

IS CZECH HEALTH CARE GOING TO BE LEAN?

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Abstract: *There is a growing interest in applying lean in healthcare. Healthcare services around the world have adopted industrial engineering methods and process improvement methodologies from the manufacturing sector, known as lean production. The aim of this paper is to provide a review of the existing literature on lean healthcare and to publish basic results of survey focused on Czech medical staff's knowledge of lean healthcare philosophy. Focus of this article is not to detail lean principles and concepts. The article explores challenges and opportunities faced by organizations that intend incorporating lean management principles and presents the specific context of the healthcare industry. Though there seems to exist an agreement about the potential of lean healthcare, it remains a challenge for academics and practitioners to evaluate lean healthcare under a more critical perspective. This paper aims to describe how the lean healthcare philosophy has been applied and to assess how trends and methods of approach in lean healthcare have evolved over the years.*

Keywords: *Lean management, Healthcare, Quality, Continuous improvement, Customer value.*

JEL Classification: *I19.*

Introduction

The idea of lean healthcare or lean services is not new. A concept which works well in industry has become a great example of using “best practises” to increase work efficiency. Therefore various attempts have been made since 70s to improve service performance in healthcare sector. Many of new studies talk about costs and non-value added activities reduction, increasing quality, reducing errors and increasing employee motivation and customer satisfaction. Public services all over the world are pressured to increase their efficiency and save money. This trend gives an opportunity to researchers to study this topic in detail and to assess which of the time-proven methods could be used in healthcare to make the health care efficient.

1 Introducing Lean

Lean is a multi-faceted concept that requires organizations to exert effort in several areas simultaneously. The evolution of production systems is tightly linked to the story of Toyota Motor Company (TMC), which initiated the lean manufacturing process. In 1950, the entire Japanese auto industry was producing an annual output equivalent to three days of U.S. car production. Therefore, Eiji Toyoda was sent to the U.S. to study manufacturing methods. Based on his findings and through much iteration, the Toyota Production System (TPS) evolved and provided a tool that made use of innovation and common knowledge. [26]

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evolved and provided a tool that used innovation and common knowledge. [26] Although lean concepts were initially developed to improve car production, a study showed that the lean principles could be applied to virtually any manufacturing system. [29]

The precise date of the first application of lean in healthcare is uncertain. Joseph Juran, who linked manufacturing and the healthcare industry, wrote: "...as the health industry undertakes ... change, it is well advised to take into account the experience of other industries in order to understand what worked and what has not." ... [4]

In minds of many, the health industry is different. This cannot be disclaimed. History, technology and culture of the healthcare industry is completely different. However, the decisive factors in what works and what does not are the managerial processes, which are alike for all industries. [18]

This is the reasoning that allows the lean production principles to be applied in the healthcare industry, despite the principles were originally developed for application in other industries.

2 Why to implement Lean in hospitals?

Lean is a management model that was born in manufacturing and is now taking hold in health care. Focused on patient needs, it uses a bottom-up approach to identify and fix broken systems anywhere in an organization. Lean engages all staff as well as leaders in redesigning processes for greater efficiency and quality. [20]

Healthcare systems are very costly and the inpatient treatment in hospitals is a major part of these costs. The question is, how can greater efficiency be effected without influencing the core business of a hospital - the cure of patients. Through improving the process flow of facility management (FM) processes, savings within these processes and less disturbance of primary processes should be accomplishable. [17]

The main reason for implementing lean methods is the fact that lean leads to less disruptions and therefore to higher stability. According to Dennis, "STABILITY" is the main object of the lean. Archimedes motto: "Give me a place to stand, and I can move the earth", explains the importance of stability either in the production factors (man, machine, material, method) in the case of production or in other areas. Dennis argues that the stability starts with visual management, 5S workplace organization and TPM (Total Productive Maintenance). All of them support standardization and provide point-of-use information that eases decision making. [12]

Implementation of lean in healthcare, particularly in hospitals, should remove duplicate processes and unnecessary procedures and also eliminate disruptions which may cause fatal consequences [21].

2.1 History of implementing Lean in healthcare

Although lean is increasingly prevalent in healthcare, there is only little evidence of a full implementation of lean to the level achieved by Toyota. The literature suggests that healthcare organisations are implementing lean by using simple tools on small projects. Experience from abroad shows that the interpretation of lean concept and industrial engineering methods outside of the industry is a challenge, and its success rests on understanding first that lean is a system, not a toolbox [2].

The reviewed literature shows that speculation about the potential use of “lean” in healthcare first appears in a work published by the NHS Modernisation Agency (2001). In 2002, Bushell and Shelest described a pilot implementation of lean in a mid-sized hospital in the USA. Specifically, the implementation was focused on the improvement of patient flow. This work increased interest about the subject, by claiming that good results were achieved.

