

Analysis of improving business processes by implementing the lean concept at the level of tertiary healthcare

Edin Medjedovic¹, Sabina Sehic Krslak², Milan Stanojević^{3,4}, Zlatan Zvizdic⁵, Edin Begic⁶, Jasmin Nurkovic⁷, Anis Cerovac⁸, Alma Suljevic⁹, Adnan Kulo¹⁰

¹ Clinic of Gynecology and Obstetrics, Clinical Center University of Sarajevo, Sarajevo, Bosnia and Herzegovina, Department of Gynecology, Obstetrics and Reproductive Medicine, Sarajevo Medical School, School of Science and Technology, Sarajevo, Bosnia and Herzegovina

² Faculty of Management and Business Economics, University of Travnik

³ Neonatal Unit, Department of Obstetrics and Gynecology, Medical School University of Zagreb, Zagreb, Croatia

⁴ Department of Obstetrics and Gynecology, University Hospital "Sveti Duh", Zagreb, Croatia,

⁵ Clinic for Children's Surgery, Clinical Center of the University of Sarajevo, Bosnia and Herzegovina

⁶ Department of Cardiology, General Hospital "Prim.dr Abdulah Nakaš", Sarajevo, Bosnia and Herzegovina, Department of Pharmacology, Sarajevo Medical School, Sarajevo School of Science and Technology, Sarajevo, Bosnia and Herzegovina

⁷ Center for Regeneration and Rehabilitation, Novi Pazar, Serbia

⁸ Department of Gynecology and obstetrics and Department of Anatomy, General Hospital Tešanj and University of Tuzla,

⁹ Clinic of Gynecology and Obstetrics, Clinical Center University of Sarajevo, Sarajevo, Bosnia and Herzegovina

¹⁰ Clinic for abdominal surgery, Clinical Center University of Sarajevo, Sarajevo, Bosnia and Herzegovina, Sarajevo Medical School, School of Science and Technology, Sarajevo, Bosnia and Herzegovina

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Correspondence:

Sabina Sehic - Krslak

sabina.sehic.krslak@gmail.com

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ABSTRACT:

Introduction. The success of healthcare organizations depends on the quality and speed of providing services to patients. Synonym for the term success of health care organization is the implementation of modern concepts. Synonymous with the success of healthcare organizations is the implementation of modern concepts. In this paper, the emphasis is on the *lean* concept, affects the quality and speed of providing health services.

Subject of research. The subject being researched in this paper is a *lean* concept which essence is determined by the implementation of methods that affect the speed and quality of providing health services. The aim of the work is to point out the actuality of the *lean* concept and its application at the tertiary level of health care. Examine the opinion of healthcare workers about the effects that would be achieved by applying the new management system (*lean* concept).

Aim of this paper is to indicate the actuality of the *lean* concept and its application at the tertiary level of health care system. Examine the opinion of healthcare workers about the effects that would be achieved by applying the new management system (*lean* concept). More precise possibilities of implementing the *lean* methodology, which can be used to improve clinical processes.

Materials and methods. The research was conducted by designing and using research questionnaires. Questionnaire structured by the author for the purposes of research in this paper. The questionnaire was sent to 472 employees' mail addresses and was filled out by 91 employees. One of the reasons for the lower questionnaire return rate is the lack of familiarity of employees with the *lean* concept and its effects on the provision of health services. The return rate of referrals indicates the need for prior presentation and familiarization with the concept itself and its impact on business processes. A Likert scale was used to assess the opinions of healthcare services workers about the effects that would be achieved by applying the *lean* concept at the tertiary level. Medical wastes are shown in the oncology department (case analysis). We statistically processed the data obtained from the questionnaire using

the SPSS 20.0 software package. The results are presented tabularly and graphically. The following methods are used in the paper: analysis method, inductive - deductive method, synthesis method, description method and proof method.

Results. The results of the research showed that (analysis of health organizations that apply the *lean* concept) and the opinion of health workers about the possibility of applying the *lean* concept at the tertiary level of health care has a positive impact on improving the efficiency of the provision of health services. The interpretation of the correlation coefficient from the previous table indicates the existence of a positive relationship between the effectiveness and efficiency of business processes ($r=0.846$; $p<0,05$).

