Foreword

Hammond Research Day is a time to celebrate and honor Duke Department of Obstetrics and Gynecology residents and fellows for their exceptional achievements. Today, eight residents and five fellows will present their research, representing the culmination of months of thoughtful inquiry, hard work, and personal and professional growth.

We are grateful to the residents and fellows for their tireless contributions to research, education and patient care during their training. Many women and families have benefited from their experience and commitment to the highest quality patient care.

We are also grateful to their faculty mentors for their efforts and support to cultivate the next generation of leaders in women’s health.

To the families, your support and encouragement is fundamental to our success.

As an alumnus who previously presented at this meeting; as a resident 1998, a fellow 2001, and as a previous Charles B. Hammond Lecturer in 2012, I know firsthand how meaningful this day to the participants and how important it is for the entire department.

We look forward to the significant contributions and unwavering dedication to improving women’s health as alumni of Duke Obstetrics and Gynecology in the years ahead as our residents and fellows pursue future endeavors.

Much success,

Matthew D. Barber, MD MHS
Chair, Department of Obstetrics and Gynecology
Professor of Obstetrics and Gynecology
Duke University Medical Center
GRADUATING FELLOWS 2016-2017

Lauren P. Cobb MD
Medical School: Baylor College of Medicine
Residency: Johns Hopkins Hospital
Fellowship: Duke University Medical Center Division of Gynecologic Oncology
Future Plans: Assistant Professor in the Department of Gynecologic Oncology and Reproductive Medicine
MD Anderson Cancer Center, Houston, TX

James M. Edwards MD
Medical School: University of Virginia School of Medicine
Residency: Duke University Medical Center
Fellowship: Duke University Medical Center Division of Maternal Fetal Medicine
Future Plans: Maternal Fetal Medicine Faculty
WakeMed, Raleigh, NC

Margaret S. Villers MD MSCR
Medical School: Georgetown University School of Medicine
Residency: Duke University Medical Center
Fellowship: Duke University Medical Center Division of Maternal Fetal Medicine
Future Plans: Commonwealth Perinatal Associates
Richmond, VA

Sanaz Keyhan MD
Medical School: New York Medical College
Residency: Kaiser Permanente Los Angeles
Fellowship: Duke University Medical Center Division of Reproductive Endocrinology and Fertility
Future Plans: Palo Alto Medical Foundation
San Jose, CA

Megan S. Bradley MD
Medical School: University of Pittsburgh School of Medicine
Residency: University of Pittsburgh Magee Women’s Hospital
Fellowship: Duke University Medical Center Division of Female Pelvic Medicine and Reconstructive Surgery
Future Plans: Female Pelvic Medicine and Reconstructive Surgery Faculty
Magee Women’s Hospital - University of Pittsburgh
Pittsburgh, PA
GRADUATING RESIDENTS 2016-2017

Clayton A. Alfonso MD
Medical School: Louisiana State University School of Medicine, New Orleans, LA
Future Plans: Duke Women's Health Associates, Durham, NC

Cynthia R. Fountain MD MBA
Medical School: University of Colorado School of Medicine
Graduate School: College of William and Mary
Future Plans: Complete Women's Care Center Woman's Hospital of Texas, Houston, TX

Maeve K. Hopkins MD MA
Medical School: Ohio State University College of Medicine
Graduate School: Ohio State University College of Medicine
Future Plans: Maternal Fetal Medicine Fellowship, University of Pennsylvania, Philadelphia, PA

Tia L. Jackson-Bey MD MPH
Medical School: University of Cincinnati College of Medicine
Graduate School: New York Medical College
Future Plans: Reproductive Endocrinology and Infertility Fellowship University of Illinois at Chicago, Chicago, IL

Ana Rebecca Meekins MD
Medical School: Duke University School of Medicine University
Future Plans: Female Pelvic Medicine and Reconstructive Surgery Fellowship, Duke University Medical Center, Durham, NC

Arlene C. Pak MD MA
Medical School: Boston University School of Medicine
Graduate School: Boston University School of Medicine
Future Plans: Centre Ob/Gyn, Raleigh, NC

