

Cardiovascular and Stroke Nursing Council Science in Review

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This paper summarizes the scientific presentations during the Cardiovascular and Stroke Nursing Council's (CVSN) Sunday morning special session, "Nursing Science in Review." The meeting took place during the American Heart Association's (AHA) Annual Scientific Sessions in 2018. The goal of this special session was to highlight the breadth and depth of CVSN research through presentations from top-funded CVSN nurse researchers. Each spring, the CVSN Council's Programming/Scientific and Clinical Education Lifelong Learning committee members extend invitations to CVSN nurse researchers funded by the National Institutes of Health with a R01 or K grant mechanism or by the AHA (any mechanism).

The AHA Scientific Sessions 2018, held in Chicago, IL from November 10 to 12, featured a new 2-day programming format for all CVSN sessions. The *Nursing Science in Review* session included 5 CVSN researchers: Gia Mudd-Martin, PhD, MPH, RN from the University of Kentucky; Erin Ferranti, PhD, RN, MPH, FAHA (Fellow of the American Heart Association) from Emory University; Anne M. Fink, PhD, RN, FAHA from the University of Illinois at Chicago; Dawn Aycock, PhD, RN, ANP-BC, FAHA from Georgia State University; and Nancy A. Pike, PhD, RN, CPNP-AC/PC, FAAN from the University of California Los Angeles. Their studies encompassed a variety of methods including: community-based participatory research, metabolomics, preclinical animal research, clinical intervention studies, and the use of magnetic resonance imaging scans to measure brain volumes and function.

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Dr Gia Mudd Martin's work focuses on the public health impact of cardiovascular disease in vulnerable populations and testing interventions to educate those individuals on risk prevention.¹⁻⁷ She presented preliminary findings from her study, "Corazon de la Familia (Heart of the Family)" (R01NR16262-01A1, UL1TR001998). The primary study aim is to compare the short- and long-term impact of an 8-week family-focused intervention and an individual-focused intervention to decrease cardiovascular disease and type 2 diabetes mellitus (T2D) risk factors in Hispanic adults. A secondary aim is to determine whether the family dyad member's engagement in healthy lifestyle behaviors affects their or their family member's health outcomes. Dr Mudd-Martin is actively engaged with the Hispanic community outside Lexington, KY. The community has helped in translating her research and pilot-testing components of the National Heart Lung & Blood Institute's *Su Corazon, Su Vida* program. This study was initially driven by requests from the Hispanic community to use their Promotores de Salud or Community Health Workers, to educate community members about their higher than normal risk of cardiovascular disease and T2D.³

One of the challenges was how to revise favorite Hispanic recipes into heart healthy dishes that follow AHA dietary recommendations. Dr Mudd-Martin's team includes a co-investigator who is from the community and a dietician who consulted on multiple revisions of recipes into healthier dishes that tasted similar to the cultural favorites. New recipes were then taste tested by study participants during the intervention sessions. Dr Mudd-Martin included tips on how to include community experts as co-investigators while meeting National Institutes of Health grant proposal requirements. She worked collaboratively with her community expert to develop a strong biosketch that demonstrated that partner's qualifications, as well as making a strong case throughout the grant application of the community expert's contributions to the study design, successful recruitment of participants, and intervention delivery.

As a public health nurse, Dr Erin Ferranti, is focused on cardiovascular and T2D health prevention in black women of childbearing age.^{8,9} She uses metabolomic data to aid in the mitigation of cardiometabolic risk in women who have experienced, or are at risk of experiencing, cardiovascular disorders during pregnancy.¹⁰⁻¹⁴ Her presentation focused on

her current studies concentrating on disparities in black women who are at risk of hypertensive disorders of pregnancy (HDP), including pre-eclampsia and gestational hypertension. All women who have HDP have a significantly higher lifetime risk of adverse cardiovascular complications such as heart failure, hypertension, stroke, T2D, and cardiovascular mortality; however, the risk in black women is significantly higher.¹⁵ Research has demonstrated that 4 microbial genera are associated with hypertension, indicating differences may exist in the gut microbiome between those with and without hypertension. Mechanisms that explain these differences are unclear.¹⁶ Experts have recently reported hypertension differences also exist between gut microbiomes in blacks and whites, leading experts to hypothesize that differences in the gut microbiota, including mechanisms of action, may vary by race.¹⁵

Dr Ferranti's first study (K12 HD085850) was a secondary analysis of a parent study (R01NR014800) which characterized the structure and dynamics of the gut microbiome in early (8–14 weeks) and late (24–30 weeks) pregnancy in women who developed HDP versus those who had not. She shared preliminary results as she continues to recruit her target of 500 participants. Her second study (NINR K01) follows women longitudinally from early pregnancy to the post-partum period (8–10 months after delivery) to examine long-term complications between women who have and have not experienced HDP. She is testing the hypothesis that black women who have HDP will also have patterns of gut microbiome and circulating lipidome changes, as well as increased inflammatory serum biomarkers. Dr Ferranti is using microbiome and anthropometric measures, blood specimens, and other clinical measures. There is a strong need for biomarkers and risk scores that clinicians can use to quantify the long-term risk for women who experience HDP. Clinicians need evidence-based recommendations for risk screening and the frequency and duration of monitoring of postpartum women who experience HDP to reduce future cardiovascular morbidity and mortality.

