Process Improvement in Emergency Units – Two Analysis Cases

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Abstract

This study shows a proposal to improve processes at two Emergency Units in Colombia. Lean was chosen as the main strategy to achieve the intended vision of patient value and also because this method applied in Hospitals is considered as new in the country. The Emergency Units in question offer long waiting times to assist patients. Also, the Emergency Units fail to comply with the minimum required spaces stipulated in the Guide Manual for Emergency architectural design. A diagnosis of the situation is carried out to identify the activities that do not add value to the process. Subsequently, proposals are put forward regarding aspects such as improvement of processes; redesign of the emergency Units and the use of management indices to evaluate the fulfillment of objectives according to Lean Manufacturing applied to Hospitals. The applicability of the proposal to patients' waiting time is assessed using Arena-based simulations. Results show a time improvement of 62% and 57% respectively.

Keywords
Lean Manufacturing, Process Improvement, Health Care

1. Introduction

The term Lean is recognized as a continuous improvement methodology (Manos et al., 2006; Zarbo., 2012., Culcuoglu et al., 2011) that focuses on the reduction of waste (Gifford, 2008). In healthcare, waste might be seen as non-added-value activities that do not improve or add value to the patient (Pondhe et al., 2006). Waste, also referred to as Muda, comprises seven types of activities, namely over production, unnecessary motion, excess inventory, excess transportation, rejections/rework, waiting, and over processing (Cachon & Terwiesch., 2009)

Lean is applicable to emergency departments because it ensures that all processes are carried out with quality, also achieving customer satisfaction (Morales, 2000). People who enter Emergency Units suffer from particular conditions, and therefore it is very important to consider the interactions between patients and medical staff, especially in light of the evidence that suggests such interactions tend to be inefficient at emergency departments (e.g. patients have to wait long to be assisted) (Anneke & Dadich., 2009)

Developed countries around the world have begun to apply Lean to healthcare (Adra, 2005; Aherne, 2007; Bliss, 2009; Sobek & Lang, 2010, Breuer, 2013; Burguess & Radnor, 2013) but in countries such as Colombia, these methods are still considered as new. This article presents two case studies (in Colombia) that address long waiting times in patient assistance when compared to the standards established by The District Department of Health.

2. Methodology

This research was conducted in two emergency units of hospitals in Colombia. Lean was chosen as the main strategy to achieve the intended vision of patient value (Wood, 2004; Found & Harrison, 2012; Lewis, 2012)

First of all, the current state of processes was established by taking measurements of the times and distances that patients have to deal with in order to be assisted (served). Then, the activities that do not add value to the patient process were identified; afterwards, an improvement process was proposed and validated using Arena software simulations.

2.1 Process description.

In order to understand the process, interviews were conducted with the leaders of the two emergency units in question; the results revealed that, in general, the processes are similar (Figure 1). Therefore, to obtain an accurate representation of the actual process and also a diagnosis, the research team accompanied patients throughout the process; obtaining measurements of time intervals and data of the distances to be traveled. This provided the opportunity to ask questions to the staff (nurses and doctors) and so gain a practical insight into the actual flow.

