Research Aid Award

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Novel Machine Learning Approach to Examine Surgical Outcomes in Patients with Craniosynostosis

Craniosynostosis is one of the most common birth defects, affecting 1 in 2000 to 2500 live births. In patients with craniosynostosis, early fusion of cranial sutures leads to compensatory growth in other areas of the skull, resulting in abnormal head shape and putting the patient at risk for increased intracranial pressure causing difficulty breathing, choking, vomiting, protruded eyes, developmental delay, or death. Surgical intervention is mandatory in the first few years of life to relieve the fused suture, improve head shape, allow for normal brain development, and improve chances of survival. Common surgical procedures include fronto-orbital advancement, open cranial vault remodelling, extended strip craniectomy, spring-assisted cranial expansion, and cranial vault distraction. These procedures are associated with a high risk of morbidity and substantial resource utilization. The goal of this project is to use novel machine learning approaches to discern patterns in surgical outcomes and to build predictive models. The Nationwide Inpatient Sample for the years 2011 to 2017 will be used for the proposed study. The outcomes examined will include infectious complications, in-hospital mortality, hospital charges, and length of stay. The proposed study results will enable health care providers to identify high risk cohorts for poor outcomes. It is critical to orthodontic education as the need for orthodontic treatment and orthognathic surgeries in these patients is high throughout their lives. The treating clinician must possess the ability to properly identify, diagnose, and carry out comprehensive treatment on patients with previous craniosynostosis repair and assess the quality of their outcomes.

The study's principal investigator is Dr. Shayna Azoulay-Avinoam, a third-year orthodontic resident at the University of Illinois at Chicago. Dr. Shayna Avinoam was born in Toronto, Canada. She graduated from Wilfrid Laurier University with a Bachelor of Science and earned her Doctor of Dental Surgery degree from the University of Toronto. After residency, Dr. Azoulay-Avinoam aims to pursue a craniofacial fellowship and ultimately focus her practice on special care orthodontics and treatment of patients with craniofacial anomalies.

The support of the AAOF is critical to this study as it aims to examine the surgical outcomes of this large sample. The funding is being used towards the software required to analyze big data sets as well as access to the sample data. The AAOF funding is helping to advance the career of the principal investigator as she gains exposure to big data research in the area of craniofacial orthodontics and works towards her graduate thesis. This award has encouraged Dr. Azoulay-Avinoam to venture onto a path of future research and academic involvement. Without the support of the AAOF this project would not be possible.