Biomedical Research Award

Professor Giseon Heo, *University of Alberta*

Short biography: In 1998, I completed a PhD in Statistics at the University of Alberta. In 2014, I joined the University of Alberta's Orthodontics Division in the Department of Dentistry, where I currently teach two graduate statistics courses. I have published around 100 articles with researchers in statistics, mathematics, medical science and dentistry. I am a member of several graduate students' thesis committees. I have supervised twenty statistics students and I am currently co-supervising two statistics graduate students and one postdoctoral fellow. As a statistician, I work closely with clinicians, orthodontists, sleep specialists, radiologists, and engineers; carrying out shape analysis of landmark configuration, curves, surfaces, and 3D point cloud data. My research interests concern high-dimensional data analysis, where I focus primarily on clinical applications to orthodontics and sleep medicine.

Brief description of the project: Pediatric obstructive sleep apnea (POSA) is a potentially serious health problem. Untreated POSA can significantly impact overall health and increase healthcare utilization. Adenotonsillectomy (T&A) is the most common treatment; however, its success rate is only 51-81%. A significant knowledge gap exists about those patients that do not respond well to A&T. We will recruit children aged 6-16 years who did not experience improvement in their OSA symptoms and quality of life following T&A, and children for whom T&A is not a viable option. The patients, with their parents, will voluntarily choose orthodontic intervention (OI), Continuous Positive Airway Pressure (CPAP) therapy, or remain untreated. We will conduct polysomnography (PSG), biofluids sample collections, and questionnaires at baseline and after 12 months. This study aims to address two objectives: (1) to evaluate the effectiveness of two treatments for residual sleep apnea - CPAP and OI, and (2) to determine interactive patterns of pediatric residual OSA with pre-existing medical conditions.

How the orthodontic education will be benefit from award: Orthodontists are uniquely positioned to screen for children and adolescents at high risk of OSA. Their strength areas include understanding of craniofacial growth, capability to assess facial features and manage, as part of a multidisciplinary team, patients at risk of POSA. This project will assess if orthodontic management could improve POSA signs and/or symptoms.

Why the foundation is important to the project: Financial support is essential for auxiliary personnel to guide patients through the study. Support staff play a key role in patients' recruitment, data entry and management in provincial health databases.

How foundation funding might help advance your career: The complexity of POSA data motivates me to develop an analytic method, which combines several techniques in sciences. AAOF 2017 funding was extremely useful for me to start the groundwork on high dimensional complex data analysis. The AAOF 2019 award will help me go deeper with this analytic method. A team of international collaborators aim to develop a SmiLe (Statistical, Mathematical, Intelligence Learning E)-algorithm. SmiLe will aid clinicians

and orthodontists in their comprehensive understanding of massive measurements and decision making for each patient. If SmiLe is effective in this proposed study, then it may also be applicable in similar capacities. This funding should result in publications, contribution to data science community, and additional interdisciplinary collaboration.