Lean Management implementation in medical environment and training importance

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Abstract: *As a stronger orientation towards the services providers, in the last three decades Lean Management offered viable solutions also in the medical field as a strategy to improve performance and reduce losses, streamlining the overall activity. Reduction of patient waiting time, improvement of patient flow time, reduced walking distance, reduced required space, optimization of resources usage, reduced inventories, increasing safety, increased productivity and reduced human errors are important effects of Lean Management introduction in the medical field. In the current challenging conditions, as a manager of a medical unit, hospital, clinic, or private medical office it's extremely important to implement the best practice in the field.*

The paper develops the subject of Lean Management implementation in the medical environment, highlighting the training importance in this process and outlining the main features to ensure an adequate Lean training, considering the studied literature and our experience after providing Lean training in a Romanian histopathology laboratory.

Keywords: *Lean management; training; clinics; medical staff; continuous improvement; outsourcing; healthcare.*

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1. Introduction

Lean Management is a philosophy and management concept based on reduction of the waste and resources used in the process of producing goods and providing services (Parkes, 2015).

As Lean Management is gathering more popularity worldwide, especially in healthcare, we were interested in finding out how important the training is in the process of Lean implementation as well as which are the main features of a Lean training.

Lean Management originated from the Toyota Production System, which is considered to be the secret to the top competitive position of Toyota company, a secret that has been investigated in "The Machine That Changed the World" book, published at the beginning `90`s.

The Toyota Production System (TPS) is a production organization method and a managerial approach that is based on the principle of "producing more with less resources" and on continuous improvement (called in Japanese "Kaizen") of production with the total quality objective, but also with development through innovation and diversification. The difference between a classic company and a TPS-focused one, is firstly given by the attention of the last one on the reduction of the activities which don`t create added value to the product, capitalizing instead all those which create value and meet customer requirements.

Toyota's principles born in the manufacturing industry were soon adapted and introduced in the service environment: healthcare, public administration, education, finance and so on and proved to reach positive results.

Lean Management is focusing on waste reduction. Waste is considered any use of resources which does not add value to the requested customer product. Any creation of value involves a creation of waste. All activities of lean management are directed to reduce waste.

Seven types of waste were defined by Taiichi Ohno, the father of TPS, that accompany the value creation. However, later, another type of waste has been added to Ohno's original list by other authors: the "underutilized people" (Natasya et al., 2013), in other words, unused employee's potential. The defined 8 types of waste are:

1. Defects - efforts caused by rework, scrap, defective products of incorrect information;
2. Over-production – production of more than needed of before it's needed;
3. Waiting time – wasted time, time used for not creating value;
4. Non-utilized talent – underutilizing people's skills, knowledge and talents;
5. Transportation – unnecessary transportation/movement of products and materials;

6. Inventory – excess materials, products that are not being processed;
7. Motion – unnecessary movements of people, including walking;
8. Extra-processing – more work or higher quality than is required by the customer, providing extra services which are not required.

In healthcare all eight types of waste are present. Some examples are presented below:

1. Defects – wrong diagnosis, wrong treatment, wrong labeling, mixed analysis;
2. Over-production – ordering medication patients don't need, providing services which does not add value to the patients;
3. Waiting time – patients waiting to be hospitalized, to be registered into the computer system, to receive treatment or care, to receive the test results; time to find a lost equipment or medication, waiting for information, any interruption and blockages;
4. Non-utilized talent – loss of talent, competences, skills, ideas and knowledge; paying extra for a service which can be done by an employee; hiding the problems, loss of learning opportunities;
5. Transportation – any movement of patients, samples, equipment, medication or materials which is not necessary; distant locations;
6. Inventory – ordering too much medication, expired medication, anything which is in too large quantities, too much printed forms;
7. Motion – unnecessary walking, accompanying patients, traveling to get results which can be visualized online;
8. Extra-processing – requesting and performing unnecessary diagnostic procedures; too much bureaucracy; requesting information which is never used.

