

# LEAN concept - possibilities of implementation and improvement of business processes in public healthcare organizations

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## Abstract

**Introduction:** The basic postulate of the lean concept is that greater efficiency of the work process can be achieved through a process of continuous improvement, which aims to eliminate waste and maximize activities that add value. The Netherlands, Great Britain, Italy and the United States were examples of healthcare systems that implemented the lean concept.

**Aim:** To examine the opinion of health workers of a public hospitals in the Sarajevo area about the possibilities of improving business processes by implementing the lean concept.

**Method:** The cross-sectional study was conducted using a questionnaire. The questionnaire was sent to the e-mail addresses of health workers of public health organizations. 91 respondents of both sexes (doctors of medicine, residents, registered nurses, nurses and administrative staff) were included.

**Results:** A positive correlation was established in the attitude toward the effectiveness and efficiency of business processes. According to the participant's opinion, the greater effectiveness of business processes contributes to greater efficiency ( $r=0.846$ ;  $p<0,05$ ). Spearman's coefficient  $r_s=0.81$  shows a strong connection between the effectiveness and efficiency of business processes.

**Conclusion:** The study showed that there is a positive attitude towards the impact of the lean concept on improving the efficiency of business processes. The

expected positive effects of the implementation of the lean concept are manifested through faster provision of services to patients, reduction of service waiting times and general improvement of business processes.

**Key words:** healthcare organization, healthcare services, business processes, LEAN concept

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## Introduction

The lean concept emphasizes the elimination of waste as a way of improving the flexibility of resources and solving the variability in the demands of customers and users of services [1]. The term was first introduced in healthcare in the early 1990s [2], where the lean concept refers to the overall management system [3,4]. Lean is defined as a management/operating system that uses a culture of continuous improvement and focuses on meeting the needs of users (i.e. the needs of patients, internal staff and the organization), improving quality by reducing waste (i.e. those activities that do not add value) [5,6], optimization of organizational processes and patient flows, and value creation, with the direct participation of the organization's staff [7].

In this paper, we use the definition from Radnor et al. "as a management practice based on the philosophy of continuous process improvement either by increasing value for the customer or by reducing activities that do not add value" [8].

Khamidullina and Puryaev [9] claim that in the modern world, the vast majority of companies that are world leaders in their industries actively apply the lean concept. Italian hospitals confirm increased patient satisfaction and reduced length of hospital stay [10]. In general, the lean concept is considered a cure for waste in organizations [11]. Waste is defined as tasks and processes that do not contribute to the creation of value but consume organizational resources, are associated with inefficiency, reduced flexibility and the creation of unnecessary costs. Although the implementation of the lean concept has proven to be successful in reduc-

ing waste in healthcare, research in Dutch public hospitals shows that its application is not high due to a lack of resources, insufficient information and insufficiently developed management models (30% of respondents).

Obstacles that were recognized in hospitals for the implementation of the lean concept in the Netherlands could realistically be expected in the healthcare organizations of Bosnia and Herzegovina.

In the health sector, the current focus of the lean concept is on managing the process of providing health services with the aim of eliminating all types of waste of resources, time, and energy [12]. Ohno, the developer of the lean concept, identified seven sources of waste (Table 1).

Countries around the world are mostly facing the problem of high increase in health care costs. Increasing costs are a reflection of rising technology costs, an aging population, an increase in the number of chronically ill patients, and an increase in the demand for health care. An additional difficulty is determining the true value of healthcare services. The key principle of the lean concept is to provide value for the customer by enabling the organization to get rid of waste and increase value in the eyes of the service user.

## Aim

The aim of the work was to examine the opinion of health workers of a public health organization about the effects that would be achieved by applying a new management system based on the principles of the lean concept.

