aimed at a graphical representation of the treatment process of a representative patient with a stroke and the basic indicators of the value stream. The value stream includes the analysis of patient treatment processes within the scope specified by the value stream manager. The development of a map of the current state begins with the detailed identification of the selected value stream according to the flow of a specific type of patients entering the healthcare facility, i.e. according to the International Classification of Diseases (ICD-9 and ICD-10), which appear at the beginning of the value stream. Defining the type of patient according to these classifications allows to collect the system data and should be done within the framework of Standard No. 1 (identification and selection of the value stream). On this basis, the starting and ending points of the analyzed process of the current value stream state should be defined. Both maps (of the current and future states) are divided into 7 analytical areas reflecting the parameters and indicators of each stage of the patient's stay process and the course of treatment and the patient's stay in individual places where services are provided. The maps should be laid out in such a way that it can accommodate indicators and visualization of processes taking place in the area of basic and auxiliary processes. The maps should include following areas [6]:

1. The area of the patient's health quality indicator.
2. The area of auxiliary processes.
3. The area of basic processes.
4. The area of key parameters of the value stream.
5. The area of registration the patient's stay time in individual place of performance of basic services.
6. Value stream cost area.
7. Summary area of indicators for a periodic value stream (e.g. 1 year).

The area of the patient's health quality indicators graphically reflects the patient's current state of health according to the adopted classification (Rankin Scale or National Institutes of Health Stroke Scale - NIHSS) at a given stage of treatment according to the available data. The indicator should be based on system data or patient history cards over time.

The area of auxiliary processes graphically reflects the places and types of activities performed during the patient's treatment process, where the patient (as a rule) does not reside, where resources are prepared, auxiliary and diagnostic tests are performed, results required in the process are developed, which are then provided in the area

of places where basic services are performed. In this area, it is necessary to identify the activities and resources necessary for the preparation of services, which are the subject of subsequent provision at the places where the basic services are performed, and to estimate them in a temporal and quantitative manner and to identify the frequency of their provision.

The area of (essential) basic processes graphically reflects the chronological identification of places on the diagnostic and therapeutic path, where the patient stays and where auxiliary and essential services are provided as part of the basic treatment processes. In this area, it is necessary to identify the activities and resources necessary for the provision of services and to estimate them in a temporal and quantitative manner, as well as to identify the frequency of their provision.

The area of key parameters of the value stream graphically reflects the resource ratios for individual places of service. It should be developed on the basis of data obtained during the patient's diagnostic and therapeutic pathway and on the basis of data on the availability and use of resources time. In this area the resources (and the number of them) required to serve the patient representative subject to the Value Stream Mapping should be defined.

The area of recording the patient's residence time in each location graphically reflects the chronological identification of the patient's residence time in each location with an estimate of the time spent on [26]:

- VA (value added)- treatment activities that increase value in the process,
- NVA (not value added) - activities related to the process, which do not add value to the treatment process, where:
- VA is the time of treatment and activities closely related to the patient reflected on the PT (Processing Time) line of the graph for a given place of the patient's presence,
- NVA is the waiting time in the process and the transport time - WT/TT – (Waiting Time /Transport Time) reflected on the WT/TT line of the graph for a given location,
- CT (Calendar Time) reflects the length of the patient's stay in a healthcare facility.

The value stream cost area in the form of a graph shows the costs of treating a patient with a stroke at different stages of the treatment process. It is the cost of the treatment process of a single representative patient (unit cost) with separate costs of individual cost components such as all resources (personnel, apparatus, premises, equipment), medical and non-medical supplies, medicines, meals, costs of external services and overhead, departmental, administrative and board costs assigned to the patient (so-called "hotel costs", surcharges, etc.).

The summary area of the current status map indicators in the form of a graph presents the summary selected and most important value stream indicators reflecting the patient stream according to the patient-representative pathway. The data source for the summary of the indicators is the annual aggregated data of the key parameters of the treatment process, time, patient health index and value stream costs. It is recommended to use the most important indicators that describe the value stream, such as the total cost of the representative's patient value stream, an indicator of the effect of treatment of patients appearing at the end of the treatment process, an indicator of the percentage of VA time to total LT treatment time.

The development of a visualization of the treatment process of the representative patient required a physical passage through the patient's diagnostic and therapeutic path, i.e. through all the places where services are provided (the so-called Gemba Walk). During the walk, it was necessary to identify: places where services are provided and prepared, the process of patient displacement, activities and their sequences, resources used in the process and assigning them to activities, external services provided to the patient, information flow process, potential losses and bottlenecks in the process, deviations in resources and processes from the standard treatment process [6].