2. Lean implementation in healthcare

2.1. Importance of Lean training in healthcare

Due to the increase of population, as well as of life expectancy, the demand for health services increased exponentially. The culture of health consumerism leads to an increase in performance demand. Doctors are asked for greater specialization and their use is more intensive. On the other hand, nurses are asked for greater decision-making responsibility and organizational capacity. The one who is not specialized in new organizational techniques is starting to lack operational space and time. There is a need

for professional upgrading, but the upgrading is no longer periodically as in the past, it has become continuous now.

Two organizational shortcomings merge out of the described concepts:

- The need for a new vision in training management, to keep controlling the drive chain of services provision. Here is where the fluidity of the provided services puts the credibility of the healthcare system into play;
- The need for clinics and hospitals that address health production in terms of efficiency (identify and reduce waste with techniques successfully tested by the manufacturing industry).

There are issues in medical field that need to be studied:

- The lack of waste vs. value concepts in our hospitals;
- The concepts of quality and improvement are seen as a technological improvement, rather than a provision of service without errors and wasted time;
- The medical services are provided separately, without a synergistic approach;
- The medical operational staff don't have the role of improving the service provision.
- The organizational variability of the demand is not considered bad characteristic to address to improve the daily activities tasks, but an alibi to ask for more resources.

Considering the listed above issues, the need for a Lean training is imperative. Lean training is aimed to increase the level of awareness of the medical staff towards efficiency, efficacy, waste reduction, value increase, continuous improvement, service quality, towards their role in improving the quality and efficiency of the healthcare service providing, as well as to update the specialists about the best practice in the field.

The approach solution, to the revealed issues, starts with a training plan in Lean management methodology, as the medical professionals are not familiar with the specific terminology and concepts to apply. An organizational change starts easier with a targeted and well-planned training.

2.2. Virginia Mason Medical Center – an example of Lean good practice

Lean application in the healthcare environment has been increasingly adopted in the last 20 years. Accordingly, Lean healthcare has been developing into a major strand of research since the early 2000s (D'Andreamatteo et al., 2015).

An example of good practice, with almost 20 years in Lean healthcare, is known as Virginia Mason Production System (VMPS).

Virginia Mason Medical Center (VMMC) is a private non-profit organization, located in Seattle, Washington, United States of America, founded in 1920. In 2002 VMMC started the ambitious journey towards Toyota production system, integrating it into the management system to eliminate waste in performing work.

Virginia Mason Medical Center in Seattle used health plans to facilitate development of standardized procedures for patient care in common conditions. These efforts have eliminated unnecessary treatment and decreased costs to employers, health plans, patients, and providers (Blackmore et al., 2011).

A major system effort was involved. By applying Toyota principles, VMPS succeeded to decrease the staff walking distances within the medical center by 38%, reduce travel distances of parts by 77%, decrease lead time by 53%, cut inventory in half, increase productivity by 44% and saving costs in budgeted capital of around $12-$15 million (www.colleaga.org).

The implementation of Lean Management principles through a self-developed system has insured to Virginia Manson Medical Center from Seattle, USA, a respectable position in the top 1% of all hospitals in the U.S. in terms of both quality of patient care and system efficiency, with numerous examples of achieved improvements (Kovacevic et al., 2016).

2.3. A review on Lean training approach in healthcare environment

Lean management in healthcare organizations attempts to empower staff to generate continuous improvement through incremental but regular improvements in work processes (Ahn et al., 2021). But Lean cannot be implemented without being trained first, as it has a specific terminology and instrumentation.

We performed a review on Lean training approach in healthcare, including also Lean Six Sigma technique. Lean Six Sigma was considered by us to have a valuable input too, as it combines the “lean” emphasis on waste reduction with the “six sigma” emphasis on quality improvement as the means to increase efficiency and reduce cost in all processes (Bloj et al., 2020). Furthermore, both philosophies are used as management tools to improve performance and both of them require training before being introduced.

We selected recent articles, published in the last 5 years on Web of Science, studied them, identified those which describe the Lean and the Lean Six Sigma implementation steps and selected the ones which refer to the training for the medical staff. The most relevant aspects of the Lean training are described below.