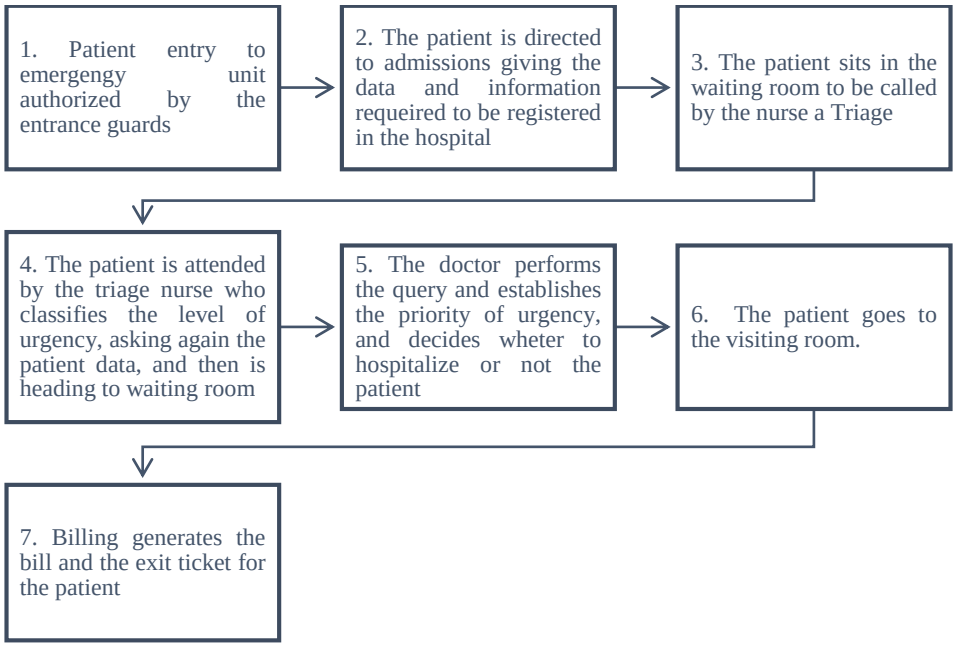

Figure 1: Emergency units block diagram.

The multifunctional process map (Figure 2) captures the activities involved from patient's arrival to the point at which patients are discharged or transferred to another process that does not depend directly on the emergency department.

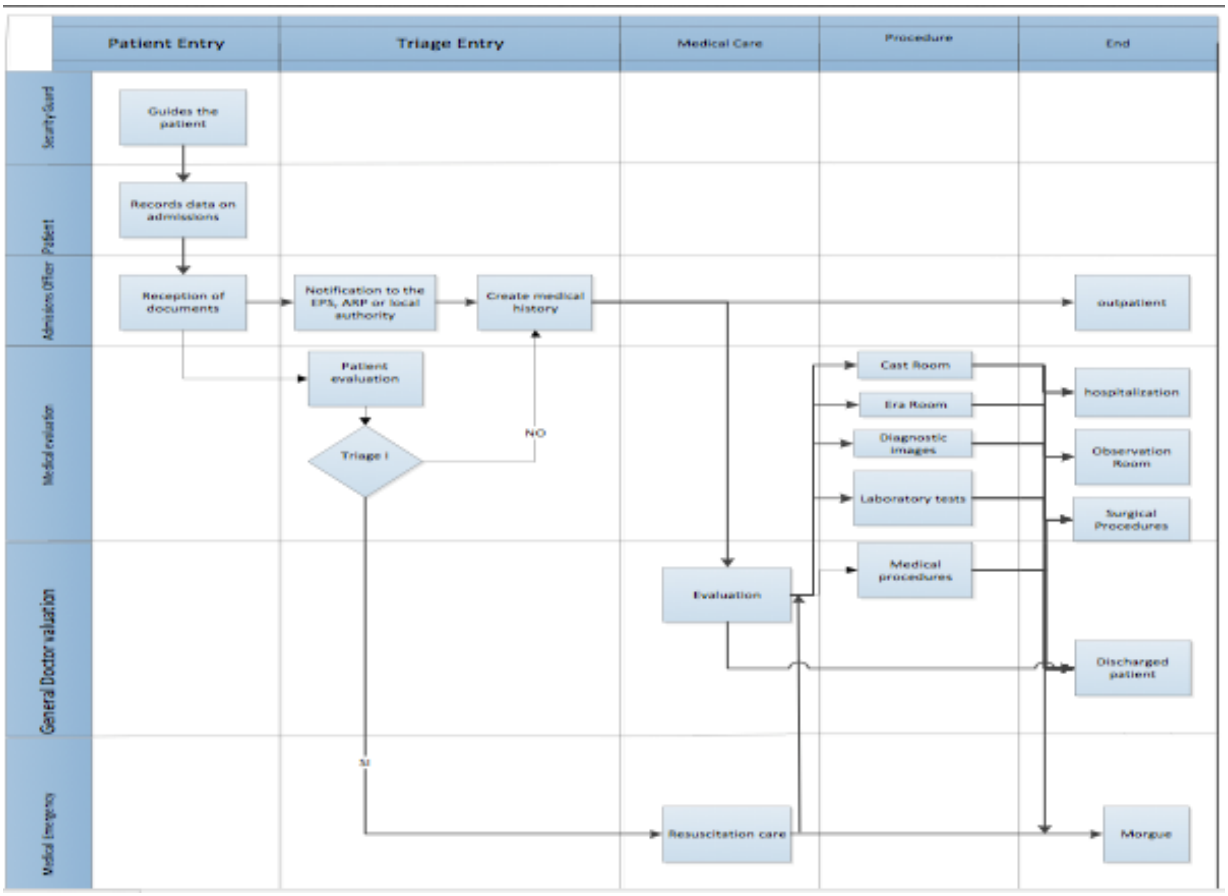

Figure 2: Multifunctional Process

2.2 Data Collection and Spaghetti diagram.

As previously discussed, the research team accompanied patients throughout the process, taking data of the distances to be traveled. The Emergency Units take long waiting times to assist patients, when compared to the standards established by The District Department of Health (Table 1).

