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Improving Emergency Department Services in Libyan Hospitals by Using Lean Six-Sigma "A Case Study"

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تحسين خدمات الإسعاف في المستشفيات الليبية باستخدام منهجية لين ستة سيجما "حالة دراسية"

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Abstract:
The use of Lean Six-Sigma methodology has spread in the development and improvement of health services in the developed and developing world. Previous studies have shown a great success in the improvements of various health services provided to patients using Lean Six-Sigma methodology. Therefore, the Libyan health facilities, especially emergency departments should take advantages of the use of this methodology and benefit from the experiences of countries that preceded us in the use of this methodology. This study aims to improve health services in emergency departments in Libyan hospitals using Lean Six-Sigma methodology. By designing, distributing and analyzing a questionnaire at the level of the state of Libya by taking samples to conduct this study represented in a number of hospitals in the city of Tripoli, and considering the Central Hospital in Tripoli as a case study, this research studies and analyses the problems and difficulties facing emergency departments, in order to identify the most important problems facing physicians and patients within different emergency departments using the Lean Six-Sigma methodology. The results of this research indicate that a range of issues faced by patients and physicians within the emergency departments have been identified. By analyzing the Pareto chart, thirteen of the most important issues were identified and prioritized. Through a cause-and-effect diagram, six main reasons for the long waiting time in the EDs were identified. A new process map was created where unnecessary movements and non-value-added activities were eliminated. A new Value Stream Map (VSM) was created where the average total time for the patient staying in the emergency department was reduced from 325 to 99 minutes if improvements are implemented.

Keywords: Lean Six Sigma, healthcare improvements, emergency department service improvements, DMAIC approach, quality improvements.

الملخص
انتشر في العقود القليلة الماضية استخدام منهجية Lean Six-Sigma في تطوير وتحسين الخدمات الصحية في العالم المتقدم والنامي. وقد أظهرت الدراسات السابقة نجاحًا كبيرًا في تحسين الخدمات الصحية المختلفة المقدمة للمرضى باستخدام منهجية اللين ستة سيغما. لذلك يتوجب على المرافق الصحية الليبية وخاصة أقسام الطوارئ الاستفادة من استخدام هذه المنهجية والاستفادة من تجارب الدول التي سبقتنا في استخدام هذه المنهجية. تهدف هذه الدراسة إلى تحسين الخدمات الصحية في أقسام الطوارئ في المستشفيات الليبية باستخدام منهجية لين ستة سيغما، وذلك من خلال تصميم وتوزيع وتحليل استبيان على مستوى دولة ليبيا من خلال أخذ عينات لإجراء هذه الدراسة ممثلة في عدد من المستشفيات في مدينة طرابلس، واعتبار المستشفى المركزي بطرابلس كحالة دراسية، حيث يقوم هذا البحث بدراسة وتحليل المشاكل والصعوبات التي تواجه أقسام الطوارئ، وذلك للتعرف على أهم المشاكل التي تواجه الأطباء والمرضى داخل أقسام الطوارئ المختلفة باستخدام منهجية

Lean Six-Sigma. تشير نتائج هذا البحث إلى أنه قد تم تحديد مجموعة من المشكلات التي يواجهها المرضى والأطباء داخل أقسام الطوارئ، ومن خلال تحليل مخطط باريتو البياني تم تحديد ثلاث عشرة مشكلة من أهم المشكلات وترتيبها حسب الأولوية. من خلال مخطط السبب والنتيجة، تم تحديد ستة أسباب رئيسية لوقت الانتظار الطويل في أقسام الطوارئ. تم إنشاء خريطة عملية جديدة process chart حيث تم التخلص من الحركات غير الضرورية والأنشطة غير ذات القيمة المضافة. تم إنشاء خريطة جديدة لتدفق القيمة (VSM) حيث تم تقليل متوسط الوقت الإجمالي لبقاء المريض في قسم الطوارئ من 325 دقيقة إلى 99 دقيقة إذا تم تنفيذ التحسينات.

الكلمات المفتاحية: لين ستة سيغما، تحسينات الرعاية الصحية، تحسينات خدمات قسم الطوارئ، نهج DMAIC، تحسينات الجودة.

Introduction

Healthcare is a set of services provided to people to maintain their health and to treat them when they are ill. This is critical for individuals and communities, helping to maintain health through treatment and disease prevention. The importance of healthcare is that it helps to maintain the health of individuals, allowing them to have a better health, and helping to reduce the spread of diseases, thus contributing to the improvement of the public health of society. They help to increase economic productivity, allowing healthy people to work and produce goods and services [1].

Integration of Six-Sigma and Lean

Six-Sigma is a quality management methodology to minimize defects and improve the quality of products or services. It was first developed by Motorola in the 1980s and has since been adopted by many companies worldwide [2]. A structured approach is used to uncover a problem's root cause using the DMAIC method: Define the problem within a process; Measure the defects; Analyze causes; Improve the process performance to remove the causes; Control the process to make sure defects do not recur [3].

The basic Lean concepts are the elimination of waste through the standardization of processes and the involvement of all employees in process improvement [4]. Lean can be described as a set of principles and techniques that drive organizations to continually add value to products or services by enhancing process steps that are necessary, relevant, and valuable while eliminating non-value-added activities [5].

Lean and Six-Sigma are two complementary approaches to process improvement. Lean focuses on identifying and eliminating waste, while Six-Sigma focuses on reducing variation and defects. Lean and Six-Sigma can provide a powerful framework for improving process efficiency and effectiveness. Lean can benefit from Six-Sigma's management structures, which provide a framework for organizing and implementing improvement projects. Six-Sigma's step-by-step approach can also be used to integrate Lean principles into operations [6].

Six-Sigma tools and techniques can help Lean practitioners identify the most significant improvement opportunities. By combining their strengths, Lean and Six-Sigma can provide a comprehensive and effective approach to process improvement.[1].

Lean Six-Sigma in healthcare

Lean Six-Sigma can be implemented in a variety of areas in healthcare, including healthcare management such as improving operational efficiency and reducing costs, clinical care such as reducing infection rates and improving patient outcomes, and medical education such as improving the quality of training [6].

