Operating Theatres (OTs) are essential facilities that allow surgical cases to be performed safely and effectively. Performing surgical cases involves the coordination of several resources, making the scheduling of such surgical cases a complex process.

A Master Surgical Schedule (MSS) is a cyclic schedule generated to dictate the allocation of different OTs to different surgical disciplines for each day of the week. The aim of this study is to develop a holistic and efficient OT Master Allocation Schedule (MAS) that maximizes OT utilization rates (OTU) and reduces patients’ waiting times to surgery (WTS).

The model produces a solution to achieve the following four objectives in decreasing order of priority:

**Objective 1:** Maximise minimum service level met across all disciplines

\[
\text{Max } \sum_{i} x_{i}
\]

**Objective 2:** Maximise the number of days a week for which each discipline can operate

\[
\text{Max } \sum_{j} \sum_{k} \sum_{t} x_{jk} \quad (2)
\]

**Objective 3:** Maximise disciplines’ preferences for OT slots on certain days of the week

\[
\text{Max } \sum_{i} \sum_{j} \sum_{k} \sum_{t} x_{ijk} \quad (3)
\]

**Objective 4:** Maximise the allocation of OT slots based on relative frequency of past OT-discipline usage

\[
\text{Max } \sum_{i} \sum_{j} \sum_{k} \sum_{t} x_{ijk} \quad (4)
\]

Constraints:

1. (5), (7): Total allocated hours does not exceed available OT hours
2. (6): Surgical disciplines are only allocated to compatible OTs
3. (8), (9): Minimum service level is met by all disciplines for OTs for the same type
4. (10), (11): Binary modelling constraint for \( x_{ijk} \)
5. (12), (13): Minimum and maximum hours to allocate to each discipline depending on surgeon availability
6. (14): Binary modelling constraint for both decision variables \( y_{ijkl} \) and \( x_{ijkl} \)

The MOLP model developed provides an improved MSS based on the following quantitative metrics used to evaluate the effectiveness of the model:

1. Service level met for each discipline
2. Number of slots allocated to each discipline on each day
3. Percentage of favourable and unfavourable slots allocated to each discipline

The development of this MOLP model allows for the operator to systematically generate an MSS based on data of each disciplines’ demand, preferences and past OT assignments. The model also introduces a quick and accurate way of generating the MSS and may potentially help to improve OTU and the surgeons’ perception of slot allocation equity.

**User Interface**

The model was built and solved in Microsoft Excel using the OpenSolver add-in and includes user guidance to providing user inputs, such as OT slot preferences and viewing the final schedule output given by the model.

**Conclusion**

The MOLP model helps to improve OT slot allocation equity of the MAS while systematically factoring in the disciplines’ preferences, past OT-discipline allocations, OT-discipline compatibilities and surgeon availability constraints. This would aid in improving the overall objectives of maximising OTU and reducing patients’ WTS.