**Table 1. The most common medical waste**

Waste	Example
Defects	Hospital-acquired infections Surgical or procedural errors Extra work caused by mistakes Repeating tests because the results are incorrect Inaccurate patient information
Overproduction	Providing more care than necessary Laboratory tests are done frequently Diagnoses are given too early
Ineconomy	Surplus of medicines Surplus of equipment Patients are waiting for a place on the waiting list to become available
Over-processing	Providing more care than necessary Unnecessary imaging
Transportation	Transfer of patients between departments Transport of drugs between departments and pharmacies Equipment in warehouse instead of on site
Waiting	Service delay Staff waiting for information Transfer from rooms
Motion	Walking between departments Moving in search of paperwork

## Method

In the period between January and April 2022, the research was conducted as a cross-sectional study focused on hospital business processes. Based on research in highly developed countries [10], the questionnaire was created by the author for the purposes of this paper. Respondents in the research were doctors of medicine - specialists, residents, senior nurses, nurses and administrative staff of a public hospital in the area of Sarajevo, Bosnia and Herzegovina. Data were obtained on the professional category of respondents, knowledge of business processes, the current way of improving business processes, as well as the opinion on the effectiveness and efficiency of business processes that would be achieved by implementing the lean concept.

Data from the research are presented in the form of absolute and relative frequencies through tabular and graphical representation. The correlation coefficient of effectiveness and efficiency was calculated with the intention of showing to what extent changes in the value of one variable (effectiveness of business processes) are related to changes in the value of another variable (efficiency of business processes).

## Results

**Table 2. Structure of study respondents by professional category**

Position	Number	Percent
Medical doctors – specialists	23	25
Residents	5	5,4
Graduated nurses	24	26,4
Nurses	27	30
Administration staff	10	11
Other	2	2,2
Total	91	100

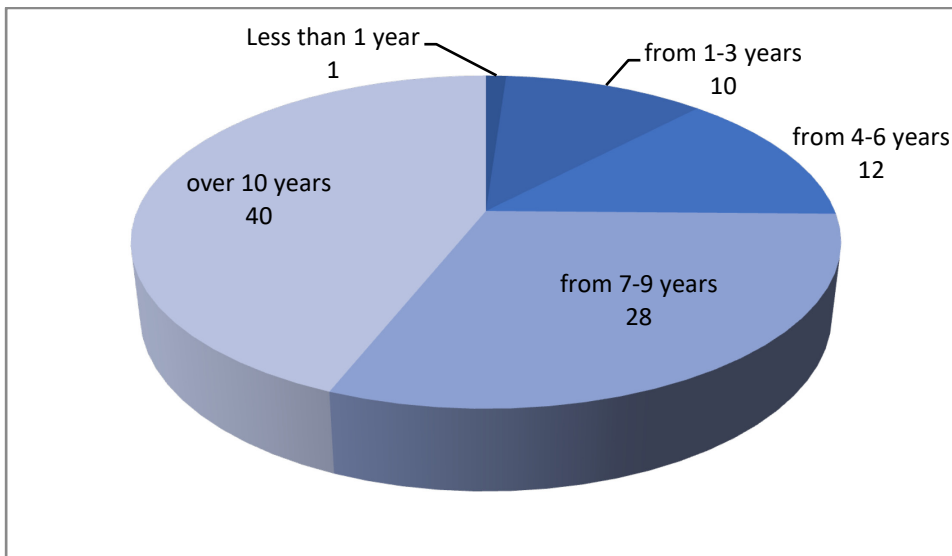


Figure1. Years of work experience of the study participants

Figure 1 shows that the largest number of respondents had work experience of 10 years and more - 40 (43.9%), approximately a third of respondents had work experience of 7 to 9 years - 28 of them (30.8%), while 12 (13.2%) and 10 (11.0%) health workers had an experience of 4 to 6 years and 1 to 3 years respectively.

In the survey, 52 (57.1%) respondents had professional knowledge of business processes, 36 (39.6%) had ad-

vanced knowledge, and only 3 (3.3%) were at the initial level of business process knowledge (Figure 2).