Based on the literature review and the obtained results, it was determined that there is no formalized concept with instructions on the implementation of clinical process improvement methods. There was a positive impact on improving the efficiency of the provision of health services, through the implementation of modern methods. The review of the literature and the obtained results revealed that there is no formalized concept with instructions on the implementation of clinical process improvement methods.

Conclusion The expected positive effects of the implementation of the lean concept at the tertiary level of the health care of are manifested through: faster service delivery to patients, reduction of service waiting time and general improvement of business processes. The implementation of the *lean* concept would reduce medical waste, which would positively affect the quality of health care services.

KEYWORDS: methods, health care services, clinical processes.

SAŽETAK:

ANALIZA UNAPREĐENJA POSLOVNIH PROCESA IMPLEMENTACIJOM LEAN KONCEPTA NA RAZINI TERCIJARNE ZDRAVSTVENE ZAŠTITE

Uvod. Uspjeh zdravstvenih organizacija ovisi o kvaliteti i brzini pružanja usluga pacijentima. Sinonim za pojam uspjeh zdravstvene organizacije je implementacija modernih koncepata. Sinonim za uspjeh zdravstvene organizacije je implementacija modernih koncepata. U ovom radu naglasak je na lean konceptu koji utječe na kvalitetu i brzinu pružanja zdravstvenih usluga.

Predmet istraživanja. Predmet istraživanja u ovom radu je lean koncept čija je bit određena primjenom metoda koje utječu na brzinu i kvalitetu pružanja zdravstvenih usluga. Cilj rada je ukazati na aktualnost lean koncepta i njegovu primjenu na tercijarnoj razini zdravstvene zaštite. Ispitati mišljenje zdravstvenih radnika o učincima koji bi se postigli primjenom novog sustava upravljanja (lean koncept).

Cilj ovog rada je ukazati na aktualnost lean koncepta i njegovu primjenu na tercijarnoj razini zdravstvenog sustava. Ispitati mišljenje zdravstvenih radnika o učincima koji bi se postigli primjenom novog sustava upravljanja (lean koncept). Preciznije mogućnosti implementacije lean metodologije, koja se može koristiti za poboljšanje kliničkih procesa.

Materijali i metode. Istraživanje je provedeno osmišljavanjem i korištenjem istraživačkih upitnika. Upitnik koji je autor strukturirao za potrebe istraživanja u ovom radu. Upitnik je poslan na mail adrese 472 zaposlenika, a ispunio ga je 91 zaposlenik. Jedan od razloga niže stope vraćanja upitnika je nepoznatost zaposlenika s lean konceptom i njegovim učincima na pružanje zdravstvenih usluga. Stopa povrata preporuka ukazuje na potrebu prethodnog predstavljanja i upoznavanja sa samim konceptom i njegovim utjecajem na poslovne procese. Likertovom ljestvicom ocijenjeno je mišljenje zdravstvenih djelatnika o učincima koji bi se postigli primjenom lean koncepta na tercijarnoj razini. Medicinski otpad prikazan je na onkološkom odjelu (analiza slučaja). Podatke dobivene iz upitnika statistički smo obradili pomoću programskog paketa SPSS 20.0. Rezultati su prikazani tablično i grafički. U radu se koriste sljedeće metode: metoda analize, induktivno-deduktivna metoda, metoda sinteze, metoda deskripcije i metoda dokaza.

Rezultati. Rezultati istraživanja pokazali su da (analiza zdravstvenih organizacija koje primjenjuju lean koncept) i mišljenje zdravstvenih radnika o mogućnosti primjene lean koncepta na tercijarnoj razini zdravstvene zaštite pozitivno utječe na poboljšanje učinkovitosti pružanja usluga. zdravstvenih usluga.

Interpretacija koeficijenta korelacije iz prethodne tablice ukazuje na postojanje pozitivnog odnosa između efektivnosti i učinkovitosti poslovnih procesa ($r=0,846$; $p<0,05$).

