

The Medical College of Wisconsin

Division of Biostatistics

Proudly Presents:

A Seminar Talk

By:



Chaeryon Kang, PhD

Assistant Professor in Biostatistics, University of Pittsburgh

Hybrid Statistical and Dynamical Systems Modeling Guides mHealth Intervention for Pain

Nearly a quarter of visits to the emergency department are for conditions that could have been managed via outpatient treatment; improvements that allow patients to quickly recognize and receive appropriate treatment are crucial. The growing popularity of mobile technology creates new opportunities for real-time adaptive medical intervention, and the simultaneous growth of “big data” sources allows for preparation of personalized recommendations. Here we focus on the reduction of chronic suffering in the sickle cell disease (SCD) community. SCD is a chronic blood disorder in which pain is the most frequent complication. There currently is no standard algorithm or analytical method for real-time adaptive treatment recommendations for pain. Furthermore, current state-of-the-art methods have difficulty in handling continuous-time decision optimization using big data. Facing these challenges, in this study, we aim to develop new mathematical tools for incorporating mobile technology into personalized treatment plans for pain. We present a new hybrid model for the dynamics of subjective pain that consists of a dynamical systems approach using differential equations to predict future pain levels, as well as a statistical approach tying system parameters to patient data (both personal characteristics and medication response history). Pilot testing of our approach suggests that it has significant potential to well predict pain dynamics, given patients reported pain levels and medication usages. With more abundant data, our hybrid approach should allow physicians to make personalized, data-driven recommendations for treating chronic pain.

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3:30 PM – 4:30 PM

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Light snacks provided