Attitudes about the current management of business processes are shown in Figure3. According to the results of the majority of respondents, 43 of them expressed a wider interest in the application lean concept, 33 respondents see the improvement of business processes as part of everyday business, 8 declared that they make maximum efforts to improve business processes, while

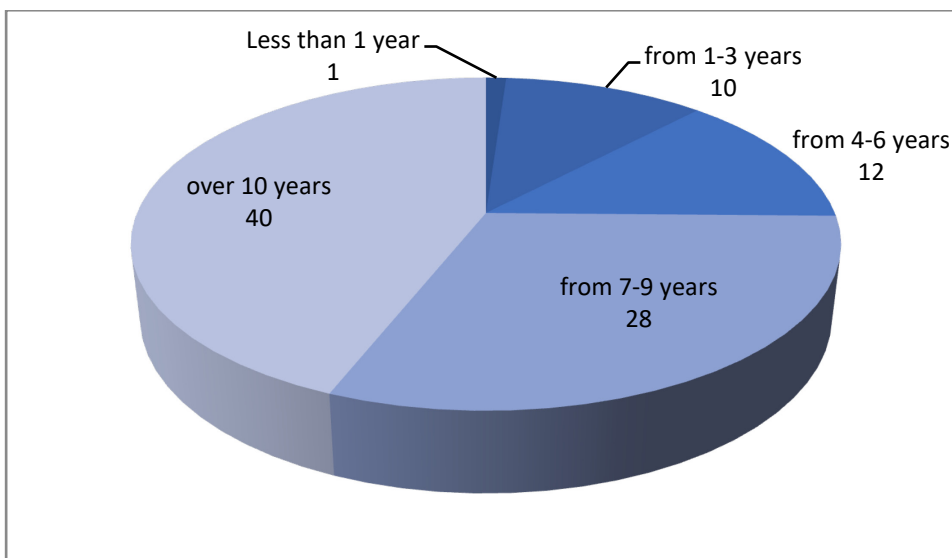


Figure 2. Knowledge of business processes of study participants

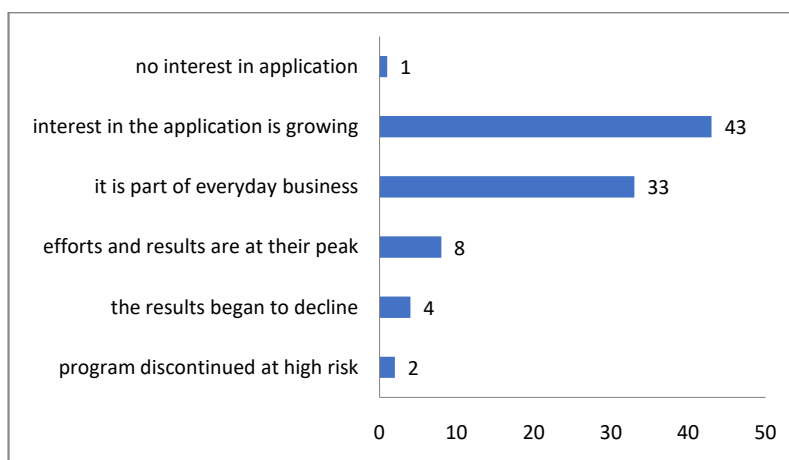


Figure 3. Attitudes on the business process improvement according to the work experience of study participants

4 respondents stated that their results are decreasing, and only 2 respondents stated that the program was discontinued due to high risk.

Table 3 presents the results of a survey of health workers' views on how they see the implementation of the lean concept within a public hospital. From the results, it can be seen that in over 80% of cases, the implemen-

tation effects were rated as significant or very significant in terms of process efficiency, process effectiveness, and output quality.

The correlation coefficient indicates the existence of a positive relationship between respondents' views on the effectiveness and efficiency of business processes. ( $r=0.846$ ;  $p<0.05$ ).

Table 3. Respondents' opinions about the relevance of applying the lean concept for selected characteristics of business processes.

