

**Supplementary Table 1.** Data extraction table: characteristics and main results of the studies included in the literature review.

Authors	Year	Purpose	Setting	Methods	Main results
Improta, G., Romano, M., Di Cicco, M. V., Ferraro, A., Borrelli, A., Verdoliva, C., Triassi, M. & Cesarelli, M.	2018	<ul style="list-style-type: none"> <li>- Improve processes that contribute value to healthcare delivery and facilitate the flow of patients between the various steps of health care treatment;</li> <li>- Eliminate “bottlenecks,” which generate waste and create congestion.</li> </ul>	Emergency room of the hospital “AORN Cardarelli”- Naples (Italy).	<ul style="list-style-type: none"> <li>• Qualitative (meetings)/quantitative (computerized system) analysis;</li> <li>• VSM;</li> <li>• 5S;</li> <li>• Visual Management.</li> </ul>	Reduction in overall time (triage, medical examination, diagnostic testing, diagnosis/recommendation and discharge).
Sánchez, M., Suárez, M., Asenjo, M. & Bragulat, E.	2018	Analyze the entire process of care in the ER of patients with urgent-type triage, using Lean Thinking and redesigning the flow in order to reduce the process time and, subsequently, the waiting time.	Emergency room of the “Hospital Clínic” – Barcelona (Spain).	<ul style="list-style-type: none"> <li>• Workshop on Lean methodologies;</li> <li>• Lean Team;</li> <li>• VSM;</li> <li>• 5S;</li> <li>• Visual Management;</li> <li>• Standardization of processes.</li> </ul>	Reduction in average process time (both in terms of dwell time and average waiting time).
Peng, L. S., Rasid, M. F. & Salim W. I.	2019	Redesigning triage from a Lean perspective to improve patient flow.	Emergency room of the “Hospital Port Dickson” – Negeri Sembilan, (Malaysia)	<ul style="list-style-type: none"> <li>• Flowchart;</li> <li>• New protocols.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced overall length of stay (LOS), particularly for critical cases;</li> <li>- Reduction in the percentage of patients leaving ER without being seen from 4.1% to 2.0%.</li> </ul>
Alowad, A., Samaranayake, P., Ahsan, K., Alidrisi, H. & Karim, A.	2021	To investigate current flow issues in terms of delays and/or waits by integrating the patient perspective (VOC) and process perspective (VOP) in order to propose a Lean methodology suitable for process	Emergency room of the “Aseer Central Hospital” – Abha (Saudi Arabia)	<ul style="list-style-type: none"> <li>• VSM;</li> <li>• A3.</li> </ul>	The limited availability of beds, the unavailability of necessary personnel, the organization of the ER, and the lack of patient understanding of the nature of emergency services are the main causes of delay that affect the quality of performance. Addressing these problems with streamlined tools, integrated with VOC and VOP perspectives, can lead to improved patient flow, greater patient satisfaction and improved ER.

		management in the ER.			
Elkholi, A., Althobiti, H., Al Nofeye, J., Hasan, M. & Ibrahim, A.	2021	<ul style="list-style-type: none"> <li>- Redesign the triage area so as to increase its functionality by using pre-existing spaces;</li> <li>- Reduce the average waiting time and the percentage of patients leaving the ER before triage.</li> </ul>	Emergency room of the “Alhada Armed Forces Hospital” – Taif (Saudi Arabia).	<ul style="list-style-type: none"> <li>• Workshop on Lean methodologies;</li> <li>• Spaghetti diagram.</li> </ul>	<ul style="list-style-type: none"> <li>- The average waiting time between patient arrival and triage, selected as the primary process measure, was dramatically reduced;</li> <li>- The percentage of patients leaving the ER before triage was used as an outcome measure for this project: it was reduced from 6.5 to 0%.</li> </ul>
Williams, D., Fredendall, L. D., Hair, G., Kilton, J., Mueller, C., Gray, J. D., Graver, C. & Kim, J.	2022	Create and maintain over time a standardized work protocol (i.e., processes and procedures that reduce variability within a nurse's workflow - NSW).	Emergency room (specifically fast-track area) of a large academic hospital, Level I trauma center - southeastern US.	<ul style="list-style-type: none"> <li>• A3;</li> <li>• Lean Team;</li> <li>• Spaghetti diagram;</li> <li>• 5S.</li> </ul>	<ul style="list-style-type: none"> <li>- The primary analysis was a pre and post comparison of performance against mean length of stay in ER (LOS). With the implementation of the NSW protocol LOS was reduced.</li> <li>- The other parameter measured was the percentage of pts leaving the ER before being seen (LWBS), which since March 2019 has fallen below its target level of 2% (at least until March 2020 with the outbreak of the COVID-19 pandemic).</li> </ul>