Talk Title: Structural Equation Modeling in Clinical Research: New Methods and Applications for EHR data, Multiple Sclerosis and Depression

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Abstract
This presentation will provide an overview of Structural Equation Modeling (SEM), a very general technique combining complex path models with latent (unobserved) variables, through applications in clinical research studies and new methods. An SEM-based approach will be discussed for distinguishing the roles of multiple sclerosis and depression in patient-reported fatigue and functional disability, using the Knowledge Program (KP) at the Cleveland Clinic's Neurological Institute data base. The KP links patient-reported depression (via the PHQ-9) responses to the EPIC EHR and provides a powerful opportunity to study and improve patient care and clinical research. SEM is a very appropriate approach to handing the latent variables, causality questions and irregular follow-up times in the KP data base. The development of SEM is a relatively new area for clinical research, and owes much to recent advances in computing power and software. There are several important methodological questions still open in the literature. A mediation analysis evaluates a hypothesized mediation process where an intervening (or middle) measure helps explain how an independent measure influences an outcome. Established methods for SEM produce biased estimates in mediation analysis with the missing data patterns we observe in the KP, and no current SEM approach deals comprehensively with responses that are non-continuous. A new distribution-free approach to longitudinal SEM-based mediation analysis addressing these concerns is discussed.