

POSTER ABSTRACT

A model to predict length of stay in a hospital emergency department and enable planning for non-critical patients admission.

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Introduction: The progressive growth of aging, increased life expectancy and greater number of chronic diseases contributes significantly on the growing demand of emergency medical care, and thus on Emergency Departments (ED) saturation. This is one of the most important problems for the management of the healthcare system worldwide, because it requires a substantial amount of human and material resources, which unfortunately are often scarce and too limited. Saturation of ED causes long waiting times at different stages along the service, and a total length of stay of patients in the service (LoS) high above the desirable, causing discontent among them, and a degradation in the quality of care received.

It's a fact that saturation of the ED service is mostly due to admission of patients with lower acuity level. These patients represent a high percentage of the admitted patients and most of them are non-critical patients. If some information or recommendation system about the current state of the service was available to these patients, they could decide the moment to go to the ED, to avoid long waiting time in the service.

We propose a prediction model of patient's LoS in the service, using an ED simulator as a sensor of the real system. The information obtained from the analysis of the data from simulation will enable the possibility of planning admission of non-critical patients into the service. Simulation also will show the effectiveness of the model.

Method: We assume the availability of a "self-triage and recommendation system", accessible to emergency department's potential patients. This will be the way to inform patients about the current state of the service, and also the platform to obtain all the necessary information required to make an adequate recommendation to the patient, e.g., its acuity level, age or possible chronic disease, among other. The hypothesis of our proposal is that this system can modify the current pattern of incoming of low acuity patients into the service, depending on the decision of these potential patients, users of the recommendation system.

Moreover, we have developed an ED simulator, based on an Agent-Based Modeling (ABM) design of the system, in collaboration with the Hospital de Sabadell. The simulator includes patients, admissions staff, triage nurses, assistant nurses, doctors and radiology technicians as agents. The actions and interactions between the involved agents at each process step result in

changes of state of the agents, which ultimately result in the global operation of the system. Each simulated scenario is identified by a sanitary staff configuration and a specific input of patients into the service, and the output of the simulation brings data concerning the number of attended patients, attention time, and waiting time for each patient in all phases in the service. We will use the simulator as a sensor of the real system to measure the LoS of patients, by modifying the input parameters concerning the way the patients enter the service, according to the different options of decision made by potential patients using the "self-triage and recommendation system".

Progress report: We have defined the model and we are working in the design of the experimental phase. Some preliminary results have been found.

Discussion: We have defined an analytical model to determine the theoretical throughput of a particular sanitary staff configuration, that is, the number of patients it can take care per unit time given its composition, which is a reference to measure the performance of the system.

The proposed model will be efficient to the extent that the "self-triage and recommendation system" is effective on the entry of patients, so that patients input curve gets flatter and approaches the value corresponding to the maximum capacity of the system, and so system performance is improved.

It will be necessary to know the minimum percentage of potential patients that should take into account the information provided, to improve system efficiency. We will use the simulation as a tool to test the effectiveness of the prediction model proposed.

Conclusions: The integrated care model tries to improve quality of care, optimize the quality perception about the attention paid to population, and contribute to the sustainability of the current system, ensuring better use of available resources. Our proposal aims to improve the ED service, which is the main entrance of patients in the healthcare system, in relation to access, quality, user satisfaction and efficiency, thus contributing to integrated care goals.

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Keywords: emergency department; agent-based modeling and simulation; decision support system; prediction model