Applying LSS methodology in the health sector has many benefits, including Improving the quality of healthcare by analyzing data and identifying areas that can be improved, such as diagnostic accuracy, medication safety, and treatment effectiveness, reducing costs by improving operational efficiency, reducing waste, and increasing productivity [2]. The Lean Six-Sigma methodology offers a powerful framework for investigating and addressing patient flow problems within hospital emergency departments. By integrating both the "Voice Of the Customer" (patients and staff) and the "Voice Of the Process" (programming operations), a comprehensive understanding of current patient flow challenges is established. Value Stream Mapping serves as a critical tool to model, evaluate, and ultimately improve workflow and operations within the emergency department. Employing statistical analysis, visual tools, and graphs facilitates the identification and analysis of key issues impacting patient flow[7].

Healthcare improvement in the emergency departments

Emergency Departments (ED) are places that offer accident and emergency care services at different severity levels. Because these departments are complex systems, there is no default template to improve performance. It is common to see overcrowding and workloads that exceed the availability of resources which results in high waiting times, delays in severe treatments, and increased lengths of hospital stays [8]. These issues impact the quality of care and clinical outcomes, increasing the rate of adverse events and hospital mortality [9].

The challenge for healthcare companies is to find appropriate management solutions that improve efficiency, productivity, and quality of performance [8]. In this context, hospital costs and patient and worker satisfaction are

affected [10,11]. EDs are often busy and crowded, and the staff is under a lot of pressure to provide high-quality care quickly. Healthcare improvement in EDs is a process that aims to make care better, safer, and more efficient. This involves finding and fixing problems with the way care is delivered, using proven methods, and making the way things are done work better [12].

Research problem

Emergency departments in general suffer from several issues related to long waiting times, in addition to the patient's discomfort while staying in the emergency departments due to severe overcrowding in corridors and waiting rooms, in addition to other uniqueness in Libyan specific emergency departments problems such as the lack of medicines and supplies of various types, and the presence of security chaos associated with crowded situations, causing a lot of discomfort and many medical errors that may result in deaths. Hence, we decided to diagnose the most important problems and issues associated with providing services to patients in emergency departments in Libyan hospitals and try to conceptualize solutions to these issues using the Lean Six-Sigma improvement methodology.

Research objectives

1. Conducting an in-depth study using various analytical tools to identify the causes of poor patient care in Libyan hospital emergency departments.
2. Prioritize these causes in order of importance.
3. Applying the Lean Six-Sigma methodology to measure the boundaries of the issue, analyze its causes, and make suggestions for improvements.
4. Proposing recommendations that can be used to initiate improvement and reform processes in Libyan hospitals emergency departments.

Research methodology

1. Collecting information and data to include it in the questionnaire.
2. Create a questionnaire based on the information collected to capture the aspects of the problem(s) under investigation.
3. Field visits to the emergency departments of the public hospitals targeted by the research and conducting interviews with those individuals concerned to be targeted for research survey.
4. Distributing questionnaires to patients, physicians, nurses, and management leaders in emergency departments.
5. Analyze the collected data using various statistical methods and Lean Six-Sigma tools.
6. Summarize the results and provide recommendations to improve health services in emergency department in Libyan hospitals.

Literature Review

- A case study conducted at a hospital in the United States on the use of DMAIC tools in the Emergency department focused on reducing the waiting time for emergency laboratory tests. the main problem found was identified as a communication gaps between the laboratory and the emergency department. Improvement initiatives have been implemented such as redesigning the collection and transfer of samples to reduce delays and strengthening the communication channels between the laboratory and the ED [13].
- In an application study conducted at the emergency children's department in a hospital in Jordan, the Lean Six-Sigma and simulation methodology were used to reduce patient waiting time and improve the operational efficiency of the emergency department. The results of the study showed significant improvements in the operation performance. It has been recorded that process cycle time decreased by 73%, and the overall performance of the emergency department has improved by 83% [14].
- The University of Kentucky Medical Center used Lean Six-Sigma to improve patient flow and reduce waiting times in their emergency department. They implemented several improvement initiatives, such as redesigned patient registration, improved coordination between radiology and ED departments, and visual management boards. The results showed a 25% reduction in patient wait times and a 20% decrease in patient length of stay, as well as improved patient satisfaction scores [15].
- In an implementation of Lean Six-Sigma study in the emergency department of an Ecuadorian Children's Hospital to evaluate the possibility of applying the LSS in a South American country, the problem is the long waiting time for patients in the emergency room. The results of the study showed decreasing in the waiting time in the waiting room by 79.5% and in the treatment room by 53.2%. The total service time was reduced by 55.6%, and the total waiting time decreased by 57% [16].

Methodology

Data collection

Two questionnaires were designed and distributed. 500 questionnaires for external customers and 150 for internal customers at ten major public hospitals in the capital Tripoli and its surroundings, to capture the voice of both internal and external customers at the interval between August 15 and October 30 - 2023. 90 external customers and 60 internal customers responded, resulting in a 23.07% response rate. All surveys were distributed personally (by hand). External customer represented by EDs patients, and internal customers represented by EDs physicians, nurses, and management.

The survey questionnaire applied for external customers was designed to divide the information collected into four main groups. The first is the quality of services provided, second concerning the length of waiting time within the emergency department, third is the general services provided, and fourth is the availability of equipment.

The survey questionnaire applied for internal customers was designed to contain four major groups of questions. First related to the work environment, second concerned the salaries and incentives, third about the availability of the medical equipment and job distribution system, fourth about other general problems from the physicians and nurse's perspectives. The case study was carried out at the central hospital in Tripoli known as Alzawia street hospital because it is considered as it has the largest emergency department among other hospitals and it contains the largest diversity of branches and services compared to the other hospitals.

