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# Fast Track in Emergency Services An Integrative Review

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**Abstract.** The objective of this study was to investigate the methodological theoretical framework of the Lean approach in overcrowded emergency services with the implementation of Fast Track. With the integrative review method, it was defined the guiding question: Which Lean principle is related to the application of Fast Track in overcrowded emergency services? The following database were used: Web of Science, PubMed, and Scopus in which 268 records were collected and 14 articles were selected. It was verified that Fast Track is a fast flow that favors the application of the principle of Continuous Flow, essential in emergency services with overcrowding, as it aims to reduce the average length of stay of patients with lower acuity. It was identified in the methodological theoretical framework the demand for more in-depth studies; and that Fast Track is an approach to reducing overcrowding in emergency services associated with the Continuous Flow principle. It was concluded that Fast Track proved to be an effective management strategy in reducing the average length of stay and waiting time of patients, which resulted in improvements in the flow of care and increased patient satisfaction, consequently providing improved performance in the emergency services.

**Keywords:** Emergency departments · Fast track · Lean healthcare

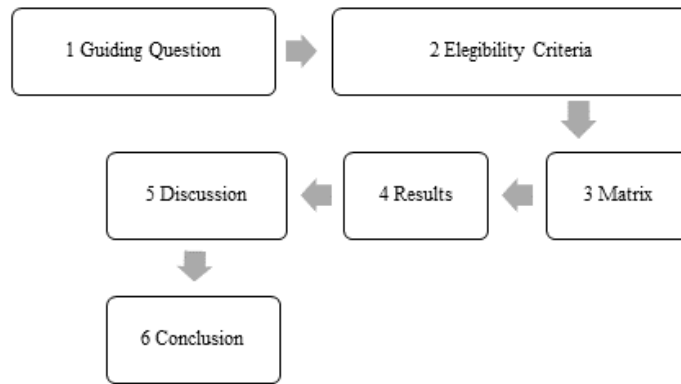
## 1 Introduction

Emergency overcrowding occurs when the demand for emergency services exceeds the capacity to provide care. The problem of overcrowding in emergency services is global in scope [16]. Lean thinking has been applied in emergency services to reduce waste, particularly in relation to the average length of stay of low-acuity patients, being value stream mapping the main tool [9, 10]. Thus, the implementation of Fast Track for management of hospital systems has allowed

to improve the flow of patients, speeding up the fulfillment of relevant activities. This study finds its main justification in the need to understand the theoretical and methodological aspects presented in the literature regarding the concept of Fast Track related to Lean Healthcare or lean management. Considering that there are still gaps in the literature regarding Fast Track applications as a robust intervention in emergency services, in this perspective, the guiding question of this study was built: What is the Lean Principle related to the application of Fast Track in overcrowded emergency services? The objective of the study was to investigate the theoretical and methodological framework of the Lean approach in overcrowded emergency services with the implementation of Fast Track.

## 2 Method

Integrative Review - it was carried out in 6 steps as shown in Figure 1.



**Fig. 1.** Demonstrative scheme of the 6 steps performed in the integrative review of this article in the period from January the 1st, 2016 to December 31st, 2020.

1. In order to select the guiding questions, the terms Medical Subject Headings (MeSH) were verified, after which search strategies were constructed using only the English language, in the Web of Science, PubMed and Scopus databases, in the period January the 1st, 2016 to December 31st, 2020.
2. The selected articles addressed the Lean principle and their interventions in emergency services in overcrowded health sectors. However, records of systematic review articles, records of scientific events, letters to the editor, book chapters, theses and dissertations, and studies on overcrowding and others without the Lean approach were excluded. The PRISMA flowchart [12] was applied for this purpose.

3. Creation of a matrix with analysis units divided into three categories: Category I - Lean Principles; Category II - Intervention approach; III - Indicators.
4. Presentation of results according to the distribution of articles in the units of analysis after categorization.
5. Interpretation and discussion of the results obtained.
6. Presentation of the review and conclusions.

