# Process Optimization and Efficient Personnel Employment in Hospitals

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## 1 Problem Area Hospital

### 1.1 Economic Conditions in Hospitals

The hospital field in Germany, with its 1.1 million employees and 62 billion Euro annual turnover (figures from 2001), represents a large and socially important field of activities [3, pp. 13]. If one considers the patients as "action object", the work system (cf. [4, p. 81]) "hospital" is characterized by a number of particularities: First, treatment decision have to be made based on incomplete information and the treatment sequences must be carried out individually, meaning that they can only be planned to a limited degree. Furthermore, the complex treatment sequences must fulfil the treatment order reliably and efficiently. On the other hand, treatment processes must also take occupational health and safety and hygiene requirements of the medical and nursing personnel into account [10, p. 224].

The financing of hospitals (in part through case flat rates) is no longer oriented toward the actual costs of the individual hospitals [7, p. 142]. The fixed pricing system of the "German Diagnosis Related Groups" was changed as of 01.01.2004 so that, depending upon the patient, only a pre-determined amount is paid (§ 17 KHG - Hospital Financing Law). As a result, the costs aspect is gaining continuously in importance and hospitals must operate more cost-effectively in order to avoid losses.

Optimizing the personnel costs is of great significance for the economy of a hospital since they make up about two thirds of a hospital's total costs [11, p. 389]. Consequently, a costs reduction is best achieved through a more efficient employment of the medical and nursing staff.

In order to be able to work more efficiently, flexible working time models, specially tailored to the respective hospitals, must be developed in order to better align the personnel capacity stock to the capacity requirements dictated by the arrival of patients.

### 1.2 Working Times in Hospitals

In the so-called "Jäger Verdict" from September 9, 2003, the European Court of Law declared that "the guideline 93, 104, EG of the European Council is to be

interpreted so that the stand-by duty of a doctor served by personal presence in the hospital represents in its entirety working time, even if said doctor is allowed, in times when he is not employed, to rest at his workplace." Average weekly working times of more than 48 hours are, therefore, no longer admissible. Studies from the associations concerned assume that this creates a workforce deficit of 20,300 doctors and 12,900 other positions (all full-time)[12, p. 9].

However, due to their financial situation, hospitals are not capable of creating this number of new positions. Thus, the need for the larger personnel workforce must be reduced. The key to this problem lies in the efficient employment of personnel, in which personnel is only on duty when there is work to be done. The need for continuous medical care and monitoring is a further constraint for hospitals, which must be taken into account in working time models [5, p. 958].

In order to find a solution for the abovementioned problem, the *ifab*-Institute of Human and Industrial Engineering has developed a simulation-based procedure for the quantitative and efficient assessment of working time models in hospitals.

## 2 Simulation-Based Working Time Configuration for Hospitals

The personnel-oriented simulation of working systems has proven to be highly effective (cf. [13, p. 371]). Comprehensive, prospective information about the possible effects of planned changes can be gained using a simulation model capable of taking temporal work operations into account [2, p. 53]. This is not possible with conventional evaluation methods (e.g. value of benefit analyses, sensitivity analyses, list of pros and cons). In the following, the elements required for the simulation-based configuration of working times in hospitals will be presented.

### 2.1 Configuration Elements of Working Time Models

According to Bellgardt [1] the configuration elements of working time models can be classified into content and formal elements. The content elements refer to the object of the configuration, meaning the type of scheduling leeway allowed in the model. The formal elements define the borders within which the enterprise and the workers can user their leeway. The following presents the elements of both types (cf. [2, pp. 55], supplemented):

- Content configuration elements
  - duration
    - weekly working time in hours
    - minimum possible working time in hours
    - maximum possible working time in hours
  - placement
    - number of working time corridors (tuples with starting and ending times, as well availabilities and possible compensation bonuses)
    - cycle period in days (time period after which the placement of the working times is repeated)
- Formal configuration elements