Na temelju pregleda literature i dobivenih rezultata utvrđeno je da ne postoji formalizirani koncept s uputama o primjeni metoda poboljšanja kliničkog procesa. Ostvaren je pozitivan utjecaj na poboljšanje učinkovitosti pružanja zdravstvenih usluga, kroz primjenu suvremenih metoda. Pregledom literature i dobivenih rezultata utvrđeno je da ne postoji formalizirani koncept s uputama o primjeni metoda poboljšanja kliničkog procesa.

Zaključak Očekivani pozitivni učinci implementacije lean koncepta na tercijarnoj razini zdravstvene zaštite očituju se kroz: bržu isporuku usluga pacijentima, smanjenje vremena čekanja na uslugu i opće poboljšanje poslovnih procesa. Primjenom lean koncepta smanjio bi se medicinski otpad, što bi pozitivno utjecalo na kvalitetu zdravstvenih usluga.

KLJUČNE RIJEČI: metode, zdravstvene usluge, klinički procesi.

INTRODUCTION

The *lean* concept is a system of leadership, management and organization of the work process, with a focus on eliminating all types of waste (resources, time, energy). The expected effect of the implementation of the *lean* concept is to reduce business costs, through the elimination of wastage. The topic of implementation of modern models at the level of tertiary health care is particularly topical. Khamidullina and Puryaev [1, 2], claim that companies that are world leaders in their industries actively apply the *lean* concept. It first appeared in production. Production and health care differ in many ways, but there are also similarities that enable the application of *lean* principles when providing health services. For the *lean* concept (suppliers, inputs, process, outputs, customers) has found application in the management of various organizations [3, 4], and the challenge is to apply it. The increase in the need for faster, cheaper and better quality services in the health sector, and in conditions of limited resources, puts before tertiary health care the necessity of searching for and applying new models and tools aimed at improving the functioning of the system. Therefore, we believe that the given research area has justification and represents a challenge for researchers.

Despite the successful implementation of the *lean* concept, many obstacles have also appeared in its application. Elkhairi et al. refer to research by the authors Bajjou and Chafi from 2018, emphasizing that they classified these barriers into three different categories: economic, managerial, and technical and social barriers. Managerial and technical barriers are lack of planning, lack of expertise, lack of top management commitment, lack of strategic perspective, lack of understanding of lean production. The economic barrier is limited resources. A social barrier is resistance to change.

MATERIALS AND METHODS

During the preparation of the paper, data were collected from the latest relevant scientific articles and books, and health systems that applied modern concepts of optimization of clinical

processes were analyzed. The methods used in this work belongs to analytical and synthetic group of methods. The analysis method was used for the purpose of analyzing the available literature that deals with the given subject of research, and for the purpose of analyzing the obtained research results. The inductive method was used as a logical reasoning procedure, based on the analysis of research problems and research results. The deductive method was used when making conclusions about whether the goal of the research was achieved and making general conclusions reached during the research. The method of synthesis was used in order to connect all elements into an integral whole and reach the general conclusion of the work.

REVIEW OF EARLIER RESEARCH

In the review of previous studies, we will describe the most important research within the Lean methodology. We believe this to be important, as SIPOC is merely one of the methods within the *lean* methodology. Another reason is that, through *lean* methodology and its effects, it is possible to clearly point out the necessity of implementing contemporary models in healthcare organizations.

A study by Dickson et al. [5], on the implementation of the *lean* methodology at the emergency departments of four public hospitals in Massachusetts, Worcester, Orlando, and Iowa City, showed that, with the help of the *lean* methodology, the patients' waiting time was reduced. The decreased waiting time directly affected the increase in the satisfaction of the patients.

A study by Zoe Radnor [6] showed that the implementation of this methodology at the Scotland Cancer Treatment Center resulted in a reduction of the time patients waited for examinations, as well as in the improvement of patient flow through the system of service provision by 48%. Based on the review of the literature dealing with the research topic of the present study, a research hypothesis was formulated: The application *lean* concept can positively affect the efficiency of the clinical process.