### 3 Results

In the Scopus database, the following descriptors were used: “emergency department”, “emergency room”, “emergency units”, “emergency ward”, “lean”, “lean six sigma”, “sigma metrics”, “six sigma”, filters were applied: pub year 2015 and pub year 2021 and limited to English language and records of article types as well as limited to subarea: medicine and nursing - 72 records were collected. In the PubMed database, the following descriptor was added: “crowding”, with filters: full text pub year 2016 and pub year 2020 and limited to English language as well as articles PUBMED – 31 records were collected. And in the Web of Science database, the same strategy used for the PubMed database was applied, with the filters: types of documents: article language: English, which resulted in the collection of 165 records.

The collection of records took place from January 11th to 28th, 2020, which were selected in three phases, according to the PRISMA 2020 Flowchart [12], (Figure 2). First phase of the 268 records, 06 articles were excluded using the duplicate identification strategy in the Mendley<sup>®</sup> reference manager. Second phase, 190 articles from the remaining 262 were excluded, after reading the titles and abstracts, for not meeting the scope of this research. The remaining 72 articles were fully read, 51 articles were excluded, as they dealt with the Lean approach in relation to overcrowding in order health services that did not directly involve the emergency services. Third phase, the full reading of the 21 selected articles was carried out, in order to identify the units of analysis according to the categories described in the method of this study, 07 articles were excluded for dealing with evaluations on the Lean approach without information on the interventions performed, 14 articles were selected and submitted to the analysis matrix, shown in Table 1.

#### 3.1 Category I – Lean Principle

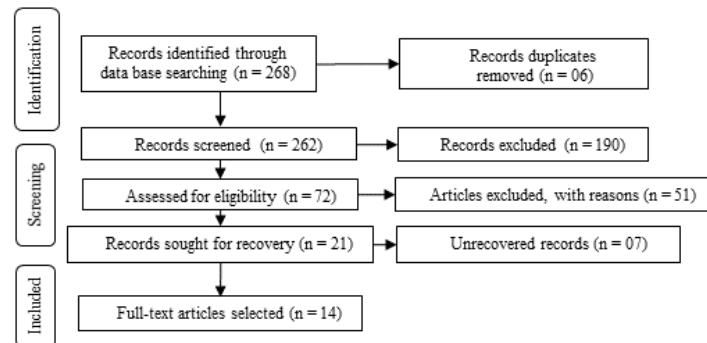
**Added Value Principle:** in the Lean methodology, the use for any purpose other than the creation of value is a waste and must be eliminated [8]. An important focus of Lean is waste reduction, which is defined as anything that “does not add value” to the customer, such as waiting time [3]. Identifying and reducing non-value-added activities is the key to improving patient flow [1].

**Value Stream Principle:** in the methodology, they used direct observation to collect flow data from patients in the emergency room [4]. They aimed to

**Table 1.** Distribution of Analysis Units by Categories in the articles

Reference	Category I Lean Principles					Category II Intervention Approaches						Category III Indicators			
	UNITS OF ANALYSIS														
	AI	BI	CI	DI	EI	AII	BII	CII	DII	EII	FII	AIII	BIII	CIII	
[1]	*	*			*	*	*			*		*			
[2]		*				*						*			
[3]	*	*			*	*						*			
[4]		*	*	*	*							*	*	*	
[5]	*	*				*		*		*		*	*		
[6]	*	*				*							*		
[7]		*			*	*			*	*					
[8]	*												*	*	
[10]												*	*	*	
[11]					*							*		*	
[13]	*					*		*	*						
[14]			*			*						*	*		
[15]	*	*		*		*			*	*				*	
[16]		*	*	*		*							*	*	

LEGEND: **AI** (Added Value) **BI** (Flow of Value) **CI** (Continuous Flow) **DI** (Pull Production) **EI** (Perfection) **AII** (Value Stream Mapping) **BII** (Report A3) **CII** (5S) **DII** (Kaizen) **EII** (Plan Do Check and Act) **FII** (Define Measure Analyze Improve and Control) **AIII** (LOS = Length of Stay) **BIII** (WT = Waiting Time) **CIII** (LWBS = Leave Without Being Served).