The other example of successful implementation of comprehensive lean projects in healthcare institutions is Virginia Mason Medical Center in US. The hospital reported increased profit margins, decrease in deaths and decrease in the number of medication errors. Other reported benefits are an 85% reduction in how long patients wait for lab results, increased productivity by 93 % and lowering inventory costs by \$ 1 million [5].

Afterwards, there have been published several books suggesting implementation guidelines for lean in healthcare (see [3], [10], [32] or [32] for reference). However, it seems that healthcare delivery is still far from achieving the level of excellence of lean applications in manufacturing, such as the Toyota’s “way”. [7]

Hospital facilities are tied very ossified system of laws and health insurance companies are very conservative and do not have enough economically oriented employees who would be interested in reducing costs and improving the efficiency of individual processes. Often hospitals focus more on external conditions such as the right legislation or situation payers – insurance companies. They can not accept the idea of reducing internal costs and support their own equipment and their own staff.

2.2 Wasting

Lean thinking is a philosophy that requires the continuous elimination of waste or non-value-added elements from processes so that customers (or patients in healthcare industry) are given even greater value. These wastes are common in all industries and are not unique to healthcare.

Understanding waste is the most important in Lean thinking. People should realize which processes are wasteful and which add value to the customer – to the patient. "Rather than focusing on cutting personnel and assets, "lean healthcare" looks to improve patient satisfaction through improved actions and processes". [28] Only 5% of activities are Value Adding and 95% of activities are wasteful. [31] Peter Drucker says: "There is nothing so useless as doing efficiently that which should not be done at all." [31]

The pre-defined wasteful activities are described below [8], [1]:

- Overproduction. Producing something in excess, earlier, or faster than the next process needs it. In healthcare it can be e.g. printing clinical reports when they are not needed or reprinting labels “just in case” they are.
- Inventory. The cost of managing a large supply inventory may not be obvious at first glance, however, beside consumption follow-up and space required to store, there is a need to follow expiration dates and to constantly ensure that the items in the inventory are not technologically obsolete. Moreover, it was already shown that the overall cost of smaller and more frequent shipment is lower than a large-volume discount purchases. Example in healthcare system: retaining unnecessary forms or obsolete items or keeping unused supply closets.

- Movement. Moving or seeking patients, equipment, medication or charts unnecessarily far away or walking too far to find other staff members are the main examples of this type of waste. A lot of walking waste can arise from poor layout (or design of the working area).
- Transportation. In healthcare the wasting transportation can be evident when moving patients, lab tests, information, etc.
- Over-processing. There are times when material provided to the customers (patients) mandated by regulations can be confusing. Staff may be taking down unnecessary information from patients on admission, making multiple recordings and logs of data, writing by hand rather than by using a computer etc. Moreover, multiple insurance claim forms (mainly in the US), including ones that are not bills, can confuse the unexperienced “novice”.
- Defects (errors). There are many examples for these defects that can be related to poor labeling of tests, incomplete information in patients’ charts, misfiling or making mistakes in documents that must be corrected later, making mistakes that lead to complaints about service quality, or in instructions provided to referrals.
- Waiting. There is probably not much need to explain why waiting a few hours in line is a wasteful activity, as well as waiting for people to phone back, waiting for equipment to arrive from supplier departments etc.
- Under-utilizing staff. Under-use is not only time-dependent but also involves deeper levels such as not sharing knowledge or not taking advantage of someone’s skill and creativity. Under-use typically shows in hierarchical structures and not using teams.

Standard healthcare systems are not designed to make the process of care flow smoothly. Most are organized around functional departments such as pathology, radiology, radiotherapy etc., in which patients travel from one site to queue up at another. In such systems, a patient can typically spend a day in hospital for only 18 minutes of value-added-time: three minutes for a blood test and five for a radiograph (for example) and then ten minutes spent with a doctor. The focus of lean thinking in healthcare is on improving flow among activities of “core value” to organizations, and on individual patients and their journeys. [1]

Compared to other industries, health care has been slow to identify who the customer really is. Because of the complexity of the health care system, internal customers — physicians, hospitals, insurers, government, payers — have often driven processes. It is critically important that value be defined by the primary customer: the patient.