The emergency department of the central hospital consists of a rapid treatment area, which contains four units (surgery, bone, brain and nerve, and recovery room). There are five physicians in the rapid treatment area for the first and second shifts, and three physicians during the third shift (night shift) in the areas of surgery, bone, and nerve sites. In the recovery room, one physician is available in each shift. The number of care nurses available during rapid treatment area varies from 4 to 6 nurses, and two nurses in the recovery room all the time. In addition to the distribution of questionnaires, multiple interviews were conducted with internal and external customers, to rephrase the survey questions and to obtain more reliability for the survey answers and to get more details about the issues they face within their emergency departments.

Results and discussion

Define phase

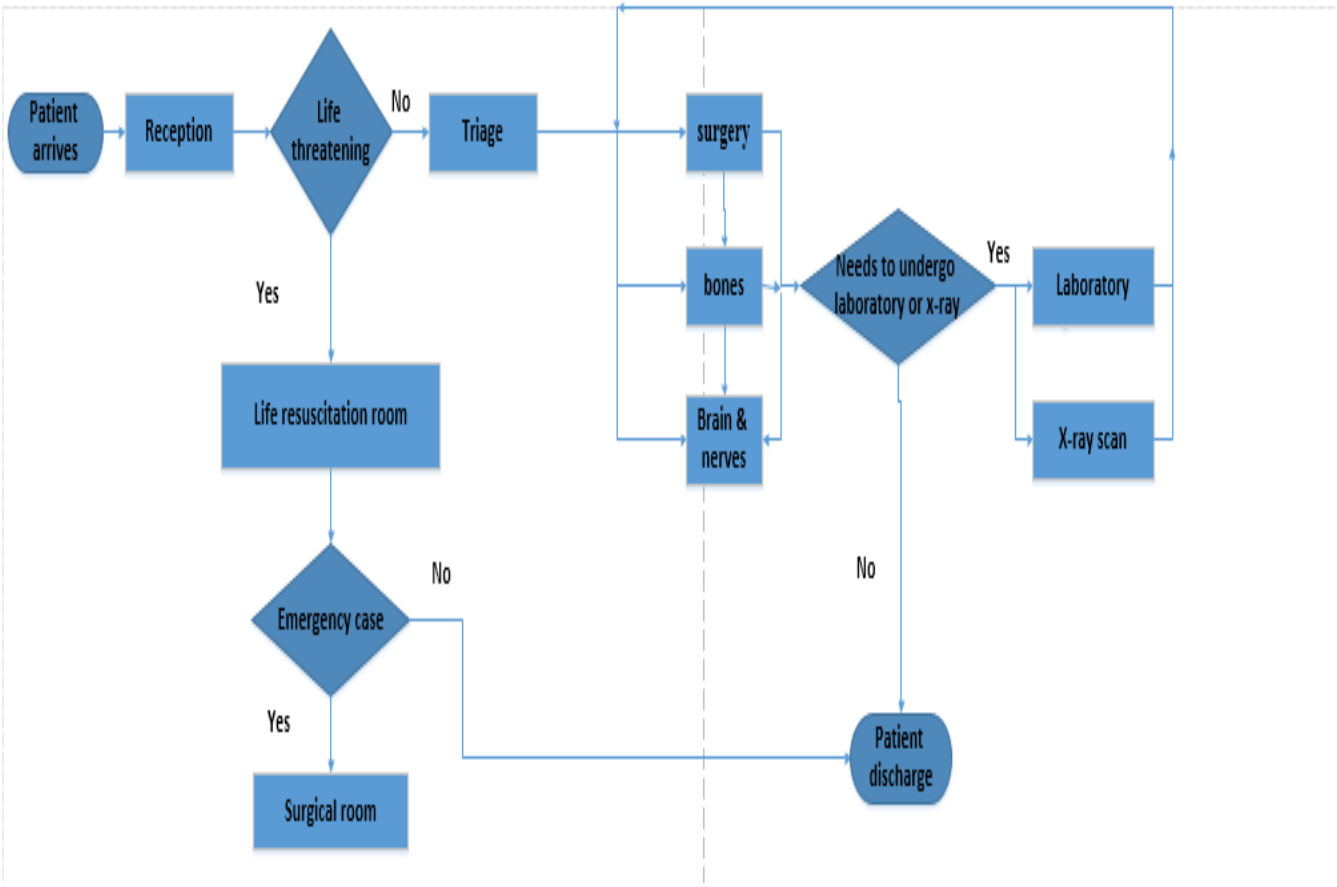
During the course of this study through onsite observations and customer reactions through interviews, it is found that many problems patients suffer within the emergency department, including long waiting time to receive care, overcrowding in different areas of the EDs results in delays in treatment leads to customer dissatisfaction. Patients suffer from the lack of medical resources and supplies, as well as qualified medical staff and lack of diagnostic equipment. Internal customers have their own concerns such as that hospitals suffer a lack of the infrastructure needed for emergency care, including beds, diagnostic rooms and areas for critical patients care. In this research, Cronbach's alpha coefficient was used to measure the correlation and consistency of the survey questions with each other and assess their internal quality for both surveys. The value of Cronbach's alpha ranges from 0 to 1, and the closer to the value of 1, the higher the internal consistency of the items. A Cronbach's alpha value higher than 0.7 is considered acceptable for research purposes. The value of Cronbach's alpha for external customers calculated was 0.849 as shown in (table1), so it is considered acceptable which indicates the strength of the correlation between the survey questions. The value of Cronbach's alpha for internal customers is 0.825 as shown in the table below, so it is considered acceptable which indicates the strength of the correlation between the survey questions.

Table [1] Cronbach's alpha for internal and external customers.

Cronbach's Alpha for internal customers	No. of Items	Cronbach's Alpha for external customers	No. of Items
0.825	23	0.849	13

Measure phase

For the measure phase, different measurement tools were used to determine the baseline performance of the system. A current process map was constructed for the external customers flow all over the ED.



Activity	Responsibility
Reception	Receptionist
Triage	Physician
Units Treatment	Physician
Life resuscitation room	Physician& Nurses
Laboratory & X-ray	Technician
Surgical room	Physician& Nurses

Figure 1: The current process map or patients flow for Alzawia Hospital ED.