**Fig. 2.** PRISMA 2020 Flowchart - it demonstrates the steps of selected published articles from January 11th to 28th, 2020.

increase the flow to the client / patient, where the value is effectively measured by the time spent by the patient before receiving care within the emergency service [6].

**Principle of Continuous Flow:** the improvement of process contributes to the enhancement of clinical services and facilitates the transitions (flow) of patients in the various stages of medical treatment [5]. Lean focuses on achieving continuous flow through a process, identifying value and eliminating waste [1].

**Principle of Pull Production:** the “pull as far” strategy that was employed so that, when rooms were available, patients were brought back immediately and screened by the bedside by the head of nursing [15]. Intervention with a series of processes, improvement steps based on Lean methodologies, and aimed at reorganizing the radiology process flow, resulted in a shift to a “pull” system instead of a “push” system, in which patients were actively moved to the subsequent step in their tests by radiology technicians [16].

**Perfection Principle:** this principle is one of the fundamentals of Lean, in which improvement efforts must be fast and interactive, as methods change quickly and frequently and, in its study, it involved improvements in the emergency sector personnel model, resulting in a dramatic reduction in waiting time [4]. In a comprehensive project that involved all visits to the emergency department, including less severe cases that need Fast Track and high-acuity cases that need observation and longer treatment time, and incorporated lean principles as an approach to improvement [4]. One of the steps for improvement consisted of adding a physician or triage team to the system [11].

### 3.2 Category II – Intervention Approaches

**Value Stream Mapping (VSM):** the VSM is a key tool to identify opportunities to reduce waste and further integrate process steps, thus improving processing efficiency [1]. The VSM in the Lean approach serves to identify (and potentially remove) any “steps that do not add value” in the process [5]. Process mapping is a component of Lean management, which was applied in the psychiatric service linked to the emergency department where there was a significant reduction in the length of stay of psychiatric patients in the emergency department [2]. After identifying the barriers to efficiency, these were grouped by similar ideas or concepts and the VSM was then executed [7]. A3 Report: analyzed activities using process mapping and problem solving spreadsheet or A3 report as a visual tool to identify sources of waste [1].

**Five Sense (5S):** they applied the 5S as a visual technique for the reorganization of the nursing station, as they followed the theoretical path of the Lean methodology, choosing the techniques considered the most important in health management, such as VSM and 5S [5]. With the 5S technique, a consensus was reached among employees about what materials and equipment should be available and how and where they should be placed in each zone [13].

**Kaizen:** the Kaizen team’s first activity was to develop a high-level process map to understand the main steps in the process. The use of Six Sigma Lean strategies served to streamline the computerized tomography processing of the emergency department in a tertiary care unit, created a Kaizen team, whose first activity was to develop a high-level process map to understand the main steps of the process [7]. The rapid improvement workshop technique corresponds to the application of Kaizen in [13, 15].

**Plan, Do, Check and Act (PDCA):** in the construction of the MFV, the teams’ responses were structured based on the PDCA Process to initiate some strategies to improve the teams’ performance [1].

**Define, Measure, Analyze, Improve and Control (DMAIC):** some studies point to the use of Lean Six Sigma and additional management or mathematical tools in their bibliography referenced one of their studies on DMAIC [5].

### 3.3 Category III – Indicators

**Length of Stay (LOS):** They used a color code to process the time from the patient’s arrival to the emergency room until the patient leaves the emergency room [5]. There was a statistically significant improvement in the mean length of



stay between the pre-mapping group and the post-mapping group [2]. The intervention with Lean approach reduced the overall length of stay in the emergency service and in the subgroup analysis the LOS rate reduced for non-critical cases, but no significant improvement for critical and semi-critical cases [11]. Waste in the emergency patient flow process is considered not only as a problem, but also as the basis for measuring and improving process outcomes (e.g., LOS) [1].