Table 1: Average Waiting times Emergency Units 1 and 2 Vs. Waiting Times Established By The District Department Of Health

Triage Level	Waiting Time Established By The District Department Of Health	Average Waiting Time Emergency Unit 1	Average Waiting Time Emergency Unit 2
I	Immediate	Immediate	Immediate
II	Immediate to 30 minutes	90 minutes	90 minutes
III	31 to 60 minutes	88 minutes	120 minutes

In Table 1, it can be observed that the average service times vary from one emergency unit to the other.

Moreover, both the Emergency Units failed to comply with the minimum required spaces stipulated in the Guide Manual for Emergency architectural design (i.e. 925 m2). The actual spaces corresponded to 717.53 m2 in the first case and 380,73 m2 in the second case; however, in both cases empty or improperly used offices (or spaces) were found. Figure 3 shows the spaghetti diagrams of Emergency Units 1 and 2.

Figure 3: Spaghetti Diagrams, Emergency Units 1 and 2.

2.3 Value Stream Mapping to Identify Process Waste

Following the construction of block, process, and spaghetti diagrams as well as data collection, the Value Stream Mapping (VSM) was established for each emergency unit. Figure 4 shows an example of the Value Stream Mapping in Emergency Unit 1. More than half of the total time cycle is attributed to patient waiting times. All of this waiting time is non-added-value and represents an opportunity to eliminate waste from the process.

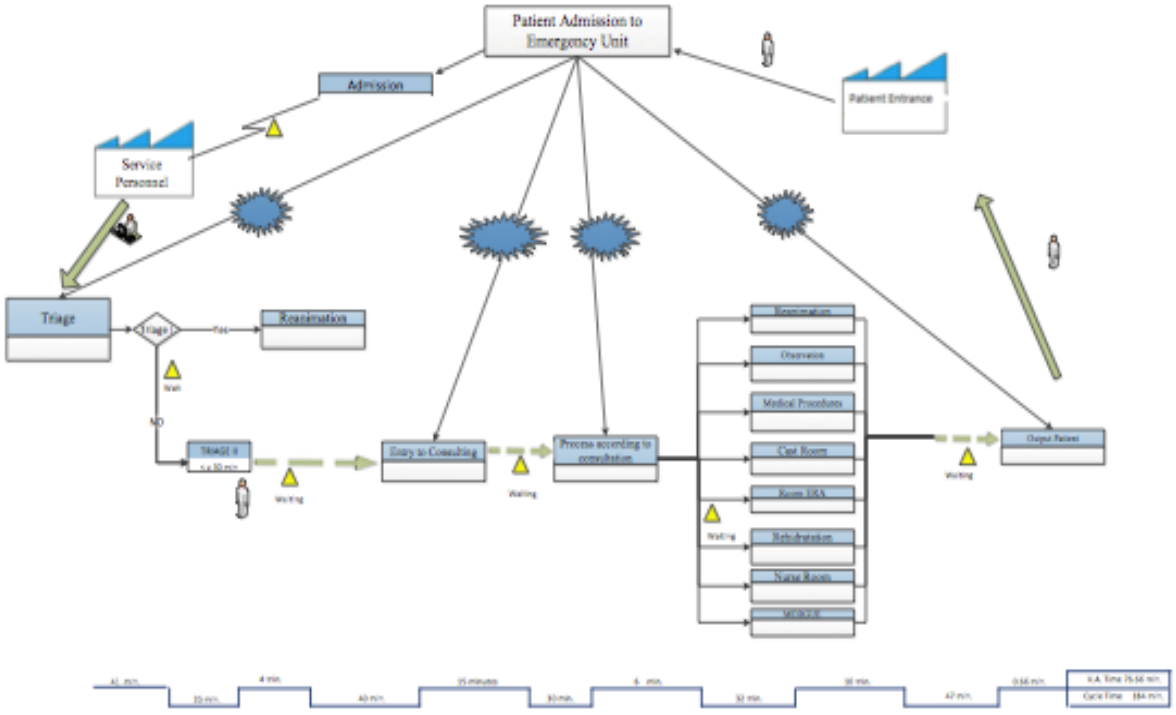

Figure 4: Value Stream Mapping, Emergency Unit 1.