CHARACTERISTICS OF BUSINESS PROCESSES	THE SIGNIFICANCE OF LEAN CONCEPT IMPLEMENTATION				
	1	2	3	4	5
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
	(%)	(%)	(%)	(%)	(%)
Effectiveness	0,0	3,4	13,0	43,0	46,0
Efficiency	0,5	2,4	4,3	32,9	59,9
Process flexibility	0,5	5,8	22,7	39,1	31,9
Output quality	0,0	1,0	7,2	38,2	53,6
Duration of the process	0,0	4,3	17,9	42,0	35,7
Cost savings	2,4	10,6	40,1	35,7	18,8
Frequency of process execution	5,3	19,3	29,5	26,1	19,8
Improved process output result	4,3	10,1	20,3	30,4	34,8

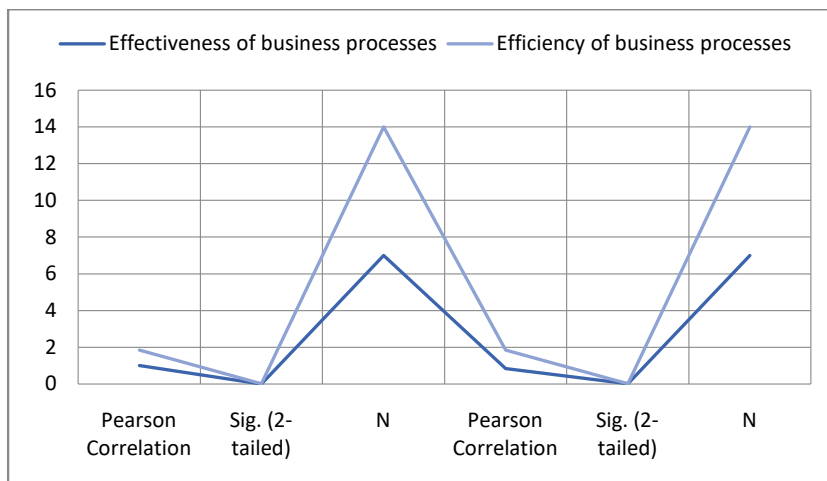


Figure 4. Correlation of effectiveness and efficiency of business processes in a hospital, according to the participants' opinion

This research was conducted to determine the level of understanding of the importance and possibility of applying the lean concept in a public health organization. Health workers with the highest percentage of agreement indicated that the implementation would achieve greater effectiveness and efficiency of business processes. According to their opinion, improved effectiveness and efficiency of business processes would mean a reduction in the waiting list of documents for hospitalization of patients, an increase in the productivity of employees, a reduction in the inefficient flow of employees and resources, and a simpler check of the waiting list.

The research actualizes the necessity of implementing modern business process improvement concepts in order to improve health services for patients of public health organizations.

The evaluation of the efficiency of the public hospital's business processes was done taking into account patient satisfaction, faster checking of patient waiting lists, reduction of waiting time for placing patients in the hospital, more efficient performance of activities within the process, and reduction of administrative costs and losses (Figure5). 76% of the respondents believed that the implementation would reduce the waiting time for the administration needed to place patients, 64% of them

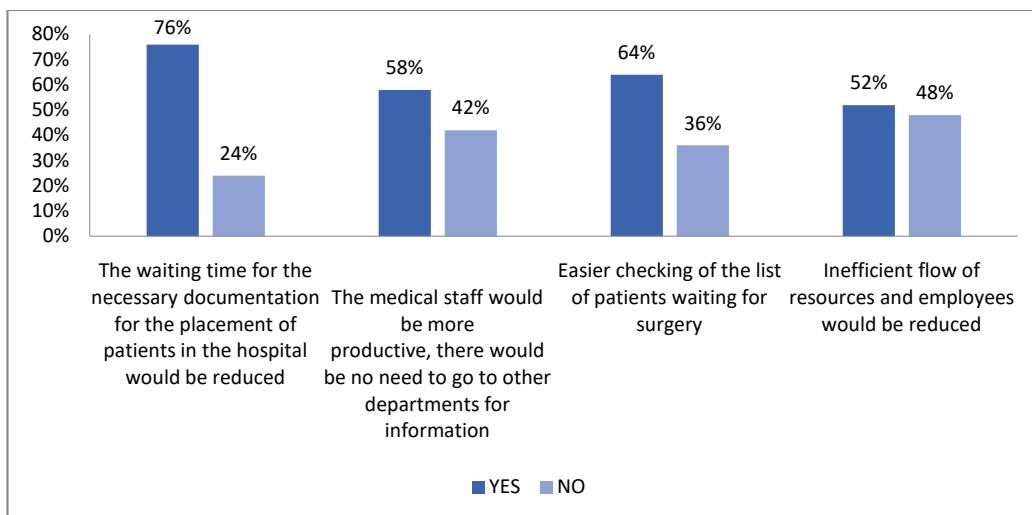


Figure 5. The respondents' statements about the effects that would be achieved by implementing the lean concept in a hospital