Allison M. Puechl MD
Medical School: University of South Carolina School of Medicine
Future Plans: Gynecologic Oncology Fellowship, Duke University Medical Center, Durham, NC
2017-2018 FELLOWS

Female Pelvic Medicine and Reconstructive Surgery

Jennifer A. Bickhaus MD (2018)
Monique H. Vaughan MD (2019)
Ana Rebecca Meekins MD (2020)

Gynecologic Oncology

Jonathan R. Foote MD (2018)
Haley A. Moss MD MBA (2019)
Allison M. Puechl MD (2020)

Maternal Fetal Medicine

Amber M. Wood MD (2018)
Annalisa L. Post MD (2018)
Chelsea M. Clinton MD (2019)
Emily S. Reiff MD MA (2019)
Megan S. Varvoutis MD (2020)
Anne M. Siegel MD (2020)

Reproductive Endocrinology and Fertility

Sandy J. Li MD MA (2018)
Kelly S. Acharya MD (2019)
Stephanie Smeltzer MD (2020)
RESIDENTS

CLASS OF 2018
Annalies E. DeNoble MD MSc
Charlotte R. Gamble MD MPH
Cassandra K. Kisby MD
Tashima E. Lambert MD
Alejandro J. Landa MD
Laura K. Newcomb MD
Nichelle A. Satterfield MD
Ashley E. Veade MD

CLASS OF 2019
Jaclyn M. Arquitecture MD
Amy L. Askew MD MPH
Katherine C. Bishop MD
Carrie A. Jones MD
Benjamin S. Harris MD
Andrew J. Rivara MD
Ja’Pel K. M. Sumpter MD MPH
Ann R. Tucker MD

CLASS OF 2020
Azza E. Abdalla MD
Luke A. Gatta MD
Dana C. McKee MD
Charlotte M. Page MD
Lauren C. Potts MD
Isabel V. Rodriguez MD
Amanda R. Schwartz MD
Logan K. Williams MD

CLASS OF 2021
Tatiana Acosta MD MPH
Melissa Paige Cisa MD
Jill M. Hagey MD MPH
Jenna L. Hynes MD
Kerry E. Drury MD
Abigail H. Fulp MD
Vivienne T. Meljen MD
Shelun Tsai MD
Charles B. Hammond MD
E. C. Hamblen Distinguished Professor Of Reproductive Biology
Chairman Emeritus Department of Obstetrics and Gynecology
Duke University Medical Center

Each year the Department of Obstetrics and Gynecology invites a distinguished leader in our field to present a lecture on Research Day and to participate in the judging of research presentations.

Named to honor Charles B. Hammond, MD, esteemed Chairman Emeritus and third Chairman of the Department of Obstetrics and Gynecology at Duke University Medical Center, the lecture is intended to advance medical knowledge, education and research in reproductive medicine.
Previous Charles B. Hammond Lecturers

2004 Sterling B. Williams MD
2005 William N. P. Herbert MD
2006 David G. Mutch MD
2007 John T. Queenan MD
2008 Frank C. Miller MD
2009 James R. Scott MD
2010 Jennifer R. Niebyl MD
2011 Michael T. Mennuti MD
2012 Matthew D. Barber MD MHS
2013 William C. Dodson MD
2014 William A. Cliby MD
2015 William T. Creasman MD
2016 Barbara S. Levy MD
Alan Hersh DeCherney, M.D. received his Medical Degree from Temple University School of Medicine where he was AOA and awarded the Henry Laughlin Alumnus of the Year Award in 2005. His internship in Medicine was at the University of Pittsburgh, followed by a residency in Obstetrics and Gynecology at the University of Pennsylvania. He holds an honorary Master of Arts Degree from Yale University and he completed a research fellowship in Immunology at the Lister Institute in London, England.

He is currently Deputy Clinical Director for Academic Affairs, Director, Reproductive Endocrinology and Infertility Fellowship Program and Head, Reproductive Endocrinology and Gynecology Affinity Group of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) of the National Institutes of Health.