In figure 4, the different Kanban bursts indicate processes to be improved or eliminated. The activities to be enhanced are as follows: admissions, waiting time login prior to consulting, process according to consulting and output order of patients.

3. Results and Findings

- In both cases activities were improved. The admission process shall be improved assuming that the process of capturing patient information is held during orientation. Waiting times for processes, namely login prior to consulting, process according to consulting and output order of patients, were improved by considering the time analysis of the study and the corresponding assignment of personnel involved. An off-the-staff redistribution of functions was proposed and some tasks are now to be held by lower-level staff (Techs/Aides).

- Software for medical records was implemented so as to help the medical staff to have updated information as well as for billing purposes; this software also reduced problems in access to information and eliminated unnecessary delays.

- The research team observed that there was a deficiency in terms of personnel in certain work shifts while in other shifts there was excess of personnel; hence staff was re-scheduled.

- In both cases a redistribution layout was proposed, providing lower distances to be traveled by patients.

- The new layout proposed made it possible to use 70.41 m^2 and 72,82 m^2 of unused spaces in unit 1 and 2, respectively. The proposed layouts for Unit 1 and 2 are shown in figure 5.

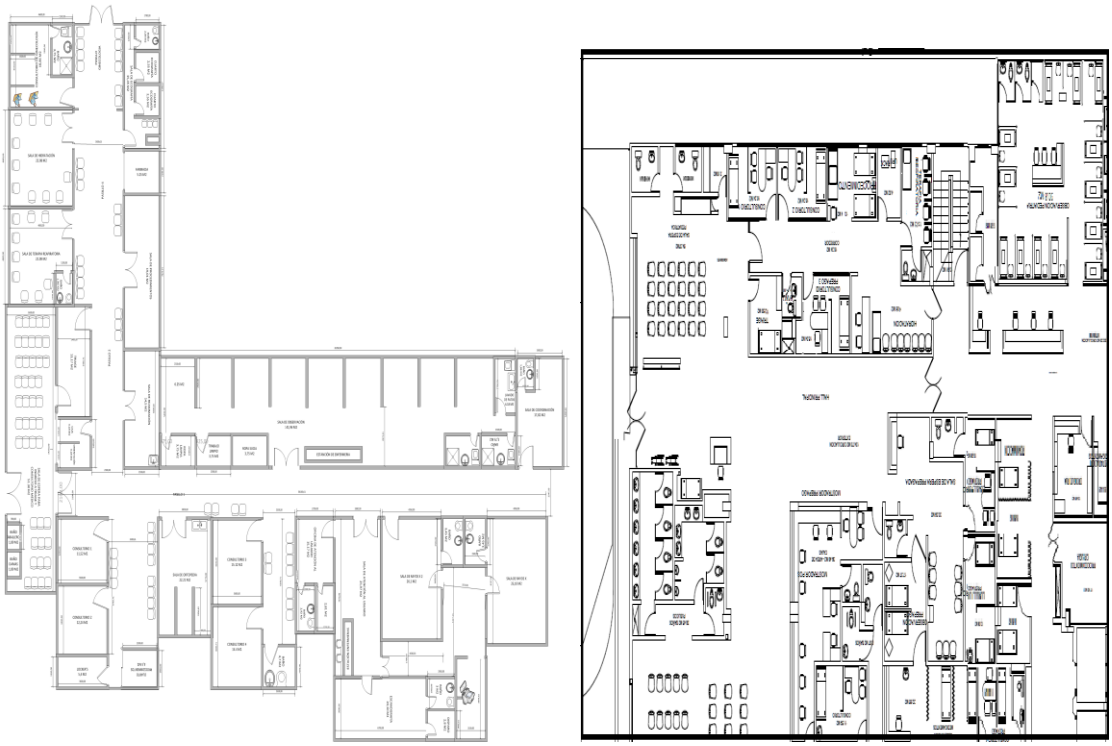

Figure 5: Proposed Layouts for Units 1 and 2.

- The applicability of the proposal to patients waiting time was assessed using Arena-based simulations for the admitting-patient process proposed. Results show a waiting-time reduction, respectively for each Emergency Unit.