OPPORTUNITIES FOR IMPLEMENTING OF THE LEAN CONCEPT IN HEALTHCARE

There are many challenges which healthcare institutions face when implementing *lean* concept. There are many unclear issues when it comes to determining values in healthcare. The greatest challenge of implementing contemporary *lean* concept in healthcare is finding a way to improve service for patients. The expected improvements resulting from the implementation of the *lean* concept are intended for: patients, healthcare workers, healthcare institutions.

For patients [7]:

- Decrease in the time spent in hospital
- Increase in satisfaction
- Decrease in waiting time
- Improvement of service quality
- Decrease in the number of errors
- Improvement of information flow

For healthcare workers [8]:

- Elimination of waste
- Decrease of overtime
- Decrease of the workload
- Increase in satisfaction
- A more peaceful and better organized work environment

For healthcare institutions [9]:

- Decrease in equipment
- Increase in the number of examined patients
- Decrease in costs
- Improvement of information flow

RESULTS

Table 1: Structure of respondents

Position	Number	Procesnt (%)
Medical doctors – specialists	23	25
Doctors specializing	5	5,4
Senior nurses	24	26,4
Nurse	27	30
Administrative staff	10	11
Other	2	2,2
Total	91	100

Source. Author's research

Table 2: Respondents' opinions about the effects that would be achieved by applying the lean concept at the tertiary level of healthcare services

VARIJABLES	SIGNIFICANCE				
	1 Strongly Disapprove	2 Disapprove	3 Undecided	4 Approve	5 Strongly Approve
Effectiveness of business processes	0,0	3,4	13,0	43,0	46,0
Process 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
Potential 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
Degree of process documentation	3,9	11,6	18,4	40,1	26,1
Degree of process performance monitoring	0,0	1,0	11,1	49,8	38,2
Continuous monitoring of activities that do not create added value	0,5	4,3	23,7	48,8	22,7
The output from the process is intended for patients	4,3	10,1	20,3	30,4	34,8

Source. Author's research

Table number 2 presents the results of a survey of the attitudes of healthcare workers as they see the effects of the implementation of the lean concept at the level of tertiary healthcare. From the results, it can be seen that in over 80% of cases, the following were rated as significant or very significant:

1. Process efficiency,
2. Process effectiveness,
3. Process output quality,
4. Continuous monitoring of activities that do not create value.

This result confirms the existence of a basis for the implementation of the *lean* concept. One of the fundamental principles of the *lean* concept is the monitoring of activities that do not create value, there before the healthcare system needs effective and efficient processes, which healthcare workers have marked as a priority. Effective and efficient processes should each result in the quality of the process output, which was assessed as a significant priority in the research. Accordingly, a correlation test of the effectiveness and efficiency of business processes was performed.

Table 3: Correlation of effectiveness and efficiency of business processes

Correlations			
Varijabla		Effectiveness of business processes	Efficiency of business processes
Effectiveness of business processes	Pearson Correlation	1	.846*
	Sig. (2-tailed)		.016
	N	7	7
Efficiency of business processes	Pearson Correlation	.846*	1
	Sig. (2-tailed)	.016	
	N	7	7

*. Correlation is significant at the 0.05 level (2-tailed).

