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Service Management Model Based on Lean and Kaizen Tools to Improve the Level of Satisfaction in Health Sector Companies

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Abstract. Thehealth sector has a relevant economic impact in Peru, whose main problem is customer satisfaction, the main reasons being high waiting times and lack of order and cleanliness. Therefore, this study proposes an improvement model focused on this indicator that will consist of 3 tools that will solve the root causes, which are 5s, standardized work, and SMED. Likewise, the model will be validated through a pilot test for the first two tools, and for the last one, the Arena Simulator software will be used. The results obtained were positive, such as the reduction of the average waiting time of the patient in the waiting room by 60.9% and the average time of the patient in the process by 25.5%. This resulted in a 14.5% increase in customer satisfaction. Furthermore, the pilot test reduced the time spent searching for supplies by 83.3% and increased customer satisfaction about cleanliness by 219%. All these results led to a 14.5% increase in the primary indicator of customer satisfaction.

Keywords:SMED, 5s, standard work, kaizen, healthcare, satisfaction

1. Introduction

Thehealth sector belongs to the tertiary sector, which expanded, reaching over 60% of gross domestic product (GDP) since 2015, generating a relevant impact on economic growth in Peru [1]. Additionally, health spending in Peru reaches 5.3% of GDP, of which 58.7% belongs to public health spending and 41.2% to private expenditures [2]. On the other hand, the service sector accounts for 42.3% of the country's employed population, equivalent to more than 7 million jobs [3].Furthermore, user satisfaction is an indicator of the quality of care provided in health services. In addition, according to the national survey conducted by the National Institute of Statistics and Informatics (INEI), the level of satisfaction with the service received in health facilities was 73.9% of satisfied users. However, the level of satisfaction is expected to exceed 80% [3]. According to the literature, the problem identified is generated by inadequate hygiene, lack of working materials and supplies, long waiting times for medical care, instability of services, and others, which would lead to low user satisfaction [4].This problem has also been identified in other studies around the world. For example, the two new hospitalization units of the Navarra hospital complex in Spain presented disorganization of materials, products in inadequate cleaning conditions, and dirty patient environments. These problems diminish the quality of the service, as well as user satisfaction [5].Under this premise, a model based on the 5s, single minute exchange of die (SMED), and work standardization tools was developed. This scientific article is divided into four parts: State of the art, Contribution, Validation, and Conclusions.

2. State of the Art

2.1. Kaizen in the Healthcare Sector

Kaizen is a continuous improvement of the process to improve quality and productivity continuously. This means that the Kaizen methodology seeks to achieve the goals already defined by improving gradually or slowly, but steadily so that there is a significant improvement in the process [6]. Kaizen methodology can cause the necessary alignment between management and employees because it needs all workers to

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participate in continuous improvement activities. A better definition would be that small improvements that add value to the process are continually being added, thus reducing waste [7].

One of the most relevant concepts of Kaizen is the PDCA cycle, which is composed of 4 stages: plan, do, check, and act. Its application is efficient and effective in process management and allows two types of actions: temporary and corrective. The first aims to correct problems immediately, and the second is permanent because it is based on an investigation of the problem to eliminate its causes. Therefore, it is an essential tool for the process of continuous improvement within the process. [8].

This methodology can be adopted as organizational culture; this would help fulfill the company's mission and vision. Also, it would support the sustainability of the application of lean tools over time and its continuous improvement [6][7][9].

2.2. 5s in the Healthcare Sector

The 5S management method is based on a set of practices whose main objective is to improve productivity through the maintenance and creation of clean and organized workplaces [10]. This lean tool is known by the term 5s, as it comes from five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke [11].

The 5s tool was applied to solve the main problem of long waiting times in a pathology laboratory of a public hospital in Ankara, Turkey. It was evidenced that both the tool and the methodology succeeded in solving the leading causes of the main problem, such as lack of cleanliness, lack of clinical information, material supply failures, errors, etc. At the end of the study, the waiting time was improved from 54 hours and 37 minutes to 43 hours and 37 minutes, equivalent to an improvement of 4.6% [12].

