

Performant Management Through The Introduction of The Lean Six Sigma Methodology in the Hospitals In Romania Case Study Municipal Emergency Hospital Moinesti

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Abstract: The purpose of this paper is to present the results that can be obtained by implementing the Lean Six Sigma methodology in the health system of our country. The results are also supported by the case study regarding the implementation of Lean Six Sigma techniques in a public hospital with good performances, nationally recognized: The Municipal Emergency Hospital Moinesti. These strategies, which include Lean and Six Sigma methods, aim to implement process improvements through a set of principles and practices that promote greater efficiency and effectiveness, with fewer errors. The main motivation for the thematic research is due to the fact that the Romanian health system has notable deficiencies which, despite the many positive changes in our country in general, in the health system, in particular, the progress is expected. From previous studies in clinics in the US and Europe we have found that there is a methodology that puts patients and their needs first, by reducing and avoiding waste, as well as streamlining and organizing medical services, so that they can meet patients' expectations. The present paper is based on both a secondary research and the actual carrying out of a case study, extended at the experiment level. The results of this paper show that the medical organization has a greater capacity to respond to challenges within the system, the use of resources has been maximized. There has been an increase in the satisfaction of the patients but also of the doctors, with the elimination or reduction of some costs. The application of the Lean Six Sigma concept in healthcare is a new topic and few researches have been carried out in this field, this work can be useful to the entities that carry out their activity in this area of utmost importance, who want to increase their level and quality. the services offered.

Keywords: Management, Lean Six Sigma, Hospital, Health.

JEL Classification: M12, M14, M54

Introduction

In recent years in Europe, various management strategies have been developed to improve the performance of hospitals, in particular by improving the processes through which they operate (Toma, S.-G., Marinescu, P., Constantin, I., 2018). These strategies, which include Lean and Six Sigma, aim to implement process improvements through a set of principles and practices that promote greater efficiency and effectiveness, with fewer bad practices or errors (Marinescu, P., Toma, S.-G., 2008). Due to their initial application in manufacturing industries, these process improvement strategies could also be adapted for other areas such as: construction, software development, financial services, healthcare, laboratory sciences, etc (Toma, S.-G., Marinescu, P., 2013). Healthcare in public hospitals is an industry, like many in the health field, which must operate at peak performance at all times. When you use Six Sigma Training in other industries, increased profit or business success is usually the goal (Toma, S.-G., Marinescu, P., 2018). However, in the healthcare industry, especially in hospital care, the Six Sigma process has gotten harder. Regardless of whether you are directly dealing with patient problems, or the efficiency processes, everything revolves around better performance in relation to patient care.

Improving the level of patient satisfaction is very important for the long-term success of a medical organization (Toma, S.-G., Marinescu, P., 2012). To improve patient satisfaction, healthcare providers must focus on strategies to improve equality. That is, health professionals must demonstrate quality in line with organizational culture. The following attributes have been identified for a quality health system: (1) safe, (2) efficient, (3)

patient-centred, (4) timely, (5) effective. In a study presented in Brussels in January 2015, Romania is ranked 35th in the European Index of healthcare systems with a total number of only 453 points (out of 1000 possible points). This result was mainly generated by the old medical equipment, limited access to medical services for some citizens, but also by the low quality of the management of the players in the health system. Thus, with Romania's accession to the European Union, the Romanian healthcare system has been more closely monitored by the other member countries. Clinics and hospitals are becoming increasingly criticized for the many deficiencies identified. Unfortunately, the health system in Romania is not yet able to cover the shortfall in terms of accessibility to medical services, the constant migration of medical staff, old equipment, lack of medical staff, etc. The Romanian health system treats millions of people every year, at the same time, saving lives in most cases. However, financial, social and economic disputes appear constantly, putting the healthcare system in a bad light.

Over the years, various innovations have tried to save the medical system from collapse. Before 1989, the medical system was guided by bureaucracy, so that after the revolution, they changed their way, applying different rules, more or less agreed by the consumers. Even if there are deficiencies in the services market in Romania, the health care system must be "refreshed" so that it can be aligned with the European health systems. An important step in achieving the modernization of the Romanian medical system would be by improving the quality of medical care.