Dr. DeCherney has been a Member of the National Academies of Sciences, Engineering, and Medicine. Institute of Medicine (IOM) since 2004 and was Chairperson of the IOM Interest Group on Maternal & Child & Human Development 2008 to 2010. In 2015 he served on the IOM Committee on Ethical and Social Policy Considerations of Novel Techniques for the Prevention of Maternal Transmission of Mitochondrial DNA Diseases.

Dr. DeCherney was a pioneer when IVF was first performed successfully in the U.S. He was among a handful of physicians who treated some of the...
earliest patients. Dr. DeCherney has mentored more than 100 Reproductive Endocrinologists over the years.

Dr. DeCherney was the John Slate Ely Professor of Obstetrics and Gynecology at Yale University School of Medicine and the Division Director of Reproductive Endocrinology and Infertility and Women’s Health Services. Prior to that, Dr. DeCherney was the Phaneuf Professor and Chair of Obstetrics and Gynecology at Tufts University School of Medicine.

He was the Director of the Division of Reproductive Endocrinology at the David Geffen School of Medicine at the University of California, Los Angeles (UCLA) from 1996 to 2006 and was Chair of the Department of Obstetrics and Gynecology from 1996 to 2002.

He is a Fellow of the American College of Obstetricians and Gynecologists; Past President of the American Society for Reproductive Medicine; a Past President of the Society for Reproductive Endocrinology and Infertility, the Society of Reproductive Surgeons, and the Society of Assisted Reproductive Technology. He is a Member of the American Gynecological and Obstetrical Society and a Past President of the Society for Gynecologic Investigation (now Society for Reproductive Investigation (SRI). He is the recipient of the President’s Achievement Award from SRI as well as their 2016 Distinguished Service Award.

He was the Editor–in-Chief of the journal, *Fertility and Sterility*, from 1996 to 2011. He was an Associate Editor and Editorial Board Member of the *New England Journal of Medicine* and a Member of the Editorial Board of *Obstetrics and Gynecology*.

Dr. DeCherney is a Diplomate of the American Board of Obstetrics and Gynecology and the Division of Reproductive Endocrinology and Infertility and is a Fellow Ad Eundem of the Royal College of Obstetricians and Gynaecologists, London.
DISTINGUISHED JUDGES

Nicole D. Fleming MD
Dr. Fleming is an Assistant Professor in the Department of Gynecologic Oncology at M.D. Anderson Cancer Center. She completed her residency training in Obstetrics and Gynecology at Duke University Medical Center and fellowship in Gynecologic Oncology at University of California at Los Angeles Medical Center. Dr. Fleming's research interests include ovarian cancer surgical trials, rare uterine tumors, fertility preservation in early-stage cervical cancer, and value-based health care. She has a special interest in innovative research and teaching minimally invasive surgery in gynecologic oncology.

A. Vernon Stringer MD
Dr. Stringer is from Ellerbe, NC and Dayton, Ohio. He attended North Carolina State University where he earned a B.S. in Electrical Engineering. He then attended Duke University where he received his M.D. degree and completed his residency in obstetrics and gynecology. Dr. Stringer is board certified in Obstetrics and Gynecology. Dr. Stringer is currently accepting new patients.
Phyllis C. Leppert MD PhD

Phyllis Leppert is Emerita Professor of Obstetrics and Gynecology at Duke University and is currently the president of the Phyllis and Mark Leppert Foundation for Fertility Research, also known as the Campion Fund, a non-profit organization that funds basic science in reproductive biology, conducts scientific meetings and educational events for the general public. She is a graduate of Duke University School of Medicine and was awarded a PhD from Columbia University. Dr. Leppert was a pediatric resident at Duke and a resident in obstetrics and gynecology at Yale-New-Haven Hospital. After completion of a fellowship in Obstetrics at Columbia University’s College of Physicians and Surgeons she joined the faculty. She was recruited to the University of Rochester and Rochester General Hospital where she served as Chair of Obstetrics and Gynecology before she moved to Buffalo where she was Chair of Gynecology and Obstetrics at the State University of New York at Buffalo.

