DGIM Project Summary:

**Name of Project:** A New Translational Tool for Studying the Role of Breathing in Meditation

**Investigators:** (Include phone numbers and email address, indicate PI and primary contact)

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**Research questions:** This project investigates the extent to which regular practice of mindful breathing results in decreases in 24-hr blood pressure and changes in breathing patterns in older women with prehypertension. In addition, it tests the hypothesis that those participants who show significant decreases in blood pressure will also show significant changes in breathing habits, and specifically, in decreased concentrations of carbon dioxide in expired air.

**Brief Background/Significance:** Several studies have reported previously that regular practice of meditative breathing exercises can decrease blood pressure in hypertensive patients. It is often speculated that this response is mediated by decreases in sympathetic nervous system activity. However, the blood pressure effects of meditative breathing could also be due to physiological effects of changes in breathing habits that are independent of sympathetic activity. For example, changes in circulatory carbon dioxide (CO$_2$) affect acid-base balance, which, in turn, is a determinant of renal regulation of total body sodium. Increased levels of blood CO$_2$ associated with disordered breathing could decrease the ability of the kidneys to excrete ingested salt. To date, no information is available, however, about whether meditative breathing alters breathing habits beyond the specific times of meditation.

Concentrations of CO$_2$ in expired air are a useful approximation of blood CO$_2$. The present study introduces a new device for ambulatory monitoring of end tidal CO$_2$ in human subjects and patients. This device is essentially a miniaturized version of a standard respiratory gas monitor that draws expired air through a CO$_2$ sensor from a nasal cannula, and records digitized data for breathing rate and end tidal CO$_2$ from successive breaths over intervals of up to hours. By monitoring end tidal CO$_2$ in the natural environment as well as in the clinical environment, this study has the potential to clarify whether individual differences in blood pressure adaptations of prehypertensive women to regular practice of meditative breathing are a function of individual differences in breathing habits. From such studies can come identification of those patients for whom meditative breathing would be a useful non-pharmacological intervention for prevention or treatment of hypertension.

**Inclusion/exclusion criteria:**  
- Inclusion criteria:  
  - Mean 24-hr SBP: 130-139 mmHg  
  - Female  
  - > 50 years of age  
  - Post-menopausal, defined as greater than or equal to one year without a menstrual cycle.  
  - Body Mass Index (BMI): 19-30  
  - English speaking (Patients not able to read and speak English will be excluded as the behavioral group interventions are conducted in English)  
  - Has a personal physician
Exclusion criteria:

- Male
- Smoker within six months
- Plans to relocate outside recruitment area within six months
- Any history of the following conditions:
  - Respiratory disease, including chronic bronchitis (COPD), emphysema, asthma, and other chronic pulmonary conditions
  - Cardiovascular disease, including chronic ischemic heart disease, cardiomyopathies, heart failure, and cerebrovascular diseases
  - Chronic liver disease and cirrhosis
  - Chronic glomerulonephritis or renal failure
  - Diabetes
- Any of the following current prescriptions or drug use:
  - All blood pressure medications
  - Tranquilizers or benzodiazepines if prescribed regularly
  - Narcotics if prescribed regularly.

Method of contact/recruitment: Letters will be sent to candidates inviting participation in the study.

Benefits/burden for participants (clearly identify potential for harm)

Benefit: Participants will be taught to engage in mindful breathing exercises. Decreases in 24-hr blood pressure in response to regular practice of these exercises would be a benefit.

Burden: The participants will attend eight, one-hour sessions of instruction in mindful breathing and 3, one-hour refresher sessions at the Osher Center; and practice these exercises regularly at home. They will also have non-invasive monitoring of blood pressure and breathing patterns in the clinic and in their natural environment. They will be compensated for their time.

Any benefits or burden to DGIM practitioners?

No specific benefits or burdens are anticipated for DGIM practitioners beyond access to (a) the data collected on participating patients and (b) the results of the study.

Timeline for recruitment (projected start and stop dates): The project is in progress, and will continue until August 31, 2014.

Funding source: The study is funded by a grant from the National Center for Complementary and Alternative Medicine of the National Institutes of Health. NIH grant #: R01 AT005820

Potential for DGIM collaborators? (We encourage DGIM resident and fellow involvement in particular)

Any interested DGIM staff are invited to visit the Osher Center and discuss prospects for collaboration within or beyond this specific study, focusing in particular on the utility of the new breathing monitor.

Do you agree to notify us when recruitment is completed? Yes.

Date form completed: November 4, 2011