To achieve this goal, we propose actions such as:

- reducing bureaucracy;
- decrease of medical fraud (especially financial fraud);
- equal access to medical services;
- avoiding / diminishing the migration process of medical personnel;
- providing modern medical equipment to clinics and hospitals;
- improving the quality of medical processes;
- disposal of any type of waste (time, movement, financial resources, etc.).

Once these first requirements are met, the Romanian healthcare system could achieve the alignment (in qualitative terms) with the European health systems. But in order to address these criteria, the involvement of the government and the medical staff is mandatory (Toma, S.-G., Marinescu, P., 2015).

What is Lean?

Lean (also known as Lean Production, Lean Enterprise and Lean Thinking) involves a set of principles, practices and methods for process design, improvement and management. Lean development is attributed to Taiichi Ohno's articulation of Toyota's production system. Ohno aims to improve efficiency by eliminating certain types of waste (called muda, in Japanese) that absorb time and resources, but add no value (Ohno, 1988). Lean & Six Sigma are tools that are increasingly being used by hospitals around the world to increase patient satisfaction, along with reducing costs and improving hospital performance. Given the challenges of health care, rising costs, increasing workload, complex regulatory environment and labour shortage in key areas, it is obvious

that there are errors and wasted activities in almost all processes (Toma, S.-G., Marinescu, P., Grădinaru, C., 2018) (Womack J, Jones D., 1996). The Lean Six Sigma methodologies help us to cope with the double pressures of cost reduction, as well as maintaining high levels of quality assistance, offering practical tools for process improvement (Marinescu, P., Toma, S.-G., 2008). A Lean process reflects the goal of continuous waste reduction and improving the workflow to effectively produce a product or service that is considered to be of great value to those who use it. Lean implementation involves systematic evaluation and analysis of the process. The preliminary stages of the Lean evaluation include "mapping the value stream" in which key persons, resources, activities and information flows needed to provide a product or service are made explicit and graphically rendered. The value flow map is a key tool for identifying opportunities for waste reduction and for closer integration of process steps, thus improving process efficiency (Toma, S.-G., Marinescu, P., Grădinaru, C., 2018).

What is Six Sigma?

Six Sigma, like Lean, is a business management strategy used to improve the quality and efficiency of operational processes (Jimmerson C, Weber D, Sobek DK, 2005). While Lean focuses on identifying ways to streamline processes and reduce errors, Six Sigma primarily aims to make the process more uniform and accurate by applying statistical methods, Six Sigma was initially developed by Motorola's Bill Smith in 1986 as a way to eliminate manufacturing defects, where it is understood that a defect is a product or process that does not meet the

expectations and requirements of customers. The name Six Sigma refers to a quality level defined as the near perfect defect rate of 3-4 defects per million products or cases (Jones D, Mitchell A., 2006). A variety of systematic methodologies for identifying, evaluating and improving processes have been developed as part of the Six Sigma approach. The Six Sigma improvement model comprises: definition, measurement, analysis, improvement and control (DMAIC). This involves observing the following steps for understanding and improving a process: 1) defining the project objectives and the client's requirements (internal and external); 2) measuring the process to determine the current performance; 3) analysis and determination of the main cause (s) of the relevant defects; 4) process improvement by eliminating root causes of defects and 5) controlling the future performance of the process. Another Six Sigma methodology, called Design for Six Sigma (DFSS), is used to systematically design new products and services that meet customer expectations and meet Six Sigma quality conditions. This concept involves training and certification of specialists in designated processes and flows (called black belts, green belts or other similar titles) within organizations. Various combinations of Lean and Six Sigma techniques have been developed over the years, which are frequently described as a single Lean Six Sigma approach. These variants are just two of the many approaches that are used for systematic analysis and improvement of process flow and efficiency in the industry. Other similar approaches include Business Process Modelling (BPM), Business Process Reengineering (BPR) and Workflow Mapping (WM). Another variety of techniques can be found in TQM and CQI

oriented, such as Kaizen, Shewhart Cycles (PDCA) and different management accounting systems.