This map shows the patient's flow during the emergency department, began from the moment he arrived until he discharged.

In order to measure the bottlenecks, value and non-value added activities, and calculating cycle time for the process, a current value stream map (VSM) was constructed for the external customer flow all over the ED after collecting the waiting times as well as the real process times. From the current value stream map, it turns out that the bottlenecks observed are during the activities of waiting before entering the triage, during treatment, and while performing laboratory test & X-ray, because there are no laboratory test and X-rays available at the emergency department facilities. It is observed that the average waiting time for these activities reaches up to 315 minutes, which considered as non-value added activities (waiting area, waiting in reception, and waiting in labs & X-ray). VSM shows that non-value-added activates contributes with 87.38% of time consumed during providing the services to patients.

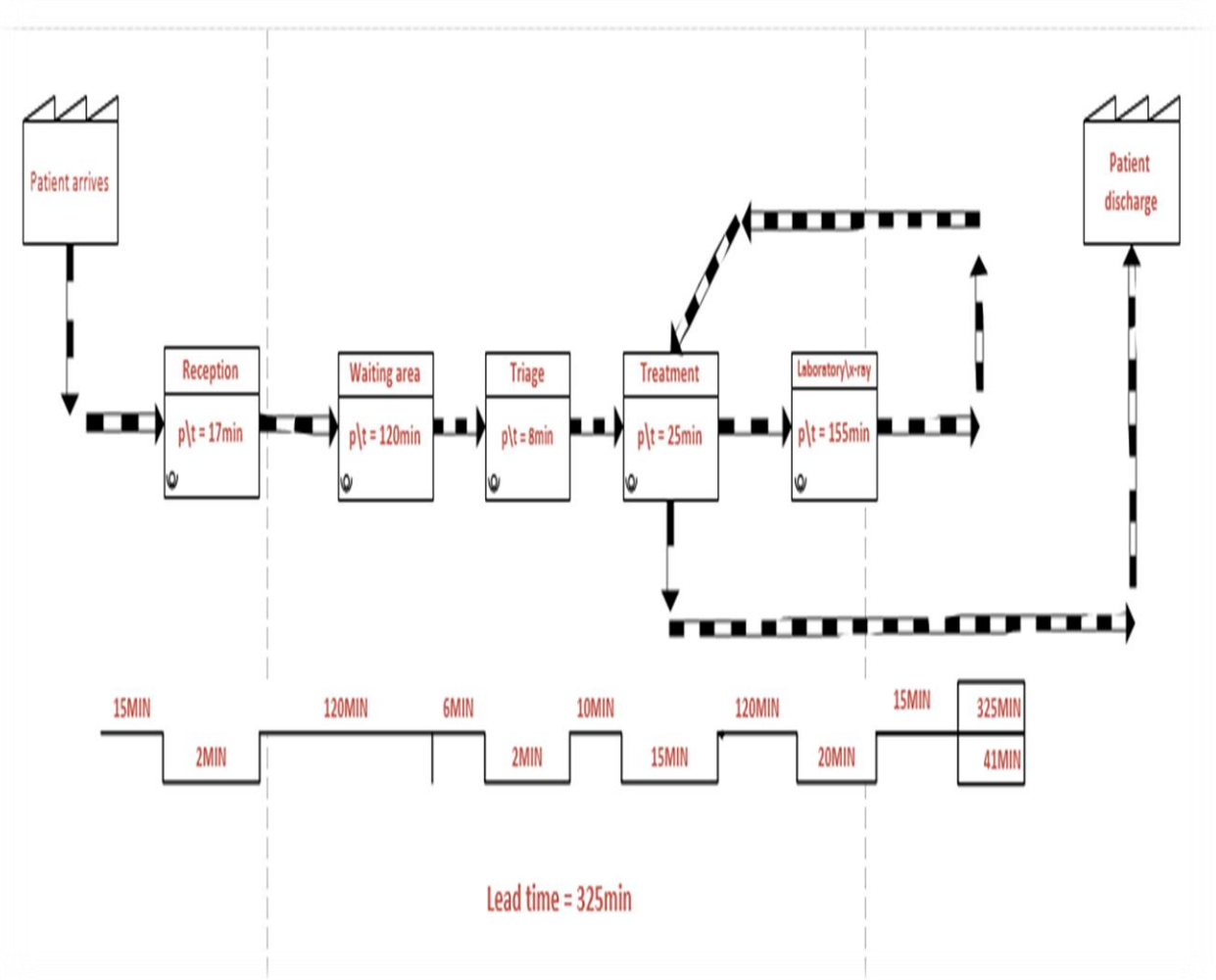


Figure 2: The current Value Stream Map (VSM) for external customers' flow

Analyze phase

In the analyze phase, several steps were used to identify and confirm the causes of the problems and concerns faced by internal and external customers to improve the process. Pareto chart is constructed to show and prioritize in order of importance the main problems and concerns captured from customers' responses of the survey. The Pareto chart for external customers shows that the main problems affecting them were the long waiting time, the scarcity of medical supplies, lack of guiding signs, and lack of sterilization. These four problems contribute to 75.6% of the total problems. On the other hand, The Pareto chart for internal customers shows convergent problems level and importance. Many concerns arise from the survey such as; low wages, lack of communication systems, lack of patient database, and others. It was revealed that mismanagement is one of the main causes of these problems. Figures 3,4 show the Pareto plot for both external and internal customers.