Any identification should also include the determinants of the process diagnosed as deviations from the patient's standard path. The scope of deviations should include: places where services are provided, services provided, human and material resources and the number of resources required for given activities, activities carried out in each place with the use of devices, apparatuses and instruments, devices, apparatus and instruments, duration of activities in each place, necessary to safely serve the patient representative [6]. All these parameters can be optimized and affect the quality of the logistics of the patient's treatment process.

An example of a future state Value Stream Map together with described indicators of the treatment process of patients with ischemic stroke is shown in the Figure 3.

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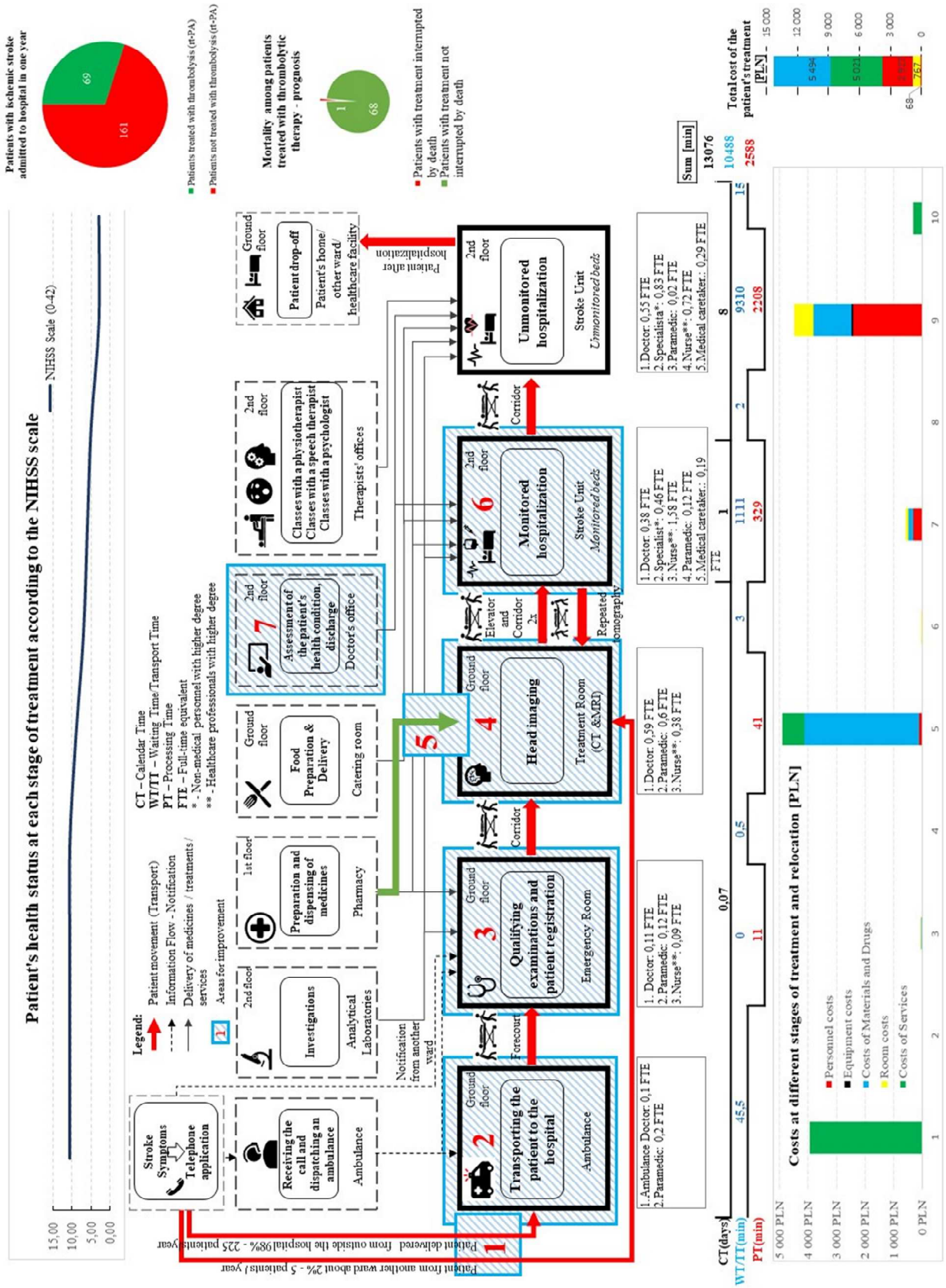

Figure 3 The example of the future state Value Stream Map of a treatment process of patients with an ischemic stroke [6]

An example of a future state map of the value stream of the treatment process of patients with ischemic stroke is shown in the Figure 3 which highlights areas where improvements in the treatment of thrombolysis stroke patients are proposed. Places of improvement were marked on the map in red with sequential ordinal numbers.

