

Center of Excellence for Mobile Sensor Data-to-Knowledge (MD2K)

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Rapid advances in technology, are leading to field-deployable mobile sensing devices that can now be used to quantify complex dynamics across time of key physical, biological, behavioral, social, and environmental factors that contribute to health and disease risk. These data will enable us to break through to the next level of biomedical understanding of causation in complex disorders. While ongoing efforts have made significant strides in the analysis of "big data" in the areas of genomics, imaging, and EHR, significant new investment is needed to develop and disseminate data analytics tools specific to the unique features of mobile sensor data (e.g., high volume, velocity, variety, variability, and versatility) to convert this wealth of data into information, knowledge, and action. Investment in strong, open, scientific, and computational infrastructure for mobile "big data" at this early stage promises outside returns to advance science and improve health. The Center of Excellence for Mobile Sensor Data-to-Knowledge (MD2K) will generate generalizable theory, methods, tools, and software, to address major barriers to processing complex mobile sensor data and its use in biomedical knowledge discovery and just-in-time care delivery, laying the foundation for P5 Medicine. It will develop and implement a standards-based, interoperable, extensible and open-source big data software platform for efficient implementation of MD2K data analytics. The MD2K Center will demonstrate the feasibility, utility, and generalizability of the MD2K approach by implementing the entire MD2K data analytics system in the context of two biomedical applications - reducing relapse among abstinent daily smokers and reducing readmission among congestive heart failure (CHF) patients. All the tools and software developed by the Center will be freely available as standards-compliant and open-source with documentation to engage data science researchers in advancing the science of MD2K and its integration with other biomedical big data such as EHRs, genomics, and imaging. The Center will provide training materials to help biomedical researchers install the MD2K software on their mobile devices and servers to collect mobile sensor data and analyze these data for biomedical discovery. PUBLIC HEALTH RELEVANCE: By enabling the use of mobile sensor data to detect and predict person-specific disease risk factors ahead of the onset of adverse clinical events, this project will make it possible to intervene anytime, anywhere, to anticipate and prevent disease complications at the earliest time point, ultimately supporting wellness. These tools, made freely available, will reduce the burden of complex chronic disorders on health and healthcare.