Applying Lean and Six Sigma in healthcare

De Koning et al. describe several applications of an integrated Lean Six Sigma approach, established in a Dutch hospital that has reduced the complexity of employing part-time clinical staff, optimizing the operating room programming by designing a new pre-surgical hospitalization process and the development of a new system of work planning for the rapid completion of equipment maintenance requests (De Koning H, Verver JPS, den Heuvel J, et al., 2006). Other successful applications of Lean and Six Sigma have been reported in many other areas of healthcare.

Lean - Seven Waste - how it applies to hospitals.

Waste is anything that does not add value to a product or service in the office, department, laboratory, etc. In the context of healthcare, value is defined as the provision of services / satisfaction for clients / patients, any activity that does not contribute to it is classified as waste. The principle of the 7 wastes can help to improve healthcare, allowing the staff to examine their own jobs and eliminate wasteful activity. This enhances the patient experience, giving staff working with patients more time to raise the quality of services. Since waste is a symptom rather than the root cause of the problem, it indicates problems within the system or organization.

The 7 wastes are defined and can be translated into a healthcare context as follows:

1. **Overproduction** - performing a "just-in-house" activity and / or in a lot. This also contributes to the constraint of the patient's steps by feeding the wrong work or the wrong size of the lot. Examples include requesting tests and referrals to outpatients "just in case".

2. **Inventory** - refers to materials, but can be translated as patient. Inventory retention works against quality and efficiency, which makes it difficult to identify problems. Examples include the use of beds for inpatients for patients who are awaiting tests, but may be safely discharged or ordering excess materials because the supply is not reliable.

3. **Waiting** - refers to waiting for a patient or material, instead of moving at the pace of customer demand. The wait may be the result of a variation of the process (the dice game will illustrate this). Examples are waiting in queues for operation, waiting for tests or preparing all the equipment in the operating list.

4. **Transportation** - any movement of a patient or material is wasteful. Although transport cannot be completely eliminated, its reduction should be attempted, especially in terms of time. When the steps of the process are located side by side, they are easier to visualize, to identify and to solve. Examples include moving the patient to an inpatient bed to be reviewed at the post-operative round and then to another outpatient unit, moving the patient for tests or to see the physiotherapist.

5. **Defects** - a defect that is passed through the process can escalate the impact of the initial defect. The goal is to have zero defects.

6. **Personnel movement** - unnecessary movement in the workplace refers to the appearance and organization. How far is it traveling to get to a computer, to enter download information? Is there a better way to minimize wasted time?

7. **Useless processing** - using complex equipment to perform simple tasks. Often, the equipment is large and inflexible, a robot in the pharmacy. Although it may take several hours for a patient to receive the prescription, the task of disposing of it takes several seconds.

Lean Six Sigma methodologies can be applied to any process in the hospital (Sewail L, DeToung C., 2003). Some of the most common areas are:

- Reduction of patient rotating time in OPD / Radiology / Laboratories.
- Increased adherence to the OT program
- Reduction of delays in the admission / discharge process
- Efficient management of materials
- Reduction of falls in geriatric and orthopaedic patients
- Simplification of the emergency flow process
- Reduction of billing errors
- Improving the performance of cases from day hospitalization;
- Improving the accuracy of clinical coding;
- Reduction of errors caused by high risk medication;
- Reduction of errors in ordering and administering drugs;
- Improving the active management of personnel costs;
- Increased productivity of medical

staff;

- Increased accuracy of laboratory results;
- Improving the availability of the bed in various departments of hospitals;
- Reducing the number of postoperative wound infections and wound related problems;
- Improving the scheduling of MRI exams;
- Improved return time for pharmacy orders;
- Improve the recruitment of the nurse or the technician;
- Increased surgical capacity;
- Improving the accuracy of patient registration;
- Improve employee retention.