A perfect process creates precisely the right value for the customer. In a perfect process, every step is valuable (creates value for the customer), capable (produces a good result every time), available (produces the desired output, not just the desired quality, every time), adequate (does not cause delay), flexible, and linked by continuous flow. Failure in any of these dimensions produces some type of waste. [14]

The challenge is to revolutionize our expectations of healthcare: to design a continuous flow of work for clinicians and a seamless experience of care for patients. [1]

2.3 Factors of successful implementation

Authors of case studies focused on applying lean tools to healthcare often points out that the tools or methods would not have led to success on their own. Additional factors are frequently cited as central to the successful implementation. These factors are [23]:

- **Wide-spread involvement.** Any process change within an organization will have multiple stakeholders. Stakeholder involvement in the change effort is cited as a crucial factor to success. In healthcare systems, the typical stakeholders are frontline staff, local management, upper management and medical staff. The involvement of those who are stakeholders extends beyond the local departments to all those who are directly or indirectly influenced by the change. The goal is to provide a clear and consistent vision to guide the program and to help members of the organization to view Lean methods and quality as an integral part of their everyday work.
- **Communication.** This is reported by many authors as critical when implementing a Lean initiative. It is necessary to create an environment in which people feel free and safe to report issues and errors. Forms of communication include for example face-to-face meetings, regular meetings of staff and employees, emails, banners and various forms of visual communication. Several authors also highlight that publicizing the success of Lean projects makes change visible, inspires others within the hospitals and therefore encourages a culture of continuous improvement. [13]
- **Organization Commitment and Support.** This support means providing sufficient resources such as: funding for staff or IT systems, investment in training, development in project management and facilitation of change to support improvement activities. It is important for managers to spend time working with staff to resolve problems and encourage staff to try new ideas. [16]
- **Training.** A few authors specifically stated the importance of senior managers attending special training in the use of Lean tools, so that they are able to teach others how to use them. Authors emphasis that leaders also need to prepare staff for a change. The goal is to help staff understand and accept the reasons for implementing Lean, its benefits and challenges and what exactly Lean means for them personally. Ways of preparation include meetings to explain current situation, initial education of Lean, or Lean awareness workshop. According to several authors, staff preparation time varies from one week to several months. [6],[16]
- **Problem-solving.** Numerous authors highlight the importance of accurately identifying the problem and its root cause. Root cause analyses attempt to identify the source of a problem at a deep enough level that solution will prevent recurrence in the future. Subsequently comes experimenting on possible solutions to verify that the problem was diagnosed correctly. [24]

2.4 Inhibitors to Successful Lean Implementation

An important reason for failure in lean implementation to healthcare is that most organizations revert to old habits without successfully making the transformation to lean thinking and behaviors. [19]

One of the most salient inhibitors for the improvement community is believed to be the adaptation of Lean tools and concepts to a healthcare setting. Most of the existing examples are specific to manufacturing and there is an absence of translation of the manufacturing language for Lean into healthcare. [24]

Authors report that the difficulty is due to the lack of leaders with expertise, and trainees having limited knowledge of basic tools and skills commonly used in manufacturing. Several authors believe that there are still knowledge gaps in how management should facilitate effective lean learning processes and behaviors in hospitals. [19]

Therefore administrators and managers may be unprepared to provide their employees with the learning and experience necessary to develop a lean culture and mindset. Using unfamiliar terminology and examples foreign to the average healthcare worker hampers the acceptance of the methodology. [13],[16]

3 Current situation in selected Czech hospitals

In order to find out what is Czech medical staff's knowledge of lean healthcare philosophy and tools, we created a survey and worked with several not-for-profit Czech hospitals. In evaluating the knowledge, working attitude and behaviors of participants, it is important to use both quantitative and qualitative methods. Quantitative data provides numerical and statistical information, and qualitative data provides the deep narrative on the context. The design of the survey was done using standard instrument design methods. [11]

Main object of our interest was the overall interest of the hospitals staff in lean methods and their attitude to any improvement activities. The basic questions were:

- Is there any difference in perception of lean initiatives of doctors/nurses/paramedical staff? (Does education have any influence?)
- Is interest in improvement activities influenced by length of practise? If so, does practice influence the interest in improvement activities in positive or in negative way?

The quantitative portion for this research comes from a survey of employees (doctors, nurses and paramedical staff) in various not-for-profit hospitals across the Czech Republic. The survey was administrated since October and November 2013. Until now we collected a total of 279 completed surveys. Surveys were distributed to doctors, nurses and paramedical staff in selected state hospitals across the Czech republic (total of 12 hospitals). The basic characteristics are displayed below.

Tab. 1: Basic characteristic of a sample.