- Figure 5 shows an example of the Value Stream Mapping in Emergency Unit 1.

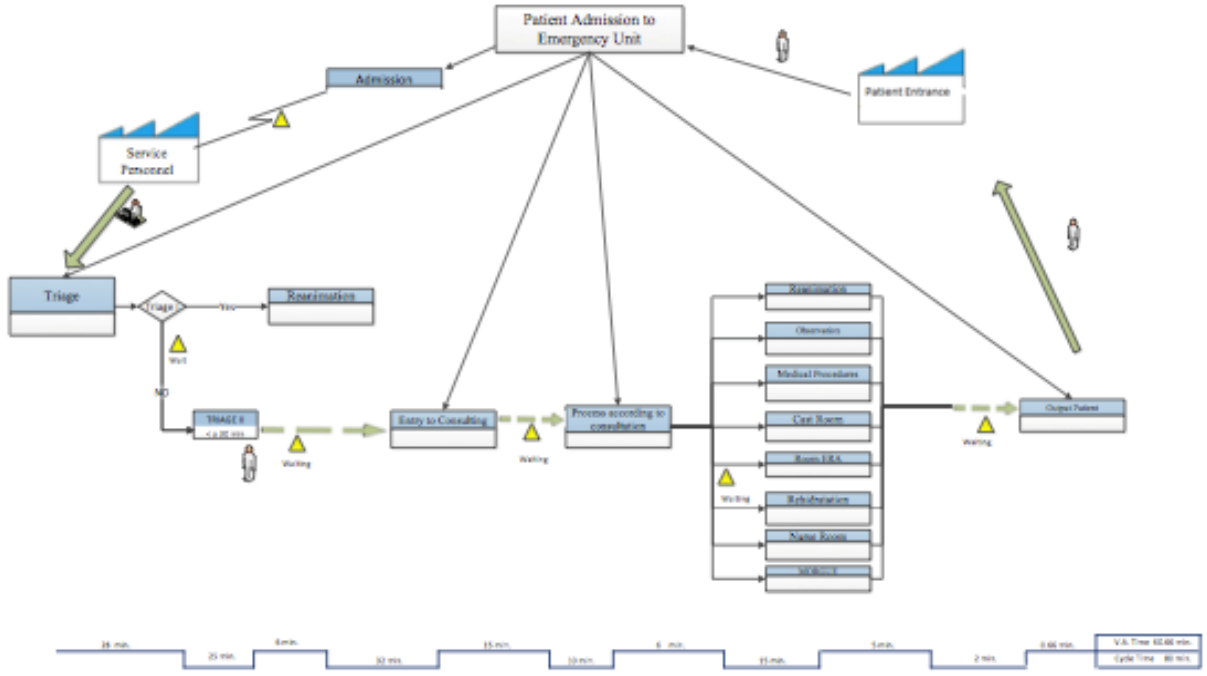

Figure 5: Proposed Value Stream Mapping, Emergency Unit 1.

4. Conclusions, recommendations and Future Work

It was found that Lean is also applicable to LA countries like Colombia, where a great deal of actions is still to be taken in order to offer better service. There are few studies in LA related to lean manufacturing in healthcare, which represent an opportunity for increasing research efforts in the implementation of these concepts (Moreno & Mendoza, 2012; Martínez et al, 2014)

For both organizations it is important to use/implement proper signs throughout their emergency units (clear and visible signs) in order to facilitate and improve patient location. It is important to continue developing studies at health-care institutions as well as implementing continuous-improvement plans.

The results indicated there were waiting-time reductions of 62% and 57% for each Emergency Unit. This stems from the main goal of Lean, which attempts to improve the value for patients (Brandao, 2009; Toussaint & Berry, 2013)

Through the proposed Emergency Unit, the redesign will reduce travel distances and patient areas, and also will meet the minimum requirements that each room must offer, as stated in the Architectural Guide Manual for emergency departments. This redesign includes each of the specifications and conditions that the target environments must offer in order to achieve the provision of emergency health services.

The results and conclusions of this work were validated by the medical staff of the two organizations in question. Furthermore, it was interesting to note that, in some cases, the organizations were not aware of their weaknesses.

Future work should focus on further validation using a larger sample size across different Emergency Units in

Colombia in an attempt to establish whether there are some differences between public and private services and also if there are differences between each type of assistance (public and private).

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