Source. Author's research

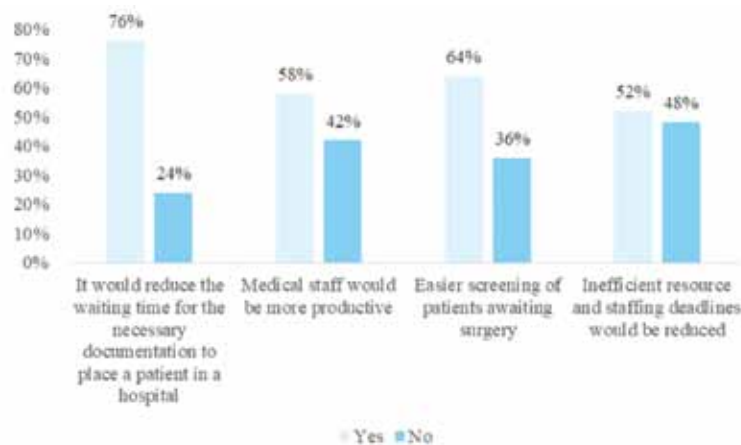
The interpretation of the correlation coefficient from the previous table indicates the existence of a positive relationship between the effectiveness and efficiency of business processes. ($r=0.846$; $p<0,05$). The results in the table (*Correlation of effectiveness and efficiency*) confirm the conclusion that there is a significant positive relationship between the variable effectiveness of business processes and the efficiency of business processes. Greater effectiveness of business processes contributes to the efficiency of business processes. Assessment of the efficiency of business processes at the level of tertiary health care is carried out through:

1. Patient satisfaction;
2. Quicker checking of the waiting list of patients;

3. Decreasing the waiting time for placing patients in the hospital;
4. More efficient performance of activities within the process.
5. Reducing administrative costs and losses.

On the other hand, the criteria that in more than 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 whether it is necessary little effort to achieve improvements quickly. This research result shows who is involved in the process itself is less important. Therefore, healthcare professionals see the purpose of a process in quality implementation.

Graph 1: The attitudes and opinions of healthcare workers at the tertiary level about the expected effects of the implementation of the lean concept



Source. Author's research

Based on the previous graph (*graph1*), you can see an overview of the results of respondents' statements about the effects that would be achieved by implementing the *lean* concept. The highest redundancy rate agreement is regarding the reduction of the waiting time for the necessary documentation for the placement of patients in the hospital. It is also one of the fundamental prin-

ciples of the *lean* concept - the satisfaction of end users, in this case patients. The second-ranked effect according to the respondents is a simpler check on the waiting list of patients for surgical procedures. The lowest degree of agreement among respondents is with the statement to reduce the inefficient flow of resources and employees.

Table 4 Example of waste at the tertiary level of healthcare Department of Oncology

Type of wastage	Mislabeled tubes	Oncology patient care
Defects	You took the tubes with the blood sample unused	Inadequate therapy for the patient
Excess production	Moving test tubes from the place of sample collection to testing	Waiting for chemotherapy
Transport	Waiting for the sample to be tested	Spatial distance of the accommodated patient to the place of chemotherapy
Waiting	Test reagents have expired	Expired dates for chemotherapy drugs
Supplies	Too many reagents	Patients wait for doctors due to delays that exceed capacity
Motion	Time to print labels that are not in use	Nurses in search of poorly located deliveries
Redundant processing	Repeating the entire examination due to one bad result	Time spent creating a schedule that is not followed.
Human potentials	Employees' ideas are not listened to	

Source. Author's research

DISCUSSION

Health care systems in Bosnia and Herzegovina (BH) are focused on traditional business process improvement systems. They are more precisely focused on business processes that add value. The *lean* concept also focuses on processes that do not add value [11]. The basic principle of the *lean* concept is to learn to see waste. The first observed medical wastages were in Dutch and British hospitals [12,13]. In our research, we have shown the results of wastage at the tertiary level of health care - the Department of Oncology (table 4). By comparing the research, it was observed the difference in the ranking of the type of wastage according to priorities and according to the frequency of occurrence. Based on the comparison of the results, it can be concluded that the emphasis in Dutch and British hospitals is on improving efficiency (speed of service delivery), while BH health institutions, the emphasis is more on effectiveness, i.e. on the mode of operation (reduction of defects). The aforementioned results confirm the necessity of improving the efficiency of providing health services in Bosnia and Herzegovina. As the correction of defects is related to the human factor, in our research we went a