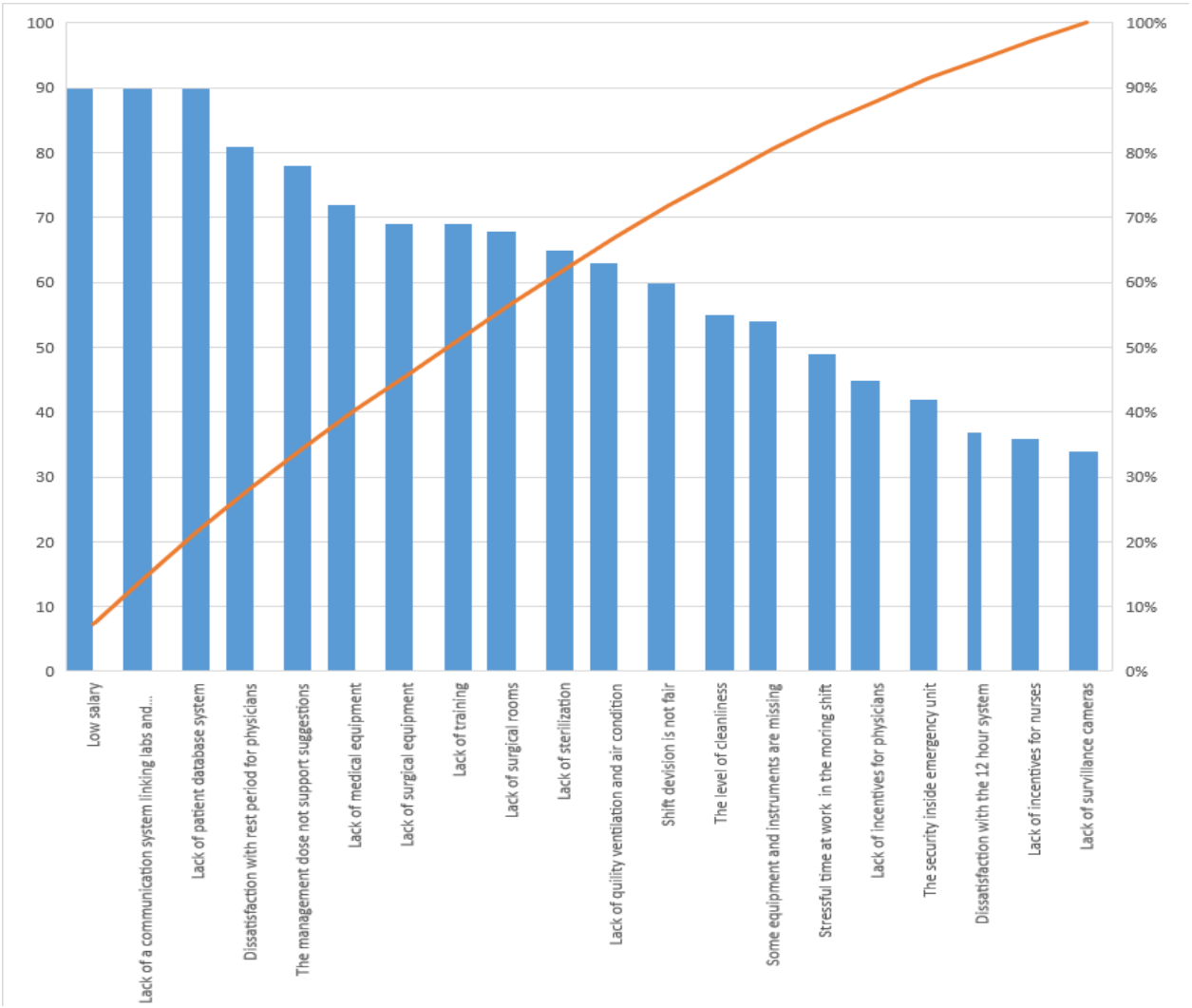


Figure 3: Pareto chart for different problems faced in the ED for internal customers.

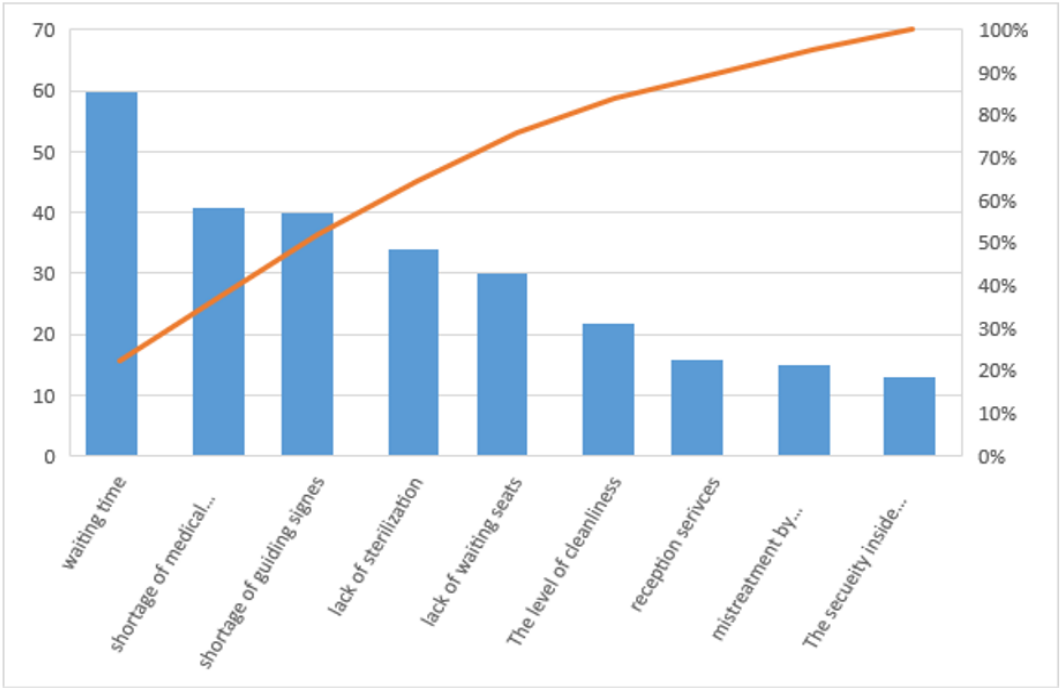


Figure 4: Pareto chart for different problems faced in the ED for external customers.