2.3. SMED in the Healthcare Sector

SMED aims to increase productivity by reducing waiting times and unused human talent [13]. In addition, this tool is one of the essential tools to reduce process times by identifying internal and external activities [14][15].

In a hospital in Kuwait, in the physiotherapy area, with SMED, it was possible to reduce the cycle time from 60 to 52 minutes/patient on average and the waiting times. This contributed to a reduction in patient time in the clinic [16].

2.4. Standard Work in the Healthcare Sector

In the Toyota Production System (TPS), standardization takes on a different meaning. Unlike quality management systems that focus on the process or product, the TPS focuses on operations, which are the activities performed by workers. Therefore, it receives a specific denomination in this context: standard work (SW) [17]. SW indicates that successful processes and practices are adopted as standard and then transferred to the production lines and to the workers, who, once they incorporate it, always perform it in the same way. It is based on the idea that quality, safety, and increased efficiency must be clearly understood and exercised by the employees [18].

This tool was applied to standardize a disposable kit for intravenous therapy used in 7 hospitals in Mexico City and resulted in reducing costs and optimizing nursing care by avoiding waste of material, time, and resources [19]

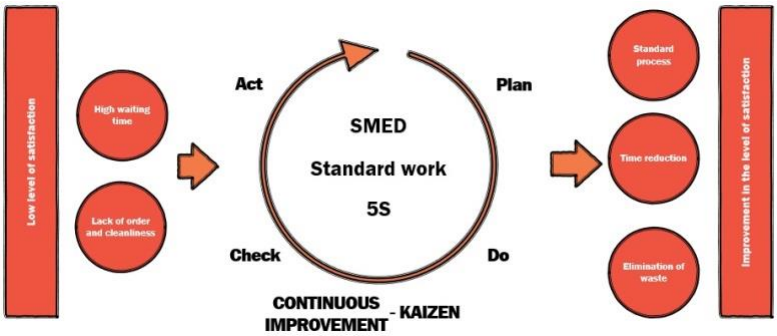

Fig. 1.Management model

3. Contribution

3.1. The Rationale of the Model Basis

Next, we will present the comparative matrix where the causes of low satisfaction in the company and the items that will be used as a basis for the choice of tools for the proposed model will be confronted.

TABLE I. COMPARISON MATRIX OF CAUSES VS. STATE OF THE ART

Causes / Articles	Process no optimized	Clutter in warehouse	Lack of standardization	Lack of cleaning plan
Durur, F., & Akbulut, Y. (2019)	-	5s	-	5s
Almutairi, D., Alrghaib, L., Alenezi, M., Almutairi, M., Alajami, R., & Alfandi, L. (2020).	SMED	5s	-	5s
Zamudio, J. J. E., & Chávez, G. I. R. (2017).	-	-	Standard work	-
Proposal	**SMED**	**5s**	**Standard work**	**5s**

3.2. Componentsof the Model

The proposed model will be developed in 4 components, which will be explained in detail below:

1. Component 1: Plan

First, the company's current situation will be described to the workers to become aware of the problems that exist and the relevance of solving them. We will begin by identifying the root causes of the problem using the Ishikawa diagram and then prioritize them using a Pareto chart. Once the root causes have been determined, the tools to be used will be chosen. With all this information, the problem tree and the indicators to evaluate the model will be elaborated.

2. Component 2: Do

In this model stage, the 5s, SMED, and work standardization improvements will be implemented.5s will improve order and cleanliness in the ultrasound area, warehouse, and waiting room. In addition, SMED will reduce time in the reception, consultation, and ultrasound processes. Likewise, the work standardization will standardize the cleaning process, ensuring quality and a determined process time.

3. Component 3: Check

For the verification, a checklist will be made to see each module's implementation level of each 5s and thus determine which one needs improvement. The proposed indicators will also be followed up to determine if there is an improvement (AS-IS).

4. Component 4: Act

This model would be implemented in other company areas, such as laboratory and topic if the objectives were achieved. In addition, after identifying the opportunities for improvement of the model, corrective actions will be developed and implemented.