In the area no. 1 on the map of the future state, an improvement was proposed consisting in the removal of the barrier and the station serving it at the entrance, while equipping the ambulance with a remote control or a system for remote opening of the barrier, which will translate into a reduction in the time of entry of the ambulance into the premises of the healthcare facility by approx. 0.5 minutes. and reduce security costs.

In the area no. 2 of the future map, an improvement was proposed to record patient data at the stroke site or during transportation, via electronic devices for remote and automatic transfer to the emergency room system. The improvement will reduce the time needed to register the patient, enter data on symptoms and health status by approx. 2.5 minutes, and at the same time avoid errors when transcribing from paper forms.

In area no. 3 on the map, an improvement has been proposed, consisting of:

- moving the qualifying examination room from the lesion area no. 2 to 4, closer to the CT and MRI room, which will translate into a reduction in the time of patient transportation to the examination by approx. 2 minutes and, at the same time, an increase in the efficiency of the use of staff time and a reduction in the costs of resources involved in the patient's transfer,
- the use of beds with the ability to measure the patient's weight in the emergency room will allow for more precise selection of drug doses according to medical procedures proportionally to a body weight, which in the case of a thrombolytic drug is very important due to its high cost and may allow to reduce the cost of drug consumption,
- the use of a wider door in the ambulance driveway, which will make it easier to manoeuvre the bed with the patient and introduce them to the emergency Room.

In the area no. 4 to be improved on the future state map, the following changes have been proposed:

- extension of the patient registration function to include registration functions performed in the emergency Room, thanks to which the registrar's workplace in the additional admission room will be eliminated and the use of human resources in the field of registration functions will be increased,
- creating an emergency room closer to the CT and MRI room, which will reduce the transportation time of the patient approx. 2 minutes,
- earlier blood tests with portable devices performed in the emergency room, rather than in a monitored hospitalization room, which will shorten the diagnostic time.

In the area no. 5 on the future state map, an improvement has been proposed to ensure the possibility of administering a thrombolytic drug in a computed tomography or MRI room, where a diagnosis is made and a decision is made to administer the drug, which will result in:

- shortening the time from the correct diagnosis to the administration of the drug as a result of the shift in the process of moving the patient from the ground floor to the second floor and the time necessary for additional related activities by approx. 5 minutes for the next stage of treatment,
- start of thrombolytic drug preparation approx. 2 minutes earlier,
- the possibility of reducing the stocks of expensive thrombolytic drugs by approx. 50% as a result of eliminating stocks in the monitored rooms of both clinics (the analyzed healthcare unit has two neurological clinics treating patients with a stroke) and accumulating the necessary supply in one place where the drug is administered to patients who are later admitted to both clinics of the facility; the limitation may also apply to other drugs necessary to be administered at this stage of treatment,
- reduction of stocks of expensive thrombolytic drugs in both clinics, contributing to the reduction of drug losses resulting from expired and non-use of full doses by packaging units,
- reducing the time spent on rehabilitation and stay by about 10%.

In the area no. 6 on the future state map, an improvement was proposed to eliminate the thrombolytic drug supply from the handy first aid kit as a result of moving the drug administration site to the MRI site.

In the area no. 7 on the map of the future state, an improvement was proposed consisting in shortening the time spent on contact with the patient's family and explaining the causes, symptoms, path of further treatment and prevention after leaving the healthcare facility, by making leaflets devoted to the subject of stroke available in the healthcare facility in order to reduce the number of questions from the family and the time spent on explanations by the attending physician by approx. 10 minutes during the first visit and next by approx. 5 min.

It has been proposed to introduce continuity of registration of patients' health at every stage on each day of the patient's stay in a healthcare facility in order to better select resources and means, control and verify the medical actions taken.

