PEPReC

Partnered Evidence-based Policy Resource Center

Improving Analysis of Endogenous Multimodal Treatments for Use in Geriatrics Health Outcomes Studies
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Anticipated Impact on Veterans Health Care: The results of this study will be used to develop best practices for using propensity scores for multimodal treatments and to strengthen researchers' abilities to use existing Veterans Health Administration data to improve health care value and efficiency for older veterans. If selection bias is ignored, we run the risk of erroneously concluding a helpful treatment has no statistically or clinically significant benefit, or erroneously concluding a treatment is safe when in fact it leads to harm. Careful targeting of VHA resources to sustain pilot interventions most likely to reduce veteran wait and travel times, improve symptom control, and reduce unnecessary hospitalizations depends on accurate interpretation of observational data analyses. Improving methods for addressing observable selection bias is essential to sustaining a high-functioning learning health care system.

Project Background: Increasingly, existing large datasets (such as the Geriatrics and Extended Care Data and Analysis Center [GEC-DAC] dataset) and prospective observational/quasi-experimental studies are being used to examine important research questions in seriously ill older adults and to explore new models of care delivery. Randomized controlled trials can be burdensome to seriously ill patients or infeasible to conduct, and they may not produce results generalizable to the population of interest. Observational data analyses in geriatric palliative care must account for severe treatment endogeneity, which occurs when factors are simultaneously associated with treatment likelihood and outcomes. Propensity scores are one way to address endogeneity. A propensity score is the estimated probability of treatment receipt, conditional on a set of observed covariates that are thought to be associated with both treatment likelihood and outcome. An unbiased treatment effect can be estimated by comparing treated and comparison individuals with similar propensity scores. Most guidance on propensity scores is restricted to methods for matching individuals with similar propensity scores across two groups (treatment, no treatment). Many treatments, however, have multiple levels, and restricting treatments to binary indicators obscures differences between groups. Weighting by propensity scores is a superior alternative to matching when there are multiple treatment groups. This study aims to develop best practices for using propensity scores for multimodal treatments and to strengthen researchers' abilities to use existing VHA data to improve health care value and efficiency for older veterans.

Project Objectives:

1) Use simulated data to determine which weighting/estimation combination (inverse probability weighting or kernel weighting by propensity scores estimated via regression with maximum likelihood estimation, covariate-balancing propensity score estimation, or generalized boosting methods) provides the most efficient estimates with the least bias in a variety of estimation scenarios.
2) Determine which weighting/estimation strategy provides the best observed covariate balance (a secondary measure of propensity score performance) across multiple treatment levels in a variety of simulated estimation scenarios.
3) Determine which weighting/estimation strategy is the least susceptible to residual confounding.

Project Methods: Traditional Monte Carlo and plasmode (empirically based) simulations will be used to achieve the objectives. To facilitate translation of results, we will repeat objectives 2 and 3 in empirical datasets with different sample sizes and expected treatment effect heterogeneity. Results will be verified by estimating effects of sedative-hypnotics on risk of in-hospital death in previously collected data from a study of 100,000

hospitalized veterans with cancer, heart failure, chronic obstructive pulmonary disease, and/or HIV/AIDS and from a study of 300,000 veterans with an opioid prescription. We expect to identify patterns of superior performance for strategies in common estimation scenarios as well as scenarios in which inferences are most likely to diverge. We will develop training materials based on our results and work with an advisory committee of leaders in observational data analysis to disseminate these results widely and inform studies of non-randomized health care interventions (such as post-hospitalization referral to Geri-PACT) as well as studies using VHA “big data” resources.