Prior to coming to Duke she was the Chief of the Reproductive Sciences Branch at NICHD in Bethesda. When she retired from the federal government Dr. Leppert joined the Department of Obstetrics and Gynecology at Duke as Vice Chair for Research and helped establish the Office of Research. She has been active in the American College of Obstetricians and Gynecologists and was awarded the ACOG Distinguished Service Award. Throughout her research career her research focus has been on the extracellular matrix of the female reproductive tract. In the late 1980s and early 1990s her work helped to unravel the complexities of the modulation of the uterine cervix in throughout gestation and birth and more recently she has studied the collagenous nature of uterine fibroids.

While at Duke Dr. Leppert and her colleagues investigate the fibrotic nature of fibroids leading preclinical studies of the utilization of a bacterial collagenase for the treatment of uterine fibroids. Phase I clinical studies of this treatment are now being conducted at Johns Hopkins University.
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<tr>
<th>Time</th>
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<td>10:00 am</td>
<td>Opening Remarks</td>
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<tr>
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<td>A pilot genome-scale DNA methylation study in women with interstitial cystitis/bladder pain syndrome</td>
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12:10 pm  Photo

12:25 pm  Lunch

1:00 pm  Alan H. DeCherney, MD, Guest Professor and Judge
IVF is translational research

1:45 pm  Laura K. Newcomb MD
Correlation of virtual reality and dry lab robotic technical skills

2:00 pm  Sanaz Keyhan MD
Male obesity and steroid hormone levels influence DNA methylation reprogramming in sperm

2:15 pm  Nichelle A. Satterfield MD
Utilization of long-acting reversible contraceptive (LARC) methods postpartum among women who received group prenatal care: a retrospective cohort study

2:30 pm  Margaret S. Villers MD MSCR
Reduction of cesarean delivery surgical site infections using an evidence-based care bundle

2:45 pm  Ashley E. Veade MD
Prognostic implications of lymphovascular space invasion on nodal recurrence in patients with stage I endometrioid endometrial adenocarcinoma after complete surgical staging

3:00 pm  Closing Remarks

3:15 pm  Reception / Awards Presentation
Duke South Food Court (patio weather permitting)
ABSTRACTS

Title: A pilot genome-scale DNA methylation study in women with interstitial cystitis/bladder pain syndrome

Fellow: Megan S. Bradley MD

Faculty Mentor: Nazema Y. Siddiqui MD MHSc

Objective: To perform a pilot genome scale DNA methylation assessment study using voided urine samples from female patients with interstitial cystitis/bladder pain syndrome (IC/BPS) as compared to age- and race-matched controls.

Methods: A total of 30 IC/BPS patients and 24 age- and race-matched controls were enrolled. IC/BPS patients had an Interstitial Cystitis Symptom Index score of >8; controls had no bladder symptoms. DNA was extracted from pelleted urine sediment and genomic DNA underwent quantitative DNA methylation data using the Illumina Infinium MethylationEPIC BeadChip. Two−sided paired t−tests were used to compare average methylation at each CpG site, with the Bonferroni correction to adjust for multiple comparisons.

Results: Our cohort consisted of 16 participants (8 IC/BPS and 8 controls) after exclusion of screen failures, subjects with positive urine cultures, absence of study data or poor DNA yield. The median age was 43.5 years (IQR 33.8, 65.0), median BMI of 27.1 (IQR 22.7, 31.4), and the majority were Caucasian (16/18, 88.9%). After pre−processing and exclusion of unreliable probes, 688,417 CpG sites were analyzed. In head to head comparisons, no sites were significantly differently methylated between IC/BPS and controls. However, in an exploratory pathway analysis, the MAPK pathway was overrepresented by member genes with differentially methylated CpG sites.

Conclusion: DNA methylation profiling is feasible from voided urine specimens. Our results suggest that altered methylation could be occurring in genes within or downstream of the MAPK pathway, though this hypothesis requires further validation with larger samples sizes using quantitative DNA methylation techniques.
**Title:** Factors affecting utilization and effectiveness of 17-hydroxyprogesterone caproate for the prevention of recurrent preterm birth

**Resident:** Annalies E. DeNoble MD MSc

**Faculty Mentor:** Geeta K. Swamy MD

**Objective:** To determine what factors impact 17-hydroxyprogesterone caproate (17OHP) use to prevent recurrent preterm birth (PTB). Second, to assess predictors of recurrent PTB in women receiving 17OHP.