The AHA increasingly recognizes that cardiovascular health includes restorative sleep.¹⁷ More than 22 million Americans have sleep apnea that increases the risk of hypertension and stroke.^{18–20} Dr Anne Fink uses animal models to study the neurobiology of sleep-disordered breathing. She is examining neural pathways in the brainstem and sympathetic nervous system to generate knowledge about the regulation of sleep, breathing, and blood pressure. Three brainstem regions are important in the control and regulation of sleep: (1) the nucleus of the solitary tract which integrates signals from baro- and chemoreceptors to regulate sympathetic and parasympathetic outflow to the heart; (2) the rostral ventrolateral medulla which regulates all reflexes that control blood pressure (one method is by sympathetic innervation to the

kidney to regulate catecholamine release); and (3) the pedunculo-pontine tegmentum (PPT) area in the Pons which is thought to control alertness, rapid eye movement sleep, and breathing patterns.²¹ The function of the PPT in regulating cardiovascular function is not clearly defined. Dr Fink (K99/R00NR014369) tested 2 hypotheses: (1) that stimulation of the PPT would cause increased renal sympathetic nervous system activity and increased blood pressure in rats; and (2) that PPT neuronal loss would result in a hypotensive response to chronic, intermittent hypoxia in rats.

Dr Fink was the first researcher to find that PPT stimulation could evoke increases in renal sympathetic nerve activity.²² These findings are important because they provide a possible mechanism by which the PPT can control blood pressure. Dr Fink's second hypothesis, that the mean arterial blood pressure decreased significantly in rats with PPT lesions during intermittent hypoxia, was supported.²³ These findings provide evidence that a loss of PPT neurons can block sympatho-excitatory responses to chronic intermittent hypoxia. Pontine networks (including the PPT) may be a target for manipulating cardiovascular activities in conditions of sleep-disordered breathing and could be applicable to a broad range of disorders involving neurodegeneration and sleep-disordered breathing such as dementia and movement disorders. Current treatments for sleep apnea are mechanical, but future goals are to define neuroanatomical and functional connections among brain networks to improve treatment options for patients with neurodegenerative diseases.^{20,21}

Stroke is the leading cause of disability in the United States, and blacks aged <65 years are 2 to 5 times more likely than whites to experience strokes.^{24–26} Dr Dawn Aycock's research focuses on increasing young black adults' awareness of their stroke risks through development and testing of culturally appropriate and innovative educational interventions such as videos, texts, and individual counseling/risk assessment to prevent strokes.^{27–31} Dr Aycock is (5K01NR015494) testing the efficacy of the Stroke Counseling for Risk Reduction intervention to improve perceived stroke risk and increase targeted risk reduction in young black adults. Dr Aycock recruited black adults between ages 20 and 35 years with at least 1 modifiable stroke risk factor into a 2-arm randomized controlled trial that included use of the Stroke Counseling for Risk Reduction intervention. She used Craigslist, flyers, and snowballing methods for recruitment and recommended Craigslist because it was free, easy to use, and yielded multiple subjects.

Data were collected at baseline, immediately post-intervention, and at 8 weeks after the intervention. The intervention incorporated one-on-one counseling sessions, the Stroke Champions video, discussion of AHA's Life Simple 7,^{32,33} participant risk assessment, personalized risk reduction planning, a diary log, and motivational text messages. The

attention control group received a safe-sex brochure and video, results of their health measures and diary, and safe-sex text messages. They did not receive one-on-one counseling. The Stroke Counseling for Risk Reduction intervention was successful, and the intervention group's perceived stroke risk and readiness for behavior change was improved.

Dr Nancy Pike's research on children with congenital heart disease (CHD) focuses on biobehavioral and health outcomes in infants, children, and adolescents.^{34–38} Dr Pike has developed a strong interdisciplinary team to develop and test interventions in this population and to translate findings into clinical practice. Cognitive deficits, particularly memory loss, are common in adolescents with CHD and can affect educational achievement, employability, self-care, and quality of life.³⁹ A generation ago, the majority of these children died shortly after birth. Surgical advances have helped children with CHD live longer lives; surviving to adolescence and beyond. As a result, they face the challenge of having to take responsibility for their own health as they transition to adulthood and independence. Hypoxic and/or ischemic brain injury is hypothesized to be one potential cause of cognitive deficits, but this remains unclear.

Dr Pike's cross-sectional studies (R01NR013930, R01NR016463) compared structural integrity in regions of the brain (hippocampus, mammillary bodies) between adolescents with congenital heart disease (CHD) and age- and sex-matched controls. Dr Pike assessed the relationship between memory and brain structures responsible for memory. Magnetic resonance imaging was used to measure total intracranial volume and to calculate volumes of the left and right hippocampi and mammillary bodies. The Wide Range Assessment of Memory and Learning, Second Edition^{40,41} and the Montreal Cognitive Assessment^{42,43} questionnaires were completed by participants. Dr Pike found that the CHD participants had differences in memory deficits and brain volumes compared with controls. On the basis of these findings, she recommended that clinicians provide periodic surveillance screening for cognitive and memory deficits in adolescents with CHD as they age. There is a knowledge gap in evidence-based recommendations for the frequency and duration of cognitive screening in children and adolescents with CHD to identify children at high risk of academic problems or threats to independence as early as possible. Dr Pike recommended that future research focus on potential therapies to provide neuroprotection and/or neurogenesis to optimize academic achievement as these children transition into adulthood.

The presentations generated many questions and the presenters shared tips from their experiences for a thought-provoking Sunday morning CVSN nursing research session. This year's speakers again demonstrated that nurse scientists are generating new knowledge and evidence-based findings to

move science and clinical practice forward in the rapidly changing healthcare environment.

Conclusions

Five scientists provided preliminary data indicating it was possible to decrease cardiovascular disease and T2D risk factors in Hispanic adults, reduce cardiometabolic risk for women with hypertensive disorders of pregnancy, establish mechanisms of sleep-disordered breathing in animal models, reduce stroke risk in young black adults using culturally appropriate interventions, and identify structural differences in regions of the brain in adolescents with and without congenital heart disease.

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Disclosures

None.

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