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Meet the Inventors

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External Link(s)

- From the lab of Dr. Padma Gulur
- From inventors with Duke University School of Medicine Department of Anesthesiology

Anesthesiology Resource Management System (ARMS), an AI software to predict and plan resource utilization

Unmet Need

Surgery makes up a majority of both the costs and revenue for major hospitals, with operating rooms accounting for 40% of an average hospital's annual budget. Human resources, especially in anesthesia, are among the most expensive, making up nearly half of the total costs of surgery, but current scheduling practices result in costly downtime and underutilization. In fact, inefficient scheduling may result in up to a 50% increase in the amount of labor scheduled compared to what is actually required to complete cases. Therefore, moving to a more efficient resource management system could enable hospitals to recoup as much as 5% of their total operating costs each year. There is a need for systems that can allocate these resources more efficiently to increase utilization and reduce costs during surgery.

Technology

Led by Dr. Padma Gulur, recent recepient of the prestigious Harwick Innovation Award, Duke inventors have developed a software system that uses machine learning to predict resource utilization for different days and times. This is intended to be a replacement for the "Staff to Capacity" scheduling model that is currently used to allocate resources, which results in overstaffed shifts and underutilization of resources due to inefficient scheduling of cases. Specifically, the system considers data on the types of cases scheduled, locations across which resources are shared, and provider characteristics such as specialization and requirement for breaks. The system includes customizable parameters and filters, easy-to-read graph visualizations, personnel reports broken down by different clinical roles, and analysis of effort for individual clinicians. The unique advantage of ARMS is a custom schema that maps EPIC case records and QGenda task data to a hierarchical structure which enables estimation of future case resource requirements, accounting for the skillsets of different types of providers that will be needed at different times of day. This has been demonstrated through deployment at Duke University's hospital system, where it ultimately saved $6M through improved scheduling efficiency.

Other Applications

This technology could also be applied to other domains where resource cost is high and there is an urgent need to maximize utilization. For example, airlines face a very similar problem, and a machine learning model that optimizes the allocation of aircraft and flight crews could significantly reduce costs. This would also have applications for scheduling fuel use at power plants, where it is infeasible to adjust operations on the fly.

Advantages

- Goes beyond historical data to actually predict future utilization in different scenarios
- Includes reports and visualizations broken down to finer resolution than existing products
- In a live deployment, this product saved money compared to the state-of-the-art