**Methods:** This retrospective cohort study included women with a singleton pregnancy who delivered within one academic health system from January 2014 through December 2015. Eligible women had a history of ≥1 spontaneous, singleton PTBs. Primary outcomes were counseling about, receipt of, and adherence to 17OHP therapy. The secondary outcome was recurrent PTB in 17OHP users. Demographic and clinical predictors were determined using stepwise logistic regression.

**Results:** Of 410 eligible subjects, 69.3% (N=284) were counseled about and 36% (N=148) received 17OHP; 72% (N=83/115 in-office users) were adherent. Hispanic ethnicity (aOR 0.33; 95% CI 0.16-0.70), each week delay in prenatal care (aOR 0.92; 95% CI 0.89-0.95), and each prior term birth (aOR 0.68; 95% CI 0.56-0.82) predicted lower odds of 17OHP counseling. Each week delay in prenatal care (aOR 0.87; 95% CI 0.83-0.91) and each additional week gestation of the earliest prior PTB (aOR 0.93; 95% CI 0.89-0.98) also decreased the odds of receiving 17OHP. Maternal age (aOR 1.20; 95% CI 1.07-1.34) and the number of prior term births (aOR 0.60; 95% CI 0.36-0.99) predicted adherence to 17OHP therapy. Among 17OHP users, each prior spontaneous PTB significantly increased the odds of recurrent PTB (aOR 1.87; 95% CI 1.12-3.12).

**Conclusion:** Utilization of evidence-based 17OHP therapy remains suboptimal: cultural and access to care barriers for eligible women may impede efforts to decrease recurrent PTB rates.
Title: Missed opportunities: quantifying significant family histories in breast and ovarian cancer patients with BRCA1/2

Resident: Charlotte R. Gamble MD MPH

Faculty Mentor: Laura J. Havrilesky MD MHSc

Objective: The purpose of this study was to quantify, among women with high-risk breast or ovarian cancer who were subsequently found to be BRCA1/2 mutation carriers, the proportion who have family histories (FH) that would have been sufficient to qualify them for genetic evaluation prior to their first cancer diagnosis.

Methods: This retrospective cohort study included patients with hormone receptor positive breast cancer (HRBC) <45yo, triple negative breast cancer (TNBC) <60yo, or ovarian cancer (OC) at any age. All patients were treated at a single institution from 2010-2016. Descriptive statistics were calculated to assess differences among cancer type, mutation type, race, and insurance status. Intervals between diagnosis, treatment, and genetic appointment were compared. Positive FH was defined based on NCCN guidelines during years of diagnosis.

Results: Of 103 subjects meeting inclusion criteria, a significant FH was present in 82.3% with TNBC (28/34), 83.7% with HRBC (36/43), and 81.5% with OC (22/27). FH was present in 84% of BRCA1 patients (n=33), 78% of BRCA2 patients (n=46), 79.4% of White patients (n=78) and 90% of Black or African American patients (n=21).

Conclusion: Although limited by sample size, this study suggests that a family history sufficient to warrant testing prior to cancer diagnosis is overwhelmingly present in this highest risk cancer group, and underscores the importance of assiduous familial risk assessment for women in the primary care setting.
Title: Obesity is associated with altered angiogenic gene expression in endometrioid endometrial cancer

Fellow: Lauren P. Cobb MD

Mentor: Angeles A. Secord MD MHSc

Objective: Obesity has been associated with worse outcomes in endometrioid endometrial cancer (EEC) and increased tumor aggressiveness in a genetically engineered mouse model. We sought to evaluate the association between obesity and angiogenic genes to determine if metformin mitigates these effects.