Case study: Implementation of the Lean Six Sigma methodology as a pilot project in the Moinesti Emergency Municipal Hospital

Starting from a real example, namely the pilot project within the Moinesti Emergency Municipal Hospital, we analysed how to implement the Lean Six Sigma methodology in the hospitals in Romania. Lean Thinking integration means speed, a better approach to processes by eliminating waste, statistical thinking (Marinescu, P., Toma, S.-G., 2008). This involves data collection and processing for understanding, process and variation in processes, application, definition of objectives. The first and most important challenge is the initial investment in the training system of the Lean Six Sigma system, the absence or difficulty of obtaining baseline data on process performance, real-time analysis at the same time as the healthcare process

(Chassin, 1998). For the healthcare industry, identifying processes that can be measured in terms of defects or errors per million opportunities is often a struggle (Lanham B, Maxson-Cooper P., 2003). Another barrier to implementing the Lean Six Sigma methodology in the healthcare industry is the psychology of the workforce (Marinescu, P., Toma, S.-G., Constantin, I., 2016). Last but not least, it is important to present recommendations by harmonizing the medical language, the business language and the statistical language (Toma, S.-G., Marinescu, P., Grădinaru, C., 2016).

In this paper, the following five experiments were analysed which can contribute to the improvement of processes and the elimination of waste from the hospital as a result of the implementation of the Lean Six Sigma concept:

- (1) Reduction of unnecessary laboratory tests
- (2) Improving the quality of the image by magnetic resonance imaging (MR)
- (3) Decreased waiting time before surgery
- (4) Reduction of catheter infections
- (5) Decreased over-stay in hospitals.

Experiment 1: Decreasing unnecessary laboratory tests.

Many blood and urine tests required in the paediatric and obstetrics-gynaecology departments need to be repeated because of procedural errors. The result is the delay in getting the final results to the doctor and unnecessary costs to recover the tests. Although human error is an important cause in most cases, there may be other important factors that need to be identified. These

include complexity, exhaustion, distraction, and inadequate supervision by senior staff. A quality improvement team was formed to analyse the process. The first part of the analysis included an examination of the current process, starting with the coordination of a laboratory test by a doctor until the results were reported to the doctor. Once the process was displayed, the team developed a graphical chart to conclude on the possible reasons for the errors. This was followed by data collection to measure the frequency of the type of actual errors. The team focused on potential errors related to personnel actions, equipment problems, and systematic impediments to the process to minimize errors. Therefore, two categories of problems were examined by the team: those related to sample collection, transport and storage of samples. For the development of standards and methods for improving blood collection, practical simulations of sample collection, transport and storage of samples were carried out, followed by an examination and discussion of the team with the assistants and technicians responsible for these activities. Following the analysis of the entire process, the principles of efficient management that will lead to cost savings were drawn and accepted.

Experiment 2: Improving the quality of the MRI image.

Many imaging technologies are introduced to the healthcare market every year. These changes ensure enhanced image quality and provide specialist diagnostic doctors to treat patients more precisely. However, this is generally achieved only with considerable additional expenses. Cost management and medical management design is required.

Lean Six Sigma tools can be used to optimize radiology design protocols in diagnostic imaging. Of course, there is always the risk of variation, because reading and interpreting can change from one person to another, but through superior imaging techniques, this problem can be overcome. The quality of the MRI image depends on many parameters, such as the technical variables, the processing conditions, the calibration of the equipment, the performance of the specialist interpreting the images. Thus, the performance in the imagistic interpretation of the specialist is of utmost importance and must be improved by training. The other parameters should be improved by providing training to the technician and ensuring the maintenance of MRI equipment when required.

Experiment 3: Decreased waiting time before surgery.