Discussion

These analyses were compiled from the results of the respondents' answers and a result of a brainstorm sessions with internal customers. Data were analyzed using process map, Value Stream Map (VSM), Pareto Chart, and cause and effect diagram tools. All the problems and concerns are illustrated as follows:

1- Waiting time: The EDs suffers unacceptably long waiting times for patients, leading to dissatisfaction, poor patient outcomes, and operational inefficiencies. Patient's average waiting time in the reception is about (15min) for registering patient's information due to the lack of an electronic registering system that facilitates the registration of patient data. as well as the untrained person in charge of registration., (120min) in the waiting area before being seen by a physician due to the shortage of physicians, and lack of examination rooms, chaos in the hospital and lack of commitment of physicians to work., and about (180min) between labs & X-ray because that the labs and X-ray inside the hospital are not activated due to the lack of necessary materials and maintenance, and lack of communication system with external labs and X-ray with ED.**.** These are shown clearly in the Value Stream Map.

2- Shortage of medical equipment: This is due to the lack of a continuous supply chain to meet their required quantities of medical equipment on-time including diagnostic, treatment, monitoring, laboratory, and patient care equipment.

3- Shortage of guiding signs: The EDs suffers a shortage of clear and effective guiding signs, which is leading patients and visitors results in delayed access to care, and increased staff workload on providing directions**.**

4- Lack of sterilization: The EDs suffers from issues related to inadequate sterilization of medical equipment and supplies, putting patient safety at risk and potentially leading to increased rates of hospital acquired infection. This is due to lack of sufficient budget for the purchase and maintenance of sterilization equipment and supplies, lack of clear standards and procedures to ensure proper sterilization.

5- Lack of waiting seats: The EDs suffers a shortage of comfortable and well equipped waiting areas for patients, leading to overcrowding and patient's discomfort. There is insufficient space in the design of ED to accommodate patients, and a difficulty in providing the necessary equipment and supplies to improve waiting conditions.

6- Low salary for hospital's staff: The EDs faces challenges in retaining and attracting qualified healthcare professionals due to low and sometimes nonexistent salaries, which can affect the quality of care and the overall operational efficiency of the hospital.

7- Lack of a system linking labs and physicians: The EDs currently lacks a system that link the hospitals laboratory services with the physicians, leading to inefficient communication, delayed test results, and potential patient safety risks.

8- Lack of patient database: The EDs currently lack a patient database, leading to inefficient data management. There are several problems that result from this issue, such as difficulty access patient data, inability to track patient history, and challenges in coordinating care across different departments.

9- No rest period for physicians: physicians complain about the lack of rest periods and equipped rooms to use during their rest periods, which increases their workload and stress. This situation negatively affects their mental and physical health, as it becomes difficult for them to provide the best possible medical care to patients.

10- The management does not support suggestions: The physicians and nurses suffer from the fact that management does not listen to their suggestions, which has a negative impact on their communication with them. Ignoring these suggestions reflects poor internal communication and makes employees feel that their opinions are not taken into consideration. This leads to a decline in motivation and productivity, as individuals are disengaged from active participation in the work environment.

11- Lack of surgical equipment and surgical rooms: The Eds suffers from a shortage of surgical equipment, causing delays in patient treatment, misuse of resources, and increased safety risks. This shortage significantly affects the hospital's performance, as physicians are forced to postpone necessary surgeries. This has a negative impact on the quality of care and patient satisfaction. The lack of surgical equipment leads to reliance on temporary solutions, increasing the likelihood of medical errors. There are actually about 5 surgical rooms at the central hospital, but only one room is available for operations. This room suffers from a severe lack of basic surgical equipment and beds are unusable. This room used alternately between units, and this is the main reason for delays in surgery for patients.

12- Lack of training: The EDs suffers from a lack of training for their staff, due to the lack of continuous and comprehensive training programs, as well as the lack of effective coordination between educational and health institutions to develop these programs. This lack of training not only affects the quality of care provided, but also reduces the effectiveness of emergency response at critical times and increases the rate of medical errors.

Cause and Effect Diagram analysis: Using brainstorming sessions, a Cause-and-Effect Diagram was constructed resulting in six main causes and each main cause has its sub-causes**.** The main causes shown in figure 5 are: Process, staff, environment, nurses, equipment, and quality department.