Methods: We evaluated the association between 168 angiogenic candidate genes and body mass index (BMI) in the TCGA endometrial cancer database (n=290) and a unique EEC LKB1fl/flp53fl/fl mouse model (n=20). Mice received 60% calories from fat in a high-fat diet (HFD), mimicking diet-induced obesity, versus 10% calories from fat in a low-fat diet (LFD). After confirming tumor growth, HFD (n=5) and LFD mice (n=5) were treated with metformin (200 mg/kg/day) or control. Tumors were analyzed using RNASeq for differential expression of angiogenic genes.

Results: Twenty-one candidate angiogenic genes (p<0.05) were differentially associated with BMI in the TCGA database. Evaluation of these genes in the mouse model revealed association between increased Edil3 expression in HFD versus LFD mice (2.2 fold change (FC); p=0.03). HFD mice receiving Metformin demonstrated an interaction effect reducing Edil3 expression (9.6 FC; P=0.009). Exploratory analysis in the mice revealed differential expression of 20 angiogenic genes including increased expression of the following potent pro-angiogenic genes (LEP (4 FC); VEGFA (2.8 FC)).

Conclusion: Obesity may alter the tumor microenvironment and promote tumor progression via differential modulation of angiogenic pathways in EEC. Specifically Edil3 may play an important role in this microenvironment serve as a novel target. Metformin was associated with significant reduction of pro-angiogenic genes.
Title: Randomized controlled trial to assess the impact of intraurethral lidocaine on urodynamic voiding parameters

Resident: Cassandra K. Kisby MD

Faculty Mentor: Cindy L. Amundsen MD

Objective: Determine whether intraurethral anesthesia 1) decreases voiding efficiency (VE; voided volume/(voided volume + residual volume)) and 2) impacts other urodynamic parameters in healthy female volunteers during urodynamics (UDS).

Methods: Randomized double-blind placebo-controlled study of women 18-60 years. Exclusion criteria were: neurologic or bladder pain conditions, recurrent or active urinary tract infections, morbid obesity, >2 responses of “sometimes” or more on the Lower Urinary Tract Symptoms Questionnaire, pregnancy, and pelvic organ prolapse. Subjects completed a Visual Analog Scale (VAS) to assess pain. They performed baseline uroflow to confirm a normal voiding pattern, followed by physiologic filling to ≥250mL. Subjects were randomized to receive 5mL of intraurethral aqueous gel (KY) or 2% lidocaine gel (Urojet), and then underwent standard UDS.

Results: 23 randomized subjects (12 placebo, 11 lidocaine) were included. VAS scores were similar at baseline and during UDS between groups. Baseline uroflow VE was similar between the placebo and lidocaine groups. After study drug administration, VE was not different between groups (89.5±4.9 vs. 87.3±8.3, p=0.44). There were no differences in sensation during cystometry, maximum urethral closure pressure, or micturition parameters (maximum detrusor pressure (Pdet) and Pdet at maximum flow). The placebo group had a lower percentage of intermittent flow pattern (0% vs. 36%, p=0.02) and a lower rate of increased electromyographic (EMG) activity during micturition (25% vs. 73%, p=0.02).

Conclusion: Intraurethral administration of lidocaine did not decrease voiding efficiency compared to placebo. The lidocaine group had a greater percentage of intermittent flow patterns and increased EMG activity during micturition.
**Title:** A randomized controlled trial of patient pain perception with tenaculum placement during in-office procedures

**Resident:** Tashima E. Lambert MD

**Faculty Mentor:** Beverly A. Gray MD

**Objective:** The single-tooth tenaculum is used in most gynecologic procedures involving cervical and uterine instrumentation. The objective of this study is to compare pain with tenaculum use based on the method of placement: Slow method versus cough method.

**Methods:** A randomized controlled trial of 66 women presenting for intrauterine devices, powered to detect 16 mm difference in pain, included women age 18 years or older. Patients were randomized to tenaculum placement via slow method versus cough method. The primary outcome was pain at time of tenaculum placement measured on a 100-mm Visual Analog Scale. Secondary outcomes included overall pain with device insertion and provider satisfaction with tenaculum grasp. Pain scores were analyzed with Wilcoxon rank sum test. Provider satisfaction was analyzed with Fisher’s exact test.