Often, patients experience dissatisfaction while waiting for surgery. From the hospital's point of view, this led to loss of resources, increased costs and additional risk to the patient. As for the patients, they complain that their time was wasted and added that there was a major inconvenience for their family. Furthermore, prolonged surgery involved additional stress. A quality improvement team was formed to identify possible nodes in the process where there could have been a significant delay. The team developed a picture of the process by which patients were admitted to the hospital for surgical intervention. Following this, the team developed a diagram to track why time could be wasted at these points during the process. The data is collected by modifying the medical record so that the possible delays

in surgery and the reasons for the delay are mentioned. It was found that the substantial delay is due to the laboratory tests to be taken into consideration before the intervention but also to the availability of another mandatory EKG (Electrocardiogram) investigation.

Experiment 4: Reduction of catheter infection.

Catheter infection is one of the serious problems that patients face after surgery. In order to carry out this project, patients with catheter infections were identified through the nurses and doctors by reviewing a dedicated documentation kept in all hospital sectors and by direct observation of the patients. Thus, an infection control team was formed. This team organized a series of meetings with key representatives from medicine and surgery, medical staff from both the medical care and critical care units, anaesthesia, treatment, materials management, in order to lead to performance improvement. The necessary information to identify the factors that influence the occurrence of the catheter infections was gathered by this team through evaluation sessions and observations made during the procedures of insertion and maintenance of the catheter. This process led to the development of the chart which highlighted the patient, equipment, medical staff and environment affecting catheter infections. This process was also beneficial in identifying the various needs: the need for staff to understand the nature and severity of the problem; a uniform education program for providers and physicians; selecting the insertion site to reduce the risk of infection; practical antiseptic standards during catheter insertion and replacement; skin antiseptic standardization;

standardization of sterile land and compliance with its use. Such a plan was developed by this team and at the base of this plan is the primary education of the caretaker.

Experiment 5: Decreased number of days of hospitalization.

Medical errors and adverse events in medical organizations are generally the most common and can be avoided. In addition to their ability to harm patients, increase the length of stay in the hospital, they greatly aggravate the financial difficulties of healthcare organizations through unnecessary cost increases. Thus, in this field, many patients were waiting in the inpatient ward to be placed in a treatment unit. To analyse where the blockage was, a quality improvement team was formed that identified possible nodes in the hospitalization process that could contribute to significant delays, the team developed a flow chart to optimize the movement of patients to the hospital (King DL, Ben-Tovim DI, Bassham J. , 2006). The team established that the excessive length of hospital stay was largely influenced by the discharge planning process. The weak link was the critical bridge between the treatment received by the patient in the hospital and the post-discharge care provided by the community. Thus, the team has prepared an efficient outpatient planning to allow easy transfer from hospital to home, producing better outcomes for the patient and reducing the likelihood of re-hospitalization.

Conclusions.

The healthcare industry is still in the early stages of evolution in terms of introducing the Lean Six Sigma methodology.

Therefore, medical staff should seek guidance for training and implementation with management support. Successful execution of simple projects in hospitals can enable practitioners to acquire stronger initiatives in the future and to create large-scale clinical changes. The introduction of the Lean Six Sigma culture in medical-specific organizations can be achieved through commitment and management involvement. Thus, the positive effects can be multiplied, having a considerable impact at all levels. A high level of internal communication is also needed to facilitate the implementation of Lean Six Sigma. The established quality improvement team should work with external quality facilitators, who can train them to implement the training and training systems required for all projects involved in system implementation, project management and use of quality tools. In addition, it also has an impact in clinical areas, such as infection control and drug

delivery, lack of financial resources, lack of human resources, lack of time, poor training and internal resistance. The authors believe that implementing the Lean Six Sigma concept as a business strategy allows the health care sector to provide a truly high-class service for patients. Lean Six Sigma is a methodology for eliminating any type of waste, to reduce variability and streamline processes. With the help of numerous tools proposed by Lean Six Sigma, we consider that, by applying them, the health system in Romania can solve some of the existing problems and offer medical services to patients with a high degree of quality. The real impact that Lean Six Sigma, if we focus on the basic issues of health care and improving the quality of life of patients, may be surprising. According to the authors, the application of Lean Six Sigma in the healthcare industry in Romania will expand in the next five years.

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