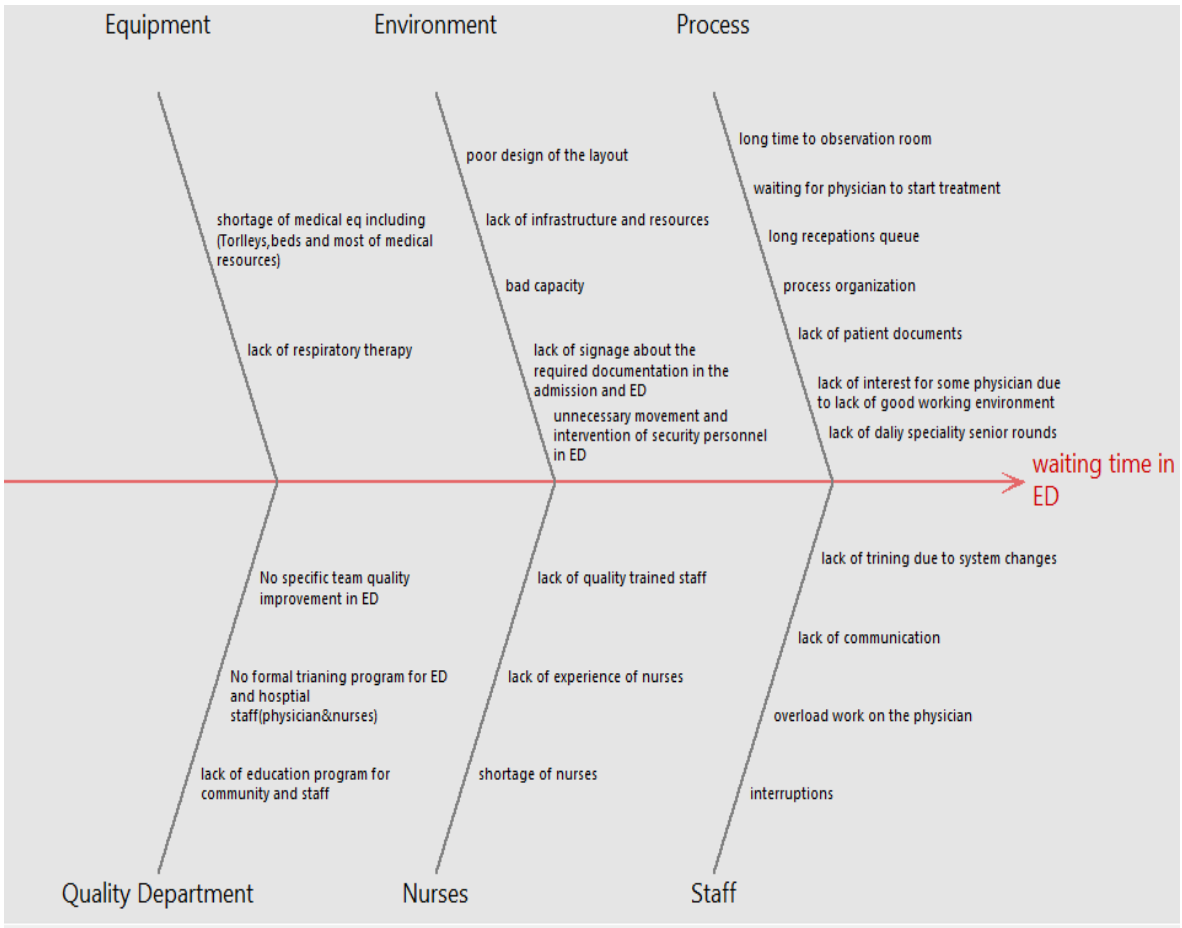


Figure 5: Cause and Effect Diagram for the long waiting time at the Eds.

Improve phase

The improve phase focuses on improving the process by eliminating defects and waste of all types using tools like value stream mapping and process flowcharts, identifying bottlenecks and waste. The following map describes the modified process map created after eliminating of unnecessary movements and non-value added activities.

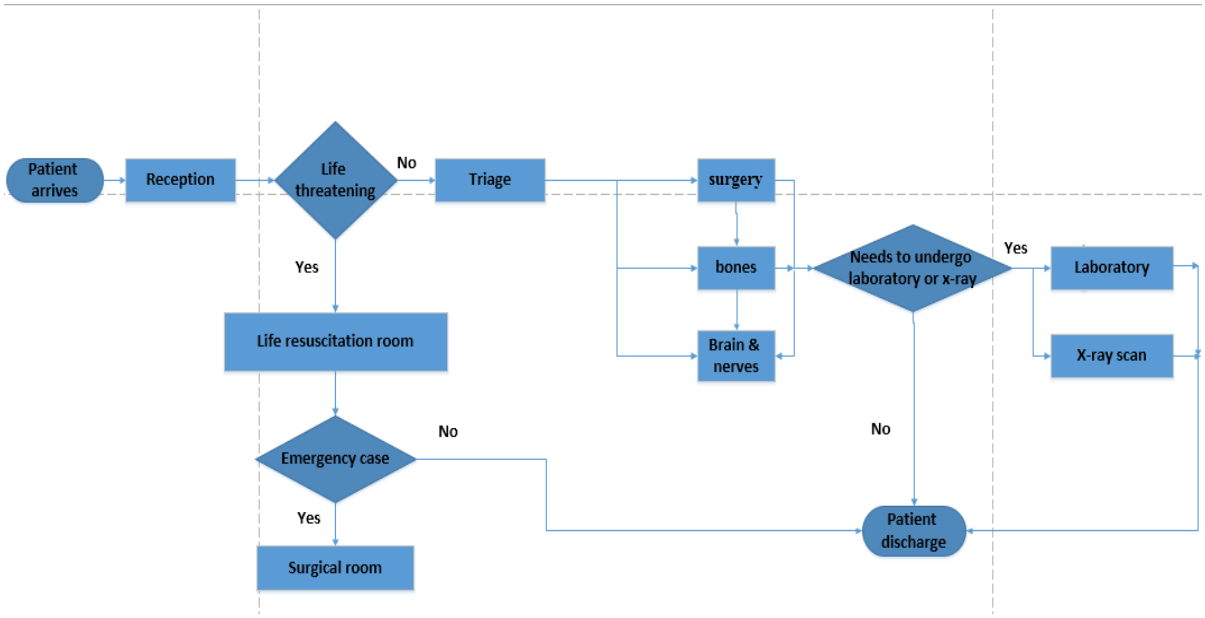


Figure 6: improved process map for the ED.

A modified VSM was created reducing the overall cycle time from 325min to 99min after eliminating the bottlenecks and non-value added activates. The following map shows the improved the VSM.