believed that it would achieve a simpler verification of waiting lists, 58% that the medical staff would be more productive, and 52% that it would reduce inefficient resource utilization flow and employee activity flow.

On the other hand, the criteria that in over 20% of cases are marked as not significant or slightly significant are the degree to which the process is documented, the scope of the process, the number of employees involved in the execution of the process, who is affected by the process change and it seems as though part of the sentence is missing.

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## Discussion

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The research results confirm that among the respondents there is a positive attitude towards the implementation of the lean concept in the hospital. Such an attitude is in accordance with the principles of effectiveness and efficiency of the healthcare system, whose processes lead to quality outcomes. Accordingly, the obtained results confirm the opinion that there is a significant positive relationship between the parameters of effectiveness and efficiency of business processes. The greater effectiveness of business processes contributes to greater efficiency of business processes. More precisely, healthcare workers see the purpose of implementing the lean concept to reduce the waiting time of patients and increase the productivity of the medical staff. The research further shows that the documentation and who is involved in the process itself is less important, thus confirming the premise of the lean concept that it is necessary to monitor activities that do not create value.

One of the salient benefits of why the lean concept is valuable for healthcare is the way it focuses on creating value for patients. The basic principle of the lean concept is to learn how to spot waste [10,13], and to compare the frequency of occurrence of waste according to priorities. While the emphasis in Dutch and British hospitals is on improving efficiency (speed of service implementation), in the hospitals in Bosnia and Herzegovina, the emphasis is more on effectiveness, i.e. on the way of working and reducing defects in the daily operations of the hospital.

Based on previous knowledge, a possible obstacle to the implementation of the lean concept is the insuffi-

cient involvement and insufficient motivation of employees [14], which, according to our respondents, can lead to the interruption of the started work process improvement programs.

Recognized wastes are eliminated in British and Dutch hospitals through modern improvement concepts. Our interviewees believe that, for the time being, in public hospitals in Sarajevo and Bosnia and Herzegovina the only waste that is noted is that there is not enough implementation. Nevertheless, it is an encouraging result that interest in the application of the lean concept is spreading. Adequate knowledge of business processes is necessary for the implementation of the lean concept in healthcare. In our research, the largest number of respondents have professional experience, which points to the existence of adequate knowledge, which is the basis for the implementation of the lean concept. The obtained research results confirmed the assumption that with years of experience in business processes comes greater knowledge since the largest number of respondents fall within the category of having 10 or more years of experience.

The presented research results confirm the existence of a positive attitude towards the implementation of the concept of business process improvement in the hospital. Increasing the effectiveness and efficiency of hospitals implies a focus on business indicators - process efficiency and labor productivity [15]. In the hospitals of Bosnia and Herzegovina, indicators of labor productivity should first be determined, in order to reduce the waste of daily business. The waiting time of patients in different stages of treatment, and in this research, waiting for the administration of documentation during the admission of patients to the hospital, for resources and personnel, were recognized wastes that can directly affect patient satisfaction [16,17], and can reduce the quality of service and the efficiency of the system. [18]. Medical staff and patients unnecessarily waste time moving between departments.

Also, the unnecessary movement of the patient within the hospital in order to be treated is discouraging to patients [19]. The opinion of the respondents in the research is that the implementation of the lean concept would solve medical wastes, which are listed as categories of transporting, waiting and motion, and improve business processes. Eliminating errors would certainly result in increased patient satisfaction, faster checking of patient waiting lists, reduced waiting times for hospital admissions, and reduced administrative costs and losses.