According to a survey conducted among 72 respondents from the medical laboratory field, adequate training was found the strongest enabler of Lean principles application in medical laboratories (Isack et al., 2018). The lack of training represents a major barrier.

Vaishnavi V. and Suresh M. (2020) consider training and learning the most important factors for the successful execution of Lean Six Sigma in healthcare organizations. They help to solve problems, take preventive measures, clarify doubts, carry out the process easily, learn and implement a new technology in health, increase performance of used techniques, reduce fear among employees, which leads to work commitment.

As described in the study of Ahmed et al. (2018), the training in process improvement tools provided by the hospital was perceived by its staff as a method to improve their skills.

An unexpected advantage was noticed by Leggat et al. (2017), who noticed that the Lean training provided useful tools that could help counter management limited skills.

The course theme is usually adapted according to the environment in which the Lean principles are applied. Studies highlight different approaches:

- Training programs covered concepts, definitions, used techniques, examples of lean management in health institutions, involved ideas exchange and a Q&A session (Durur and Akbulut, 2017).
- The hospital conducted a training program on 5S, quality improvement techniques, benefits of Lean implementation, but also on the importance of participants' contribution for the study, the importance of their work for the system efficiency and patient satisfaction (Gupta et al., 2018).
- Educational process involved meetings, working group sessions, working on tasks (Prado-Prado et al., 2020).
- Combined face-to-face and online training was carried out by an external private training company (Radcliffe et al., 2020).
- Lean activities were built into the trainees' clinic rotations: an 8-hour Lean training, assigned Standardized Work Observations, protected time for the weekly board meeting, and mini-improvement projects with nurses and clerks (Wu et al., 2019).

Some challenges presented in specialty literature must be highlighted about Lean trainings:

- Training process was criticized by some participants, as it did not address the healthcare field and it seemed to reinforce a division between clinicians and managers (Radcliffe et al., 2020).
- As the training was not adapted to healthcare context, it caused misunderstandings and negative perceptions of Lean. Initial implementation efforts failed, the messaging and language of externals triggered mechanisms of innovation fatigue, poor

'sensemaking' and a lack of engagement for frontline staff. Training nature, approach and resources used are critical to change (Flynn et al., 2019).

- Participants perceived Lean as a management system largely focused on cost-cutting (Udod et al., 2019).

Thus, it's extremely important that the training is adapted to the activity specificity of different groups of medical staff, as a key for the people's involvement.

Sreedharan et al. (2019) are calling attention r to the need for awareness and training in quality excellence, supporting the idea of Panizzolo et al. (2012), which consider training important in awareness creation for changing people's mindset from the traditional ways of working toward building a quality excellence culture.

On the other hand, according to Fine et al. (2009), healthcare leaders are facing challenges when aiming to implement a Lean culture, such as engaging physicians and making the Lean initiative sustainable (Ingelsson et al., 2020).

A distinct element to approach this issue was noticed in the research of Gupta et al. The authors mention that the hospital staff was assured that the Lean implementation shall neither threaten their jobs nor will be a measure of their efficiency (Gupta et al., 2018). This ensures a relaxed environment, which encourages involvement towards the continuous improvement culture.

3. Outsourcing training services in lean healthcare. A case study

3.1. Outsourcing Lean training in healthcare

In healthcare, the training of Lean Management and Lean Six Sigma is usually outsourced. This happens mainly because Lean needs to be implemented as a systemic approach, well known by professionals. Externals bring their expertise, a new way of work and understanding, which are all elements needed to improve results and implement changes.

Involving an external team can bring lots of advantages:

- Mitigate risks;
- Adapt to quick changes without compromising internal resources (Guimarães and De Carvalho, 2012);
- Get an objective view on the actual processes;
- Access expertise in Lean implementation;
- Better conflict management;

- Reduce costs;
- Reduce waste and non-value adding activities;
- Find out-of-the-box solutions;
- Eliminate existing waste;
- Improve flexibility;
- Better focus on results attainment etc.

