A new generalized approach for surgeries scheduling

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This paper deals with a great problem encountered in operating room (OR) scheduling, which is the imbalance between allocated or assigned tasks on different OR, which is the reason for several failures in the hospital system, and inefficiency planning.

We are interested in the problem of assigning a set of surgeries on each workday in an OR suite. We try to minimize the completion time or the makespan which involves the minimizing of the overuse and the underuse of the OR suite, by controlling the overtime and the idle time.

This problem plays a decisive role in utilizing OR efficiently, which is of paramount importance for OR suites to provide high quality service at ever reduce the cost of trading off between the two performance criteria idle time and overtime.

The problem of planning consists in determining the date of intervention for every elective patient as well as the OR where the intervention will take place; taking into account the uncertain surgery duration.

A new technique that improves the surgery schedule is suggested. We have developed a new approach that can be applied to any hospital system. This approach resolution takes into account the specificities of some surgical department found in the literature (Landa et *al.*, 2016, Riise et *al.* 2016). However, with some change in the parameters, this study can be valid for all Hospital systems.

We formulate the problem as a mixed integer programming (MIP) model, we are concerned in improving OR efficiency in terms of overtime and idle time. The MIP model is validated by small instances then it will be applied to a large size instances, and the results will be compared with the actual performance of the concerned OR suite.

Our problem is assimilated to the problem of distributed permutation flow-shop scheduling workshops (DPFSP), Naderi and Ruiz (2010) with additional time's constraints. For a horizon H of F days, for each day we have identical ORs that are similar to identical factories fount in the DPFSP. Each of them must perform the same set of M operating phases that are similar to identical machines in the DPFSP. No waiting time between the operating phases of an intervention or between interventions.

This problem is known to be NP-HARD when $F \geq 3$, according to Naderi and Ruiz (2010).

We begin the execution of the program with a small set of the instance. The latter is tested on a bigger set of instances. Moreover, we check the capacity of the resolution of the problem in a short time execution and acceptable values of performance indicators.

When running program with weekly instance the execution time increase considerably, the execution stops without reaching the optimal solution. In addition, the instances with more than 2 operating rooms cannot be resolved by a deterministic resolver because the problem becomes NP-Hard and needs a metaheuristic to reach a near-optimal solution.

References

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