The Scheduling Support System Used in Clinical Work Allocation

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Summary:
Clinical work allocation is a complicated and unpreventable task especially in a large medical setting. The process of clinical work allocation is highly constrained by multiple conditions thus makes itself one of the most unfavorable works. In order to maintain a high-quality operation of the medical setting with fast-growing health service complexity, we propose a novel scheduling support system. Its efficiency and effectiveness have been agreed in preliminary research results.

Problem addressed:
Being one of the largest regional hospitals in Taiwan, Taipei City Hospital has to provide health services to fully fit the requirement of citizens, public health, city policies, and nation-wide policies. Health services are mostly labor-intensive and the human involvement is still irreplaceable. Unfortunately, human resource seldom catches the manpower consumption of clinical works originated from fast-growing health service requirement. Furthermore, some clinical works require clinical workers with specific abilities or attributes. Clinical workers also have their own conditions in accepting clinical works. For the satisfactory of clinical workers, the allocation of clinical works not only needs to consider above distinct conditions but also vague human factors.

All of above requirements make clinical work allocation a time consuming and unfavorable load.

Specific purposes of the system:
We propose the scheduling support system to improve the efficiency, effectiveness, and quality of scheduling.

Clinical works can be divided into small granules, or shifts, mostly by time slicing. Each shift needs to be filled with a suitable clinical worker. The problem can be represented as filling the shifts with clinical workers conforming to predefined constraints. Shifts and clinical workers both have their own scheduling constraints. We develop a set of rule syntaxes to represent the constraints easily and flexibly. The scheduling engine of our system processes the constraint rules and outputs a complete schedule. It also produces some statistical tables for analyzing the scheduling results.

Evaluation results:
The evaluation research of this system focuses on effectiveness and efficiency. Effectiveness is decided by the completeness of the rule implementation and the final scheduling output. Efficiency is presented by the measurement of executing time.

The scheduling support system has served at the Family Medicine Department of Taipei City Hospital since September 2006. In the evaluation environment, ten more physicians often have to share more than 300 shifts in a month. These shifts belong to more than fifteen different types of clinical works. Besides these shifts, physicians always have their own personal schedules. A set of rules was created for each scheduling requirement. In our strict evaluation cases, all constraints required to represent the conditions during scheduling can be transformed into our rule formats. A validated rule set guarantees a complete schedule. Without the assistance of this system, the chief resident has to spend more than ten hours in manual scheduling. This system requires only 20 minutes in preparing the rules for scheduling. The executing time of the rules ranges within seconds depends on the complexity of rules.

Conclusions:
The scheduling support system provides great assistance in clinical work allocation. Surprisingly, it can indicate the possibility of higher human resource utilization by assigning more strict constraints. In order to improve the rule-building procedure, the experience, and further promotion, a web-based graphic user interface is under construction. More evaluations are necessary for the improvement of this system.