On designing a nurse rostering information system for Site Management Organizations

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In order to carry out the clinical test system of the biological technology industry plan, the Executive Yuan has been actively helping hospitals establish clinical trial management. Site Management Organization (SMO) has replaced the old management model that one doctor handles one plan at a time. SMO can effectively help schedule nurses to serve more patients and reduce the time to search for patients. The original management model before SMO usually requires longer time to search for patients because the sources of the patients are scattered around places. On the other hand, SMO has more complex rules to assign nurses to the patients. Our research focuses on techniques to search for and also serve all patients with less human resource. According to our studies, SMO is used in the third stage of the clinical trial process which is also the stage of the largest cost. In order to improve the operations of SMO, one needs to efficiently decide the schedules of treatments for each patient and each served nurse so that the cost for human resources is reduced. This optimization problem can be considered as a Nurse Rostering Problem (NRP), which is often solved by integer programming. In this thesis, we propose a mathematical model based on integer programming that leads to better schedules and reduces the cost of human resource. In particular, several objectives including the minimization of the number of served nurses, and balancing the daily workload are formulated in our IP models and solve by CPLEX. However, the solution calculated by CPLEX seems to be inconvenient compared with the original schedule in the sense that the solution tends to partition the daily schedule for each nurse. Moreover, CPLEX consumes a lot of computational time. To construct a more convenient schedule in a shorter time such that the original objectives are achieved as much as possible, we propose several greedy heuristics and build a rostering information system to help SMO managers design a good schedule that not only reduces the human resource costs but also assigns workload more reasonably.

Keywords: clinical trial, SMO, nurse rostering problem, integer programming, heuristics