step further compared to research and analyzed human potential, as one of the causes of possible wastage. The obtained results indicate that not listening to the ideas of employees is one of the causes of insufficient motivation to improve effectiveness, and thus the recognized need for improving efficiency. In the research they conducted, they cite insufficient involvement and insufficient motivation of employees as one of the obstacles to the implementation of the *lean* concept. In Bosnia and Herzegovina for healthcare institutions, a frequent obstacle to the implementation of modern models is the lack of motivation. In British and Dutch hospitals, recognized wastages are eliminated through modern improvement concepts, and in BH they are found without sufficient implementation, but the encouraging data is that in 43 cases interest in implementation is spreading. Adequate knowledge of business processes is necessary for the implementation of the *lean* concept in healthcare. In order to achieve an increase in the effectiveness and efficiency of business processes, it is necessary to find process indicators. In the Britain and Dutch hospitals, integral indicators are applied: process ef-

efficiency and workforce productivity. In BH health institutions, it is necessary to work more on determining indicators, above all the productivity of the workforce, which is aimed at reducing defects that are part of everyday business according to the results of the research.

According to [13,14], characteristic of the situation and problems in health care systems, the solution lies in the implementation of modern business process improvement concepts. In addition to them, the following are specifically mentioned as *lean* indicators: cycle efficiency, cycle time, overall equipment effectiveness. The respondents in this research rated 80% of cases as significant and very significant (table 3), which confirms the possibility of applying the indicator as in Dutch and British hospitals. In support of this, the results on graph 1 show how employees at the tertiary level of health care see the implementation of the *lean* concept. The effects that the respondents expect to achieve through the implementation of the *lean* concept to a significant extent coincide with the effects that are evident in hospitals that apply the *lean* concept. As many 76% of the respondents agree that the waiting time for documentation of patient placement in hospitals would be reduced, in 64% of cases, waiting lists of patients would be checked more quickly, in 58% of cases the medical staff would be more productive, in 52% of cases the flow of resources would be more efficient. Also, the mentioned research results confirm that the implementation of the *lean* concept of improving business processes would solve medical wastages, which are listed as categories of transport, waiting and movement in (table 4). With the mentioned results of the research, the respondents confirmed their agreement that the mentioned defects would be eliminated by the implementation of the *lean* concept. Correcting errors would certainly result in an increase in: patient satisfaction, faster checking of patient waiting lists, reduction of waiting time for hospital admissions, reduction of administrative costs and losses. In order to analyze waste, it is necessary to define process indicators. In our research of the oncology department, to precisely define the indicators, this would determine the cause and eliminate waste more quickly. Although the implementation of the *lean* concept has proven to be successful in reducing waste in healthcare, surveys of hospital managers have shown that full implementation in

healthcare in the Netherlands is still not high. Philips Healthcare Consulting divided the reasons into three main ones, based on the results of research conducted in 77 Dutch hospitals. It was determined that full implementation in healthcare is low due to: lack of resources (59% of respondents), insufficient information (41% of respondents), and insufficiently developed management models (30% of respondents).

CONCLUSION

This research was conducted to determine the level of understanding of the importance and possibility of applying the *lean* concept at the tertiary level of health care. Health workers in the highest percentage of agreement indicated that the implementation would achieve greater effectiveness and efficiency of business processes. This would mean: reducing the waiting time for documents for hospitalization of patients, increasing the productivity of employees, reducing the inefficient flow of employees and resources and easier checking of the waiting list. In research of potential benefits of the implementation of the *lean* concept, it was determined that healthcare workers recognize the importance of the *lean* concept, but in order to encourage them to implement it, education and seminars are needed. And on the other hand, healthcare management needs to prepare a *lean* concept implementation strategy.

In the healthcare system, the implementation of contemporary concepts is very important, from the aspect of timely execution of all the demands defined by the end user (patient). In this study, the initial premise was that, in order to improve the clinical process, it is necessary to minimize errors and improve service delivery through decreased waiting time. This confirms the basic premise of the method – the rationalization of the clinical process.

The success of healthcare organizations is in direct correlation with the quality of the resources used to provide services [15, 16]. To achieve that effect, it is necessary to use tools that enable the control of resource expenditure.

The contribution of this research is updating the topic of the necessity of implementing modern business process improvement concepts in order to improve health services for patients at the tertiary level of health care.

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