**Waiting Time:** to study the issue of overcrowding an interesting new case study was based on the implementation of the Lean methodology to reduce emergency waiting times and improve the flow of patients between the emergency room and recovery areas [4]. They reported having reduced waiting times during peak hours in diagnostic imaging and particularly in X-ray with Lean Healthcare [6]. In a cross-sectional observational study, comparing crowding, radiology response times, patient waiting times in the emergency department, and the proportion of patients who leave unattended (LWBS) report their reductions [16]. Through systems engineering approaches such as Lean methodologies, emergency room leaders can potentially reduce patient wait times [16].

**Leave Without Being Served (LBWS):** in an external review, Lean training, Fast Track, patient centered approach, door-to-doctor approach, performance reporting and an action-based peak capacity protocol the LWBS indicator decreased, and in Fast Track areas with mid-level providers, improved patient flow occurs and reduces crowding, wait times, LOS and LWBS rates in the emergency room without affecting the quality of care [10]. Waiting times and services to identify the main causes of overcrowding were calculated, and Fast Track was applied for urgent cases that do not require observation or long stay, this allows to manage more patients with fewer staff [4]. Lean principles in the redesign of frontline operations in the emergency department and regression-adjusted difference estimates for LWBS rates showed that it did not change significantly [15]. In their study, they obtained a result of improvement in the rate of patients leaving a health service without being treated after their arrival record (LWBS) [11].

## 4 Discussion

Lean principles are fundamental in the management process, considering that they are intrinsically related and sequential. These principles were referenced in the studies, especially in the theoretical foundation, not making it clear how they guided their interventions.

As for the relationship between Lean principles and interventions, it was found that the principle of Pull Production was described in only three of the fourteen studies analyzed, contrary to the Perfection principle, which was frequently cited, which leads us to the understanding that they are related to the

application of strategies for continuous improvement. The Value Stream principle was also mentioned, in this sense, the added value represents the patient's satisfaction when being assisted in a shorter time than expected.

The principle of Continuous Flow is related to the application of fast track strategies, which are essential in overcrowded emergency services, as it aims to reduce the average length of stay of patients with lower acuity, and which represent one of the main factors that contribute to overcrowding in emergency services, creating bottlenecks.

The time factor has been extensively studied in relation to the stay of patients in emergency services and we can relate it to the Added value principle, as this factor was considered as a value attributed to patients who had their time clocked and recorded in their care for analysis of results of the LOS and LWBS indicators.

A large part of the studies showed positive results, highlighting the importance of the Lean approach in relation to improving the quality of emergency services.

## 5 Conclusion

In this study, it was found that the Lean Continuous Flow principle is related to the application of Fast Track, and consists of a fast flow, which in the context of emergency services contributes to reducing overcrowding. It was found that for the healthcare area, the flow of care with Fast Track represents the application in an order or sequencing of the planning and control of resources, of the type "Shortest Operating Time first (SOT), where small tasks are processed quickly, aimed at patients with lower risk or complexity. Thus, with the performance of care with Fast Track, improvements in the flow of care are achieved, resulting in patient satisfaction through the shorter waiting time and shorter average length of stay for patients in the emergency room.

Fast Track proved to be an effective management strategy in reducing the average length of stay of the patient and consequently, it would improve the performance of these services. Public and private sector managers devote resources and efforts to mitigating the effects of overcrowding. The improvement in the quality of care for patients in emergency services with the Lean approach was demonstrated in the articles, however, from a theoretical perspective, we saw that future research is still needed to consolidate a theoretical and methodological framework that can serve as a reference for application Fast Track. The methodological theoretical framework in the application of the flow of care with Fast Track in the Lean Healthcare approach in overcrowded emergency services was not clearly presented in the articles, further studies using the method intervention (DMAIC) are suggested, according to the Lean Six Sigma approach.

**Limitations:** the terminology on the different techniques, tools and methods used in the Lean approach is vast, it was observed that they are presented with different names in the articles, which led us to adopt Category II Intervention Approach, to be included regardless of nomenclature adopted in the articles.

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