

# Predictive models to optimize resources in tele critical care in distributed hospital networks

## Abstract-

**Background:** Telemedicine creates the opportunity – in pandemic conditions and otherwise -- to spread health care to regions where intensivists and health services may not be available. It offers the opportunity to provide better patient care, decrease healthcare costs, and overall improve population health.

**Introduction:** Critical care telemedicine has increased in deployment due to its impact on providing care at all times of the day as well as in reaching remote regions of the world. Tele-critical care (Tele-CC) systems can provide concurrent service to several hospitals and can manage available resources more efficiently than traditional ICUs.

**Materials and Methods:** This study utilizes the Philips eICU system and its Collaborative Research Database (eICU-CRD) to evaluate intensive care operations in the electronic ICU setting, with the objective of analyzing where and how system engineering techniques can be potentially applied to enhance the effectiveness of such environments.

**Results:** Several metrics are evaluated, including patient outcomes, APACHE score, length of stay and type of unit in regard to the age of the patient. Prediction models based on decision and regression trees are presented to estimate mortality and length of stay.

**Discussion:** Prediction models offer the potential to optimize the Tele-CC environment by helping to estimate the number of patients who will remain in the ICU during the following days.

**Conclusion:** Prediction models accurately estimate mortality and length of stay in ICU. The estimation of future number of patients can be used to determine the resources needed at each hospital, as well as to provide insight on potential savings when Tele-CC centers provide concurrent services to multiple hospitals.

**Index Terms-** eICU, eICU collaborative research database, electronic ICU, intensive care, length of stay prediction, mortality prediction, resource management, tele-critical care, telemedicine

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