		Frequency	Percent (%)
Gender	Male	42	15,05%
	Female	237	84,95%
Age	18 - 29 years	87	31,18%
	30 - 49 years	129	46,24%
	50 and more	63	22,58%
Practice	Less than 5 years	60	21,51%
	5 - 10 years	66	23,66%
	10 and more	153	54,84%
Position	Doctor	42	15,05%
	Nurse	174	62,37%
	Paramedical staff	63	22,58%
Interest in improvement activities (kaizen)	Absolutely interested	30	10,75%
	Maybe interested	135	48,39%
	Not interested	60	21,51%
	Nothing to improve	54	19,35%
Percieved influence on quality	Absolutely influencing	153	54,84%
	Rather influencing	90	32,26%
	Rather not influencing	30	10,75%
	Definitely not influencing	6	2,15%
Percieved rate of wasting	0 - 4 (0 = rarely, 4 = permanently)		
Overproduction	0	15	5,38%
	1	78	27,96%
	2	99	35,48%
	3	54	19,35%
	4	33	11,83%
Wasteful movements	0	25	8,96%
	1	74	26,52%
	2	90	32,26%
	3	57	20,43%
	4	33	11,83%
Defects	0	48	17,20%
	1	93	33,33%
	2	78	27,96%
	3	30	10,75%
	4	30	10,75%

Source: Author

3.1 Results

Below the perceived influence on quality depending on job position in hospital is displayed.

Tab. 2: ANOVA: Perceived influence on quality vs. job position.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	10,4086022	1	10,40860215	21,57887085	0,00000645	3,89249438
Within Groups	88,7526882	184	0,482351566			
Total	99,1612903	185				

Source: Author

According to the results, job position does not have an influence on how hospital employees do perceive their influence on quality of health care. A good message is, that regardless the job position, almost 88% of the participants believe that they can influence the quality of health care directly. If they do realize that, we can suppose that they should be more willing to work on increasing the quality.

It may seem astounding, but based on the results, 91 % of the intervention group participants have never heard about the Lean Healthcare concept. Only 9 % of the participants do know the Lean Healthcare concept, mainly from medical journals or from internet.

We have also asked on what do the participants think the Lean Healthcare is consists in. 62 % participants have no idea about meaning of the Lean healthcare concept. 14 % of the intervention group thinks that Lean Healthcare is focused mainly in cost-saving and waste-reducing activities; 17 % believe that Lean Healthcare consists in increasing work efficiency. Remaining 7 % participant thinks that Lean Healthcare provides only a basic care to patients.

Another good result was given by participants according to their willingness to get involved in improvement activities, which is also not conditional on a job position they have.

Tab. 3: ANOVA: Involvement in improvement activities vs. job position.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1,94086	1	1,94086	5,181279	0,023983346	3,892494
Within Groups	68,92473	184	0,374591			
Total	70,86559	185				

Source: Author

Regarding the improvement activities, we decided to analyze an influence of length of participants' practice on their attitude to improvement activities. As can be seen in the table below, length of practice has an impact on interest in improvement activities.

Tab. 4: ANOVA: Involvement in improvement activities vs. length of practise.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1,209677	1	1,209677	1,590839	0,20880303	3,892494
Within Groups	139,914	184	0,760402			
Total	141,1237	185				

Source: Author

In order to prove the results above we have tested a correlation between the two factors. Measurement units of the correlation values are set up as follows: [17]

0,00 - 0,14 ⇒ very weak correlation;

0,15 - 0,24 ⇒ weak correlation

0,25 - 0,39 ⇒ middle strong correlation

0,40 - 0,50 ⇒ strong correlation

0,51 and above ⇒ very strong correlation

Correlation value between length of practice and interest in improvement activities is 0,5105. It means very strong correlation between these factors. Therefore we can say that willingness to improve is strongly influenced by length of practice. The longer practise participants have, the less interested they are in any improvement activities. This is not really a positive outcome.

The most positive feedback from the survey was given by 91 % of the intervention group when answering question about possible interest in learning methods which can increase an efficiency of their everyday work, such as waste reduction, new layouts, applying ergonomic principles etc. These results give a huge opportunity and suggest a role for practicing professionals to implement (or assist in implementation) Lean concept to healthcare. It also suggests a role for academics to study, characterize and disseminate best practices.

4 Conclusions and Future Directions

As the cost of health care continues to rise, hospitals are put under increasing pressure to reduce costs while improving patient safety and care, and reducing errors. New discoveries in medicines are being made and new treatments are being developed, but these will be no more important to healthcare services in the future than the results of lean thinking. Medical devices and equipment are very costly and therefore it is necessary for hospitals to seek all possible ways of reducing them. One of those ways can consist of optimizing processes and a use of industrial engineering methods to make the processes more effective.

Applying lean thinking to the healthcare sector can provide significant cost and process efficiencies. However, in order to realize and sustain these benefits fully, there is an urgent need to educate and empower healthcare staff in the Lean principles and methodologies.

Education and training in lean thinking should be an inseparable part of organisations' competency frameworks to ensure consistency across all functions. Therefore there appears to be a significant need for the development of training materials and curricula that replace manufacturing jargon with healthcare terminology, contain healthcare-related examples. Much work remains to understand how to implement the lean model into healthcare.

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