Outsourcing serves lean thinking, as it is a strategic decision to improve performance in the value chain by focusing on what the organization does best and omitting redundant activities or activities that require less expertise to experts in that area (Guimarães and De Carvalho, 2013).

Some disadvantages may involve: increased workload; outsourcing generates costs; requires understanding of the specific medical field etc.

Sreedharan et al. (2019) found out that there is not a single standard training module that exists in any of the sampled firms to cater to their quality programs and propose a structured Lean Six Sigma training framework. They mention 4 categories of information to be included in a Lean Six Sigma training:

- Awareness and the individual's role;
- Strategic goals and the management's role;
- Deployment;
- Benefits.

3.2. Providing Lean training in a histopathology laboratory – main learnings

We introduced Lean training in the histopathology laboratory of a public Romanian hospital with the aim to increase awareness on the importance of Lean Management principles in the medical field. Our main hypothesis was that once employees receive knowledge and become aware of the efficiency benefits, they will not turn back to the old way of thinking and acting.

The training was ensured free of charge by collaborators from the local university with the aim to introduce a Lean pilot project.

The training was planned and aligned together with the laboratory manager, being scheduled for the regular weekly meeting. 87.5% of employees, including doctors, nurses, autopsies, recorders and caregivers participated in the training. The training was

held in one single session of two hours, which was followed by a 5S site and the addition of posters and Lean visual management tools.

The training material was created especially for the healthcare environment and adapted to laboratory specific. It included an introduction to Lean Management, basic tools, examples of good practices in the healthcare environment, the concepts of Value, Waste and Flow, the types of waste and concrete examples of them in the laboratory field, 5S tool and its steps, examples of 5S implementation in laboratories.

The 2-hour training was followed by a Q&A session, to check employees' understanding and offer more clarity. The training marked the beginning of a 3-month Lean implementation project, which results are described in our previous research (Veres et al., 2020).

Some aspects related to the training may be concluded after experiencing the Lean tools implementation in clinical laboratory environment:

- Each Lean or Lean Six Sigma project must start with adequate training. Adequate training and learning are required to use tools and techniques in an effective way (Iyede et al., 2018).
- To ease understanding, the training material should address the specific of the health institution / department.
- The training helps medical employees to gain knowledge on tools, benefits, resources for a Lean application and prepares them for the upcoming project.
- The training makes the medical staff aware of the generated waste and one session is enough for them to already identify and mention the types of waste at their workplaces.
- People show resistance to change. The objectives of the training should be explained and detailed to participants. As mentioned previously, it's important to also make them understand that the future Lean project shall neither threaten their jobs but contribute to improving results and expanding their knowledge.
- Right from the beginning people should be explained the important individual role they have for overall system efficiency and for patient satisfaction.
- Hospital management commitment and support should be ensured.
- People should be encouraged to address questions and give feedback.

Even though ensuring adequate training requires preparation, the invested time will pay off. After introducing only 1 session of external training on Lean Management in the pathology laboratory, the medical staff became aware of the 8 types of waste, they were able to immediately identify waste in their environment, some productivity indicators

were explained and introduced, activities which helped improve the process and led to a more efficient and effective work. Shortly after, visual management tools were introduced to ensure continuity of the improvement project.

During the 11 months project we reached several qualitative improvements: reexamination and reinforcement of procedures, improvement of data collection and data representation, elaboration of records and introduction of electronic registers, introduction of working procedures, elaboration of a complete map of the functional circuits (of samples, waste, personnel and documents), introducing the 5S standard, etc. Several types of waste were reduced such as motion, transportation, and defects due to continuous monitoring of the 5S indicator.

Some quantitative results were monitored and displayed regularly. We focused mainly on the slicing of the samples phase, because it presented the biggest deviation between operators. We found out that 6 operators were working in 2 different ways and the procedure has been standardized. By this, in only 7 months the team average time for performing the slicing phase decreased by 24,4%.

