Scarce, scarcer, scarcest: Sensitivity-flexible AI-based planning of elective surgeries for efficient and effective intensive care resource management

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Objective

Operating Room and Intensive Care capacities belong to the scarcest resources in hospitals. When planning elective surgeries, it is important to consider both resources in an integrated way and to guarantee a certain flexibility in planning in order to avoid cancellations.

Methods

In this work, we introduce a sensitivity-flexible AI-based planning algorithm for the prediction of whether an elective patient is transferred to the Intensive Care Unit after surgery. The algorithm is evaluated by a data set of the University Hospital of Augsburg, Germany, consisting of 26,600 elective surgeries between 2017 and 2021 and extensive simulation studies.

Results

We find that our sensitivity-flexible algorithm, other than state-of-the-art Machine Learning algorithms, is able to flexibly prioritize a particular label while maintaining high accuracy. As a consequence, the ratio of realized and planned intensive care resources is stable and near to 1 for different scenarios with regard to scarcity of resources and patient cohorts.

Conclusion

Our sensitivity-flexible AI-based planning algorithm outperforms state-of-the-art Machine Learning algorithms and supports decision makers in hospitals while guaranteeing planning flexibility.