Preliminary Title: Toward Precision Medicine in the Intensive Care Unit

Preliminary Abstract:  Critical illness encompasses a wide variety of ailments which require intensive 24-hour care.  While mortality in the intensive care unit has declined over the past few decades, mortality in select patient populations (sepsis, acute lung injury) remains high. Survivorship can be costly and burdensome, with patients experiencing reduced physical or cognitive functionality requiring additional care.  The critically ill patient population is also complex—patients tend to be aging with multiple comorbidities. Faced with costly and burdensome care, it is imperative to better understand the varied and unique pathophysiologic states experienced by these patients to deliver care targeted to their condition. Unfortunately, randomized controlled trials in critical illness disproportionately yield negative results. Reasons for this extend beyond improving methodology, power, and appropriate outcome measurements. Rather, our inability to recognize the heterogeneous and dynamic nature of critical illness makes it challenging to prospectively design observational research and clinical trials, limiting our ability to find high quality therapies to improve outcomes. Instead, precision medicine approaches rooted in translational –omics science, health informatics, artificial intelligence, and predictive analytics are required to develop targeted, effective therapies and improve patient outcomes.