3.3. Indicators

For this project, four indicators will be used to evaluate the impact of the model based on the results obtained and verify whether it was possible to achieve the research objective.

a) Level of satisfaction

It allows us to determine the percentage of satisfied patients whose objective is to increase satisfaction by 20%.

$$\frac{Total\ number\ of\ satisfied\ patients}{Total\ patients\ attended} * 100\%$$

b) Average patient time in the waiting room

It allows determining the average time a patient waits to be seen, from when they arrive until the doctor sees them. Its objective is to reduce waiting time in the doctor's office by 62%.

$$\frac{\sum Patient\ waiting\ time}{Number\ of\ patients}$$

c) Average search time for supplies

It allowsto determining the average time it takes to find supplies in the practice's warehouse. Its objective is to reduce the average supply search time by 33%.

$$\frac{\sum Supply\ search\ time}{Number\ of\ supplies}$$

d) Average patient's time in the process

It allows determining the average time of the patient's stay from arrival to departure. Its objective is to reduce the patient's average time in the process by 29%.

$$\frac{\sum Patient\ time\ in\ the\ process}{Number\ of\ patients} * 100\%$$

e) Customer satisfaction concerning cleanliness

It allows determining the % of satisfied customers about cleanliness. The objective is to increase satisfaction by 27%.

$$\frac{Total\ number\ of\ patients\ satisfied\ with\ cleanliness}{Total\ number\ of\ patients\ attended} * 100\%$$

To evaluate the improvements that will be achieved, the indicators obtained will be compared with those previously mentioned since an improvement is sought with the implementation of the proposals.

4. Validation

4.1. Initial Diagnosis

The proposed model was implemented in a polyclinic belonging to the health sector. The main problem encountered is low customer satisfaction, which is found through post-service surveys. This is due to high waiting times, lack of information, and lack of order and cleanliness. The low level of this indicator results in the loss of S/.55770 per year, which is equivalent to 23% of turnover. The case study was validated in October when the 5s tool was applied, the SMED and its simulation were carried out, the standardization of cleanliness was used, and surveys were conducted to evaluate the indicators.

4.2. Validation Design and Comparison with the Initial Diagnosis

For the validation of the 5s and the work standardization, a pilot test was conducted in the ultrasound area, warehouse, and waiting room, which were carried out in October 2021. Although, on the other hand, the Arena Simulator program was used to validate the SMED tool, the customer service process was not modified. However, the times of the process activities were improved. Therefore, it is essential to consider the patient's time in the process, the patient's time in the waiting room, the time spent looking for supplies, customer satisfaction, and customer satisfaction concerning cleanliness, since these will allow us to evaluate the improvements in the company.

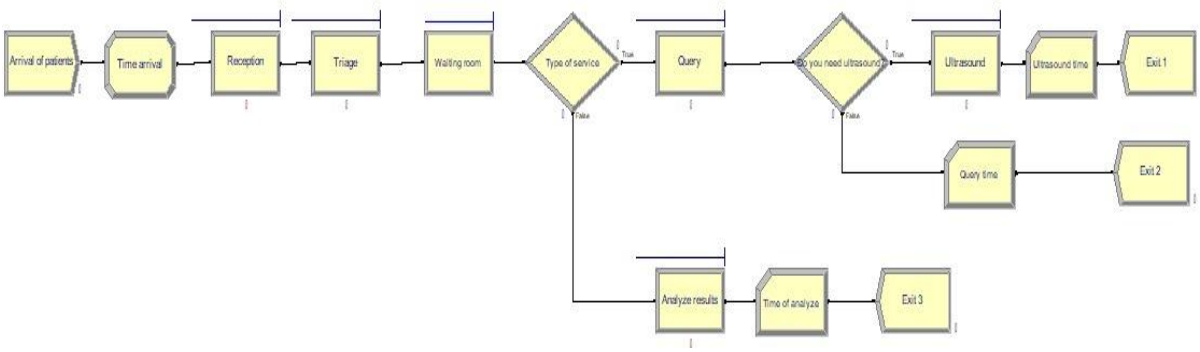

Fig. 2. Proposed Arena simulation model

4.3. Application of the Proposed Model in the Case

For the validation of the 5s and the work standardization, a pilot test was conducted in the ultrasound area, warehouse, and waiting room, which were carried out in October 2021. Although, on the other hand, the Arena Simulator program was used to validate the SMED tool, the customer service process was not modified. However, the times of the process activities were improved. Therefore, it is essential to consider the patient's time in the process, the patient's time in the waiting room, the time spent looking for supplies, customer satisfaction, and customer satisfaction concerning cleanliness, since these will allow us to evaluate the improvements in the company.

