

# A Model to Evaluate the Flow of an Emergency Department

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## INTRODUCTION

Little is published about generic models that describe the physic and information process of an emergency department. This chapter expounds the development of a general model that describes the current physic and information processes of an emergency department; it is based on observations of emergency departments in The Netherlands and the United States. This model can be of great value for the management of an emergency department, since it is useful to first analyze a current situation before improving organizational processes (Daft, 2000).

The main purpose of this chapter is formulated as “the creation of a model that can evaluate the physic and information flow of an emergency department by using literature and emergency department observations.” This research investigates if it is possible to develop this kind of model, and if this is possible, then how this model can be used to compare the physic and information flows for different emergency departments.

This research is defined inside one of the projects of the department Organizations, Operations and Human resources of the University of Twente. This is a four-year project involving the emergency department of a large hospital in The Netherlands, led by ir. R. J. Rosmulder and guided by prof. dr. ir. J.J. Krabbendam. The project includes the improvement of organizational processes at this emergency department by using business theories in order to develop new ways of controlling the organizational processes of the emergency department.

## BACKGROUND

In order to develop the model, observations were made in the emergency departments of larger hospitals in The Netherlands and the United States. The United States was chosen because many differences were expected between the Dutch and American emergency departments due to the more denationalized health care, the managed care, and the differences in medical education in the United States.

The foundation of the developed model is based on Miller and Rice (1967) who developed a theory of one generic framework where organization, human activities, and tasks are conciliated. Based on the findings of Miller and Rice (1967), the developed model encloses tasks, human activities, and organizational aspects. In addition, the operations model of Slack, et al. (1998) is used. Here, Slack, et al. (1998) describe the division in design of the process, planning, and control of the process and improvement of the process. Since only the current process of an emergency department is involved in the model, it demarcated the model boundaries. In addition, to gain knowledge about the input, throughput, and output of the process, and especially about the input and output of patients, the model of Asplin (2003) is used. To use a framework in this research, the theory mentioned in *Processen in Organisaties* is used, written by dr. ir. H. Boer and prof. dr. ir. J.J. Krabbendam (1996). They expose a step-by-step plan to analyze the different characteristics of a process inside an organization. To analyze the two observed emergency departments, their division is used.

## DEVELOPING THE MODEL

### Simplification of the Model

Similar to manufacturing organizations as referred to in Slack (1998), in an emergency department there is the input, throughput, and output. The input contains patients who enter the emergency department. These patients can be seriously ill or just need some care on that specific moment. Examples of different inputs are given by Asplin (2003).

The throughput is divided into triage, making a diagnosis, treatment inside the emergency department, and a referral to a place outside the emergency department. As heard from authorities and seen in hospitals and emergency department environments, this is an accepted approach of medical personnel to diagnose and treat patients. In this figure, it is assumed that every patient that arrives at the emergency department will successively pass through all these steps except triage. As mentioned in Ceglowski, Chirilov, and Wassertheil (2005), the emergency process is hard to describe, for example, because one nurse serves many patients. In this model, the patient is the central part; it is not mentioned what percentage of the nurse's time is spent on that particular patient. The patient flows through the process.

During the throughput process, the organizational arrangements like structure, culture, and procedures

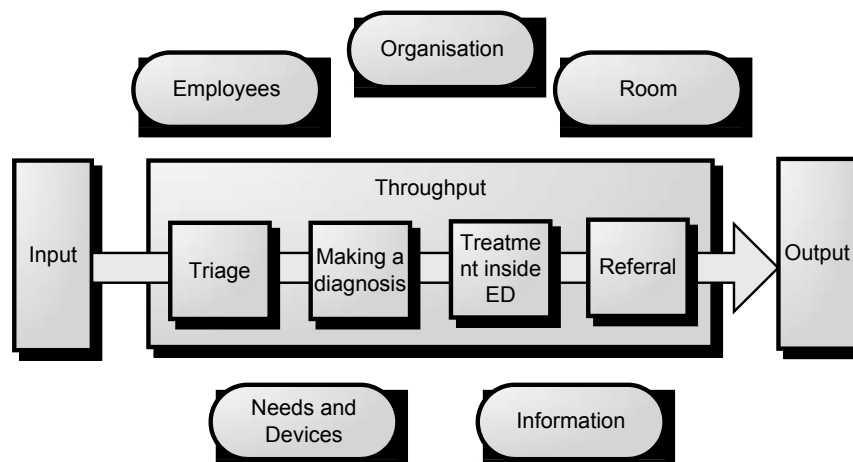
are of great influence (dr. ir. H. Boer and prof. dr. ir. J.J. Krabbendam, 1996). In addition, the amount and kind of employees, rooms, needs, devices, and information change. In the triage step of the throughput, for example, there is most of the time one nurse needed, a triage room or waiting area, some simple medical instruments, and information like the patient's medical history. For every step (triage, making a diagnosis, treatment inside the emergency department, and the referral) a combination of employees, rooms, needs, devices, and information is used during that part of the process. By describing every step, at the end the patient flow, its needs are described. In Figure 1, the simplification of the model is presented.

In order to present a simplified model, very specific flows could not be shown here. The output of this process could be cured patients, but far more is possible. Patients can be sent to their homes, admitted to the hospital for either surgery or nurse ward, or referred to another care institute. Asplin (2003) mentioned some in his model, and after experiences in emergency departments, there are some more mentioned in the next model.

### The Extended Model

This model has the same basis as the simplification presented previously, but in a more extensive framework and, therefore, more complete. The

*Figure 1. The simplification of the model*



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