The approach to the implementation of the lean concept in hospitals in the USA was systemic, and in Italian hospitals a “project by project” approach was applied, i.e. each department was a separate project [20]. Comparing the effects achieved in hospitals that implemented the lean concept, a potential way to implement the improvement of business processes can be systemic or project-type, i.e. department by department. The experiences of countries implementing the lean concept in healthcare organizations show that the key to successful implementation is the involvement of leaders of healthcare organizations [20].

### Research limitation

The limitation of this research is the small number of respondents as well as the fact that the study considers only subjective opinions. In order to see the objective situation, it is necessary to have a nationally established monitoring and reporting of indicators of the effectiveness and efficiency of business processes in healthcare institutions. On the other hand, insufficient knowledge of the lean concept, which is evidenced by the lack of studies by local authors on the implementation of models for improving the processes of healthcare organizations, as well as on the satisfaction of users of healthcare services and employed healthcare workers, which are necessary to raise awareness of the need to improve the way business processes are carried out in Bosnia and Herzegovina. This research can be seen as an initiative that would lead to the improvement of business processes in the hospital sector because it indicates the existence of a positive attitude toward the implementation of the lean concept. Investigating the potential benefits of the implementation of the lean concept, it was determined that healthcare professionals recognize the importance of the lean concept. In order to encourage them to implement it, education and seminars are needed, while on the other hand, management needs to prepare strategies for implementing the lean concept.

### Conclusion

This research was conducted to determine the level of understanding of the importance and possibility of applying the lean concept in a public health organization.

Health workers indicated with the highest percentage of agreement that the implementation would achieve greater effectiveness and efficiency of business processes. According to their opinion, improved effectiveness and efficiency of business processes would mean a reduction in the waiting list of documents for hospitalization of patients, an increase in the productivity of employees, a reduction in the inefficient flow of employees and resources, and a simpler check of the waiting list. The research actualizes the necessity of implementing modern business process improvement concepts in order to improve health services for the patients of public health organizations.

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## LEAN koncept - mogućnosti implementacije i unapređenja poslovnih procesa u javnozdravstvenim ustanovama

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### Sažetak

**Uvod:** Osnovni je postulat lean koncepta da se veća efikasnost procesa rada može postići kroz proces kontinuiranog poboljšanja. To znači eliminiranje otpada i maksimiziranje aktivnosti koje dodaju vrijednost. Zdravstveni sustavi u Nizozemskoj, Velikoj Britaniji, Italiji i Sjedinjenim Američkim Državama implementirali su lean koncept.

**Cilj rada:** Ispitati mišljenje zdravstvenih radnika javne bolnice na području Sarajeva o mogućnostima unapređenja poslovnih procesa implementacijom lean koncepta.

**Metoda:** Istraživanje je provedeno kao presječna studija u javnoj bolnici na području Sarajeva. Upitnik je poslan po poštom zdravstvenim radnicima. Obuhvaćen je 91 ispitanik oba spola (doktori medicine, specijalizanti, diplomirane medicinske sestre, medicinske sestre i administrativno osoblje).

**Rezultati:** Utvrđena je pozitivna korelacija stavova o efektivnosti i efikasnosti poslovnih procesa. Prema mišljenju ispitanika, veća efektivnost poslovnih procesa pridonosi većoj efikasnosti ( $r = 0,846$ ;  $p < 0,05$ ). Spearmanov koeficijent  $r_s = 0,81$  pokazuje jaku povezanost efektivnosti i efikasnosti poslovnih procesa.

**Zaključak:** Istraživanje je pokazalo da postoji pozitivan stav o utjecaju lean koncepta na poboljšanje učinkovitosti poslovnih procesa. Očekivani pozitivni učinci implementacije lean koncepta manifestiraju se kroz: brže pružanje usluge pacijentima, smanjivanje vremena čekanja usluge i generalno poboljšanje poslovnih procesa.

**Ključne riječi:** zdravstvena organizacija, zdravstvene usluge, poslovni procesi, lean koncept