reviewed. After initial general data collection phase, we categorized data as “must have” and “good to have.” “Must have” variables were defined as data variables that were essential for the study outcomes. “Good to have” variables would not affect the main outcomes of the study if missing. We measured completeness of data using the in-built REDCap data quality check feature. We used several strategies to encourage reduction of missing data. We initially did random data checks but noted that the amount of missing data was substantial and could not be adequately addressed this way. Second, we created excel sheets highlighting missing data for each site and sustained sites. This proved onerous to create and made it burdensome for sites to identify easily where data was missing. Third, we built a custom report form in REDCap specifically able to identify which “must have” data points were missing. This could be easily accessed by the principal investigator at each site and made completing the data forms more straightforward. We encouraged all sites to complete their data collection by sending weekly data reports to each site highlighting the patients with missing data. An instructional YouTube tutorial was also created and the link was shared with all sites to demonstrate how to use the custom built report form in REDCap and how to appropriately fill in the missing data. Since this was a global study, we communicated with sites using a variety of locally favored mechanisms including Zoom, FaceTime, WeChat, WhatsApp as well as email. By harnessing the buy-in of local champions our approach was successful.

RESULTS/ANTICIPATED RESULTS: The total number of patients recruited for the CERTAIN study is 4843. The rate of all missing variables improved with the efforts described above. Hospital admission dates were missing in 8.4% pre efforts and 4.2% post efforts (p < 0.01). ICU admission dates were missing in 5.0% pre and 2.1% post efforts (p < 0.01). Documenting hospitalization details of care (including central line review, urinary catheter review, consideration for blood transfusion) improved significantly from pre to post (p < 0.01).

DISCUSSION/SIGNIFICANCE OF IMPACT: Missing data can be a problem in all types of research studies. This study provides some preliminary evidence for effective approaches that can reduce the problem of missing data when conducting a global study at sites with limited research infrastructure in place. By addressing the concern about missing data, we can be more confident that our results can be accurately analyzed and interpreted, improving the quality of the research.

Big data approaches in translational science: The influence of psychiatric and trauma history in predicting smoking during pregnancy in a cohort of female like-sex twin pairs

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OBJECTIVES/SPECIFIC AIMS: Smoking during pregnancy (SDP) is associated with negative health outcomes, both proximal (e.g., preterm labor, cardiac, pulmonary, chronic lung disease, low birth weight) and distal (e.g., inattention, externalizing behaviors and attention deficit/hyperactivity disorder (ADHD) symptoms, increased risk of child smoking). As pregnancy provides a unique, formative window, smoking behaviors during pregnancy will likely carry into adulthood. We used objective measures of smoking frequency and the past 30 days smoking cessation data from a large, national twin cohort to explore predictors of smoking during pregnancy in female twins with a history of Attention Deficit Hyperactivity Disorder (ADHD). The purpose of this study was to identify potential variables and develop a smoking cessation intervention model that could be tailored to high-risk women with ADHD.

The findings of this study may be useful for future smoking cessation interventions targeted at these high-risk women, and may be particularly useful for interventions that focus on smoking cessation for women with ADHD.

Cognitive and behavioral side effects in patients treated with droxidopa for neurogenic orthostatic hypotension

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OBJECTIVES/SPECIFIC AIMS: To describe adverse behavioral symptoms attributed to droxidopa therapy for neurogenic orthostatic hypotension (nOH). METHODS/STUDY POPULATION: BACKGROUND: Droxidopa, a norepinephrine (NE) precursor, improves symptoms of nOH by replenishing NE levels. Central NE effects are poorly described but may offer potential benefits given the pathophysiologic progression of α-synuclein-related disorders. Here we report a series of cognitive and behavioral side effects linked to droxidopa therapy. METHODS: We identified 5 patients treated at Vanderbilt University who developed behavioral symptoms including mania, irritability, and disinhibition shortly after the initiation of droxidopa for nOH. Comprehensive chart reviews were performed for all patients, including analysis of droxidopa titration schedule and dosing, medical comorbidities, clinical course,
and outcome. All patients had symptoms of synucleinopathy, manifesting with autonomic failure, REM behavior disorder, and parkinsonism. Four met criteria for idiopathic PD, and one was diagnosed with pure autonomic failure but had concomitant symptoms of parkinsonism and REM sleep behavior disorder. RESULTS/ANTICIPATED RESULTS: Our patients had no significant cognitive or behavioral symptoms before the initiation of droxidopa. The average decrease in blood pressure upon standing was 27 mmHg systolic and 17 mmHg diastolic. Behavioral disturbances were observed early in the titration period and persisted at relatively low doses of droxidopa (most daily doses ranging from 300 to 800 mg/day; droxidopa therapeutic dose range 900–1800 mg/d). The most common symptoms reported were mania, irritability, and confusion. Symptoms resolved with dose reduction in 4 patients, and droxidopa was discontinued in 1 patient due to persistent irritability. No other medical comorbidities or alternative etiologies were identified to explain these effects. DISCUSSION/SIGNIFICANCE OF IMPACT: Droxidopa is a produg designed to act peripherally, but may also have important, yet poorly described, central effects. We hypothesize that these behavioral manifestations result from an “overdose” of key NE networks linking orbitofrontal and mesolimbic regions. Further studies are warranted to better characterize central NE effects in patients treated with droxidopa.