Still, there is an important aspect to mention turning back to our hypothesis: as the pandemic crisis occurred and we were not able to monitor anymore the application of Lean principles in the histopathology laboratory due to limited access in hospitals, things turned back to the old way of working. Visual tools are not used any more, productivity is no longer monitored on the visual panels.

Therefore, some additional conditions are required in the Lean Six Sigma implementation:

The process of Lean education and training should be carried out continuously.

Training and developing leaders to this new way of thinking and behaving takes a multipronged approach (Anderson et al., 2019).

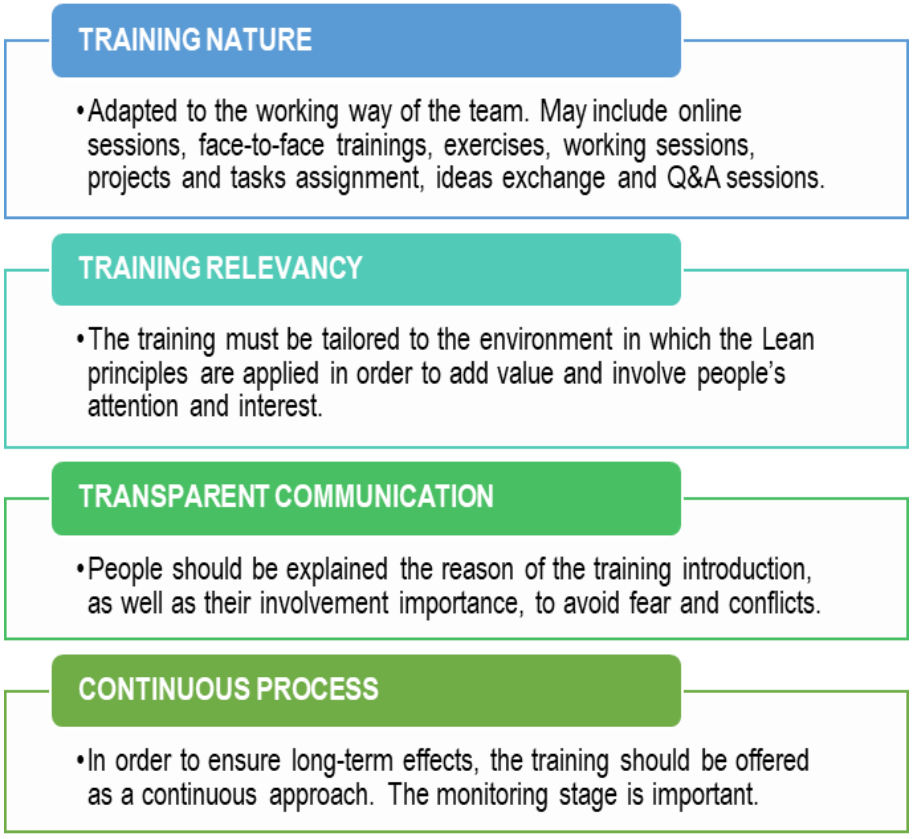
Perseverance and determination is crucial in achieving project success.

4. Conclusions

Training is the strongest enabler and a mandatory component for Lean successful application in medical laboratories. By ensuring adequate training, an institution reduces the risks and conflicts, raises the team's involvement and awareness.

To ensure adequate training we developed a list of the main features to be taken into account, considering the studied literature and our case study, as presented in Figure 1.

Figure 1. Features to ensure adequate Lean training



Source: Created by the authors

Outsourcing the Lean Training brings lots of advantages, but it should be correctly approached. Experienced teams usually highlight the importance of Lean training for the institution, make people understand the need for improvement, support the medical staff, ensure a psychologically "safe" climate for participants, rather than measuring their results. Outsourcing facilitates proper preparation and, with people`s support, a medical institution can increase the added value for the customer, ensuring by this the best quality services.

This article brings value by combining the literature review with an implementation experience to define the main features which should be considered in a Lean training to ensure a successful project start.

In future we would like to expand our knowledge in terms of Lean training and to study if there is any correlation between the impact of Lean projects and the training duration.

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