An improvement has been proposed, consisting in the performance of activities by personnel with adequate and sufficient education to perform given activities in order to reduce the work of resources with a higher rate of labor cost by involving employees such as medical secretaries,

who can perform activities related to fill in the certain documentation for a neurologist.

It was observed that there was a need to make improvements consisting in shortening the time at the first stage of the process, i.e. diagnosing a stroke outside a healthcare facility and transporting patients to it in the so-called 'time window' of 4.5 hours for ischemic stroke. In this area, it is proposed to increase public awareness of stroke prevention and recognition of the early symptoms of each type of stroke through social campaigns about the role of the nearest environment in improving the whole treatment process by reporting this fact and calling the ambulance immediately.

The above-mentioned proposed improvements may contribute primarily to the improvement of the patient's health as a result of earlier administration of the drug and thus less cost-intensive further hospitalization, shortening the time of stay in the facility, improving the efficiency of the facility's resources and reducing the indirect costs of the patient's further functioning in society, which were not measured.

5 Conclusions

The use of lean management tools is still not very popular in improving patient treatment processes in Poland, even though there are many examples of the positive impact of lean concept implementation on the development of hospitals around the world, as below [15]:

- Reduce total clinical trial time by 60% without increasing staffing or purchasing new equipment (Alegent Health Hospital);
- More than 70% reduction in instrument decontamination and sterilization cycle times (Kingston General Hospital);
- Reducing patient waiting times for orthopaedic procedures from 14 weeks to 31 hours (ThedaCare Hospital);
- 95% reduction in patient deaths due to bloodstream infections (Allegheny Hospital);
- Reduced hospital stay by 29% and avoided a huge investment in a new emergency department building (Avera McKennan Hospital);
- Increase revenue from surgical procedures (Ohio Health Hospital) and savings, invested then in improving healthcare through improvement workshops (Park Nicollet Health Services Hospital).

The standards were developed in close cooperation with representatives of the medical community, and their final version was reviewed and approved by the National Consultant for Neurology. In the opinion of Polish scientists dealing with the application of the lean management concept in healthcare, the project under which the analyzed standards were created was very important for the Polish healthcare system [27].

The adaptation of the presented method described in the standards may prove to be very useful from a technological, organizational and economic point of view, in a very wide and diverse range of medical procedures.

The main goal of the described standards was to achieve effects in various areas of treatment and functioning of healthcare facilities. There are mainly four types of effects [6]:

- Procedural, directly related to the medical procedure (in this case, it concerns the treatment of patients with ischemic stroke).
- Medical (technological), related to learning about the shortcomings of medical procedures.
- Organizational, related to the organization of the full process of preparation for treatment, treatment and rehabilitation stage.
- Economic, related to alternative methods of treatment from the point of view of costs and time savings, expressed in the form of costs.

The article shows that the described VSM standards can support logistics processes in the treatment of patients with ischemic stroke, where time saving is particularly important as it increases the chance of returning to the patient's normal life and reversing the effects of the stroke. The standards can be also implemented in treatment of patients with other diseases. The scope of application of the standards in healthcare can be very wide. It results from the high adaptability of the method, expressed on three levels [6]:

- Process, expressed in terms of different configurations of nodes with variable (flexible) time and cost parameters;
- Technological, expressed in terms of different levels of permissible deviations of individual structural elements of medical processes;
- Organizational, expressed through various adaptation activities at different structural points of the organization of the holistic treatment process.

Thanks to the above-mentioned objectives, the adaptation of the presented method described in these standards may prove to be very useful from many points of view in a very wide and diverse range of medical procedures, because a standard is a tool that allows for replicating an effective remedy for anyone who acts in similar circumstances [28].

The use of the developed standards is also associated with the introduction of changes in the health care facility, which is a complex issue not only from the organizational point of view, but also for psychological and sociological reasons, which were not the subject of research discussed in the whole project. Particularly important are the changes that transform the organizational situation of an individual and a team into an innovative situation, very often interpreted as disruptive and threatening to the individual. Reference visits to hospitals allowed us to observe scientifically interesting problems and phenomena that may become the subject of further research, which is a

continuation of this project. The presented standards were used in a few Polish hospitals and can be an important tool supporting logistics processes in the whole healthcare sector.

The application of the lean management concept in the Polish healthcare system needs to be popularized, because despite numerous foreign examples of its use in order to eliminate waste and maximize the savings of resources and the quality of services provided, in Poland it is still a new issue that is used by only a few medical units or hospitals.

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