**Results:** Sixty-six women were enrolled, 33 randomized to each arm. Average pain score with slow placement was 44 (SD 24.4) with median of 44 (IQR = 21,63). Average pain score with cough placement was 35.5 (SD 23.9) with median of 32 (IQR = 19,54). There was no significant difference in pain scores between methods of tenaculum placement (p=0.16). There was no significant difference in overall pain scores (p=0.12). Provider satisfaction was not associated with one method over the other (p=1). Anxiety was significantly associated with pain at the time of tenaculum placement (p=0.01).

**Conclusion:** Providers should utilize the method of tenaculum placement of their choice since neither method significantly improves pain or provider satisfaction. Pain with tenaculum use is significantly associated with anxiety.
Title: MMP activation in human fetal membranes by TNF-α and *Ureaplasma parvum*

Fellow: James M. Edwards MD

Faculty Mentor: Amy P. Murtha MD

Objective: Infection-induced inflammation causes matrix metalloproteinase (MMP) enzyme activation in the fetal membranes leading to membrane damage and preterm birth. We hypothesize that *Ureaplasma parvum* (UP), an organism commonly associated with preterm birth, causes MMP activation via ERK-mediated TNF-α signaling.

Methods: Full thickness human fetal membranes were mounted in a tension-free dual-chamber tissue explant system and the choriodecidua was treated with UP or TNF-α. After 24 hours of treatment, conditioned media from the maternal and fetal compartments were collected and fetal membranes were harvested. MMP activity levels were assessed in media from each compartment using gel zymography. Next, fetal membrane ERK and IκB-α signaling was assessed via Western blotting. An ANOVA model was fitted on the log transformation and inference was made on treatment effect for each biologic marker. We conducted pairwise comparison with adjustment for multiple testing if overall treatment effect was detected.

Results: Six replicates were performed for each treatment. Overall treatment effect was detected for amnion MMP-2 activity (p<0.001) and amnion MMP-9 activity (p=0.009). Phosphorylated ERK and IκB-α were increased with treatment, but not statistically significant (p=0.37 and p=0.55). Pairwise comparison revealed significant increases in MMP-2 and -9 activity level for TNF-α compared to control (p=0.002 and p=0.017) and UP compared to control (p<0.001 and p=0.011).

Conclusion: TNF-α and UP treatment of the choriodecidua increased MMP activity in the fetal compartment. MMP activation in the fetal compartment by UP induced TNF-α signaling may lead to membrane damage and preterm birth.
Title: Transvaginal cerclage and risk factors associated with failed cerclage and preterm delivery

Resident: Alejandro J. Landa MD

Faculty Mentor: Andra H. James MD MPH

Objective: To evaluate risk factors associated with preterm delivery in patients with a transvaginal cerclage.

Methods: This study is a retrospective chart review of all women with a transvaginal cerclage (both history indicated and rescue cerclage) placed between January 2010 and July 2016 at Duke University Medical Center. The presence of various risk factors was compared among women who delivered preterm (<37 weeks) and those who did not. Univariate and Multivariate analysis were stratified by type of cerclage.

Results: 296 women were identified for a total of 337 transvaginal cerclages; 55 transvaginal cerclage events were excluded, for a final count of 282 singleton pregnancies. In the cohort with history indicated cerclage, preterm birth < 37 weeks was associated with an increase in BMI (p= 0.012), black race (p= 0.0128), presence of funneling (p =0.05) and shorter cervical length after cerclage (p =0.002). In the rescue cerclage group, preterm delivery at <37 weeks was associated with more use of tocolytics after cerclage (p=0.04), and shorter cervical length after cerclage placement (p =0.0001) as well as at 24-25 weeks (p =0.0006). After multivariable logistic regression, preterm delivery at <37 weeks was still associated with shorter cervical length after cerclage placement in the history indicated cerclage (OR= 0.95 (0.91, 0.99) and in the rescue cerclage group (OR= 0.93 (0.87, 1)).