a) Implementation of the 5s

Seiri (Classify): Items were classified in the ultrasound, storage, and waiting room areas. The criteria used were the item's condition, time in the area, and the action

Seiton (Sort): The items left after sorting will be organized under the criteria of the frequency of use circle, and at the same time, they will be labeled to establish order and facilitate their search.

Seiso (Clean): Once the sources of dirt were identified and the cleaning plan was developed, this plan was implemented to eliminate the sources of dirt.

Seiketsu (Standardize): In this stage, visual controls were implemented in the ultrasound area and the warehouse. The 5s panel was also prepared for dissemination throughout the company.

Shitsuke (Discipline): In this last stage, checklists and audits were carried out to evaluate the implementation of the 5s and verify if it is being maintained.

Fig. 3. Application of the 5s

b) Standard work

The proposed standardized cleaning program was implemented and evaluated by patient surveys.

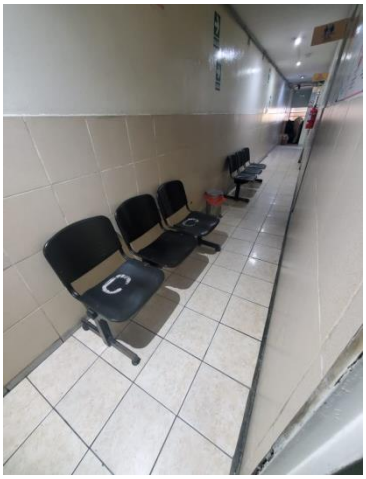

Fig. 4. Application of the standard work

c) SMED tool simulation

1. Current situation – Software Arena

The software used for the simulation was Arena Simulator, where the customer care process was covered. This process starts from the arrival of patients, continues with reception, then triage, followed by consultation or analysis of results, and finally, if required, ultrasound. Subsequently, the optimal number of repetitions to be used in the simulation was determined using a 95% confidence level and an error of 10%. As are a result, we obtained a value of 138 repetitions.

2. Process modeling in Software Arena

Improvements were obtained in the leading indicators With the SMED simulation and the 5s and work standardization application. The results obtained are shown below.

TABLE II. RESULTS OF VALIDATION

	Indicator	**As-Is**	**To be**	**Δ%**
General	Patient satisfaction	58.7%	73.2%	14.5%
SMED	Patient time in the waiting room	16.1 min	6.3 min	60.9%
SMED	Patient time in the process	58.1 min	43.3 min	25.5%
5s	Search time for supplies	3 min	0.5 min	83.3%
Standardization	Patient satisfaction with cleanliness	61.2%	83.1%	21.9%

According to table 2, the level of client satisfaction increased to 73.2%. Thanks to the implementation of the SMED tool, it was possible to reduce the time required for consultation activities, analysis of results, and ultrasound. These time reductions allowed for greater fluidity in the flow of the process, thus reducing waiting time. Likewise, the 5s achieved a notable decrease in the time spent searching for supplies thanks to the order and cleanliness that was implemented with it. Finally, the standardization of the cleaning process allowed us to ensure the quality of the cleaning of the areas, thus increasing customer satisfaction concerning cleaning.

5. Conclusions

Under the Kaizen methodology and using the 5S, SMED, and work standardization tools, we increased customer satisfaction from 58.7% to 73.2%.

Thanks to the SMED tool, it was possible to reduce the time spent by the patient in the process from 58.1 minutes to 43.3 minutes and the time spent by the patient in the waiting room from 16.1 minutes to 6.3 minutes, thus allowing a considerable increase in satisfaction.

It was concluded that according to the data obtained from the Arena model, improvements in patient care could be achieved, supporting the results achieved in the case study in the Kuwait hospital [16].

For future research, it is recommended to use the VSM tool to have a better view of the entire process and to be able to eliminate unnecessary activities.

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