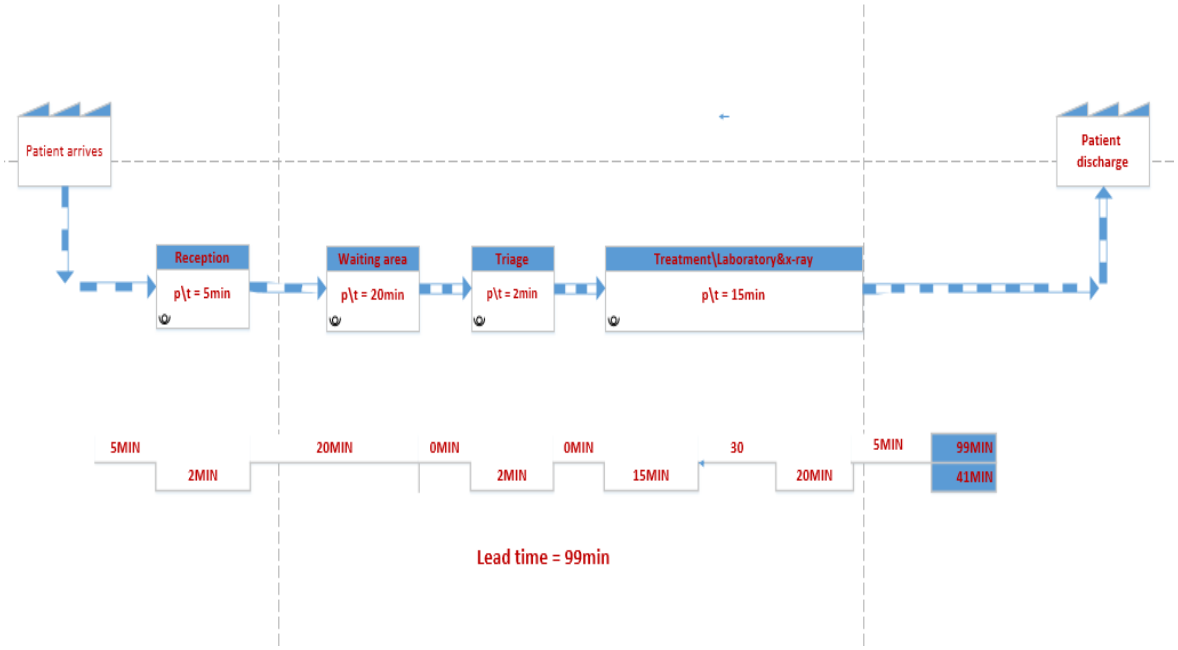


Figure 7: Improved value stream map for the ED

An improvement effort has been proposed in order to create improvements and eliminate patients' discomfort and dissatisfaction as follow:

1- Waiting time: First, an advanced digital data recording system, which allows officials to record information quickly and accurately, should be put in place by providing modern equipment and well-trained teams. This can minimize the initial waiting time and ensure a smooth flow of information. Second, consideration should be given to increase the number of physicians and nurses available in the ED, as well as improve the distribution of rooms and facilities to meet the needs of patients. This may require new recruitment or even the redistribution of staffs from other departments in the hospital, to ensure there are enough of them. Also, chaos management within the hospital needs to be improved by organizing the entry and exit mechanism for patients, clearly defining waiting areas, and enhancing cooperation between different medical teams. As for waiting times for laboratory and X-ray, reworking in the hospital's labs by providing the necessary materials and tools will have a significant impact. Furthermore, an effective communication system with external laboratories is required to ensure that test results are not delayed, allowing physicians to make treatment decisions faster.

2- Shortage of medical equipment: Conduct a comprehensive assessment to determine the type and quantity of medical devices required based on utilization rates and current ED needs. Develop strategic relationships with suppliers and negotiate long-term contracts to ensure availability of devices and consumables when needed. Consider signing cooperation agreements with other hospitals or organizations to share resources in case of emergencies. Establish an integrated inventory management system and use modern technologies, such as specialized inventory management software, to monitor the status and physical availability of devices and consumables. Implement preventive maintenance programs and establish a regular maintenance and inspection schedule for devices to ensure they are working efficiently.

3- Shortage of guiding signs: A comprehensive signage improvement program that addresses gaps and increases the operational efficiency of the hospital should be developed and implemented. This includes redesigning spaces in the department and installing colorful and simple signage that clearly displays information, to ensure those patients' needs and expectations are met.

4- Lack of sterilization: The management should take urgent steps to allocate a larger budget for the sterilization department. This budget should include the purchase of modern sterilization equipment and the provision of the necessary materials to ensure a high level of hygiene. In addition, clear standards and procedures should be put in place to ensure that all emergency department staff perform sterilization procedures accurately and effectively.

5- Lack of waiting seats: A thorough review of existing waiting areas should conduct, including the number of seats, availability of amenities (e.g. charging stations, water, magazines), and the general condition and cleanliness of the spaces.

6- Low salary: Conduct a detailed analysis to determine the appropriate salary and benefit ranges for different roles and levels within the hospital, taking into account the local labor market and industry benchmarks.

7- Lack of a system linking labs and physicians: laboratories and X-ray should be activated inside the hospital, equipped with the necessary equipment, and a system that connects them to physicians, as well as a system that connects physicians to external laboratories to reduce the waiting time for patients.
8- Lack of patient database: Create a database linked to the national number for each patient to facilitate access to the correct data and avoid confusion. The database helps to organize and store information in a neat and easily accessible manner. The database should contain accurate details about each patient.
9- No rest period for physician: Identify and equip rooms to be used as rest areas for physicians.
10- The management does not support suggestions: Establish formal communication channels where employees can systematically provide suggestions and feedback, fostering a sense of belonging and incentivizing participation in development efforts.
11- Lack of training: A Comprehensive training programs should be developed and implemented in line with the hospital's strategic objectives and staff needs.
12- Lack of surgical rooms and surgical equipment: Improving the provision and perform maintenance of surgical rooms and equipment.

Control phase

This is the final part of any Lean Six-Sigma project and is an essential part of maintaining the improvements that have been developed. This can be achieved by standardizing and documenting procedures for improvements. This also includes maintaining the improved value stream map that has been created. As well as creating a system that monitors the continued implementation of these improvements and maintains sustainability.

Conclusions and recommendations

Conclusions

1. Two questionnaires, each containing four main themes, were created to identify a range of problems faced by patients and physicians within the ED.
2. Through Pareto-chart analysis, thirteen problems of the most important problems were identified and prioritized.
3. Through the cause and effect diagram, six main reasons for the long waiting time in the ED were identified.
4. A new process map was created by eliminating all unnecessary movements and non-value added activates.
5. A new value stream map was created where the overall time was reduced from 325 to 99 minutes if improvements were made.

Recommendations

1. It is strongly recommending the adoption of Lean Six-Sigma as a strategic continuous improvement methodology to bring about improvements in all parts of the services provided by the health sectors, whether in the emergency department or other departments.
2. Motivating workers in the fields of providing health services financially, morally and by training.
3. Installing colorful and simple signage that clearly displays information.
4. Activating laboratories and X-rays and providing medical equipment and therapeutic medicines.
5. Coordinate the work schedules of physicians so as not to create a workload for some and increase the effectiveness of their performance.
6. Providing systems to link internal and external laboratories with physicians.
7. Provide a standardized database that is easily accessible to all ED.

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