Conclusion: Shorter cervical length measurements after a cerclage placement (either history indicated or rescue) are associated with preterm delivery at <37 weeks.
Title: Correlation of virtual reality and dry lab robotic technical skills

Resident: Laura K. Newcomb MD

Faculty Member: Nazema Y. Siddiqui MD MHSc

Objective: To determine whether a set of virtual reality (VR) surgical simulation drills have correlative validity when compared to the validated Robotic Objective Structured Assessment of Technical Skills (R-OSATS) dry lab drills.

Methods: We performed a prospective methods comparison study. Participants completed five VR drills on the daVinci Skills Simulator and five dry lab drills. Participants were randomized to the order of completion. VR drills were scored automatically by the simulator. Dry lab drills were recorded, reviewed by three blinded experts, and scored using the R-OSATS assessment tool. Spearman correlation coefficients were calculated comparing simulator scores and R-OSATS scores for the same surgeon.

Results: The correlation for overall summary scores between VR and dry lab drills was strong (r=0.87, p<0.01). Each of the five VR drills was also found to have a statistically significant correlation to its corresponding dry lab drill with correlation coefficients ranging from r=0.49 to 0.73 (all p-values <0.01). The performance on VR drills also confirmed construct validity. Faculty and fellows had consistently higher overall scores than residents (median VR scores: 437 for faculty, 408 for fellows, 311 for residents; p<0.01).

Conclusion: We selected a core set of VR drills that reliably correlate with validated dry lab R-OSATS drills. Because dry lab drills require significant time and effort from the evaluators, this set of VR drills could serve as an ancillary method of determining trainee competency.
Title: Male obesity and steroid hormone levels influence DNA methylation reprogramming in sperm

Fellow: Sanaz Keyhan MD

Faculty Mentor: Susan K. Murphy PhD

Objective: To determine if steroid hormone levels are associated with altered DNA methylation and to examine the relationship between male overweight/obese status and DNA methylation profiles throughout the sperm genome.

Methods: This was a retrospective cross-sectional study of semen and blood from 45 normal weight (BMI < 25 kg/m²) and 18 overweight/obese (BMI ≥ 25 kg/m²) Caucasian men. Infinium HumanMethylation450 BeadChip arrays were used to identify CpG loci showing differential methylation in sperm using linear regression models with validation by bisulfite pyrosequencing or sequencing of cloned alleles. Estradiol and testosterone levels from all individuals were analyzed using linear regression models to identify associations between hormone levels, BMI, and sperm DNA methylation.

Results: We identified 3,061 CpG sites significantly associated with BMI (P<0.05). Of these, 2,281 sites had gene annotations (Illumina). The differentially methylated CpG sites were significantly enriched for genes involved in embryonic development, neuronal development, and cell adhesion. Moreover, many of the significant differentially methylated CpG sites show significant interactions between BMI and both testosterone and estradiol. Analysis of individual sperm DNA sequences revealed that the methylation differences affect a subset of sperm rather than being randomly distributed across all sperm.

Conclusion: We found significant differences in sperm DNA methylation comparing overweight/obese to normal weight men at multiple CpG sites. Many of the associated genes have key regulatory roles in developmental, metabolic, and inflammatory processes. These DNA methylation alterations may be heritable, and depending on their impact on gene expression, could have the potential to impede normal development.
Title: Utilization of long-acting reversible contraceptive (LARC) methods postpartum among women who received group prenatal care: a retrospective cohort study

Resident: Nichelle A. Satterfield MD

Faculty Mentor: Beverly A. Gray MD

Objective: The study purpose was to evaluate uptake of LARC methods postpartum among women who received group prenatal care versus traditional prenatal care. Secondary measures included obstetric and delivery outcomes, triage visits, and pregnancy rates within one year of delivery. We hypothesized LARC uptake would be higher for patients enrolled in Centering.

Methods: A retrospective cohort design was used to evaluate those who delivered a singleton live birth over one year. The two cohorts were women enrolled in Centering Pregnancy® group prenatal care and those who participated in traditional care at the same facility. Data was collected from prenatal, labor and delivery, and postpartum records.

Results: Of the 5,579 women who delivered during this time interval 753 women met inclusion criteria for the study; 146 in Centering care and 607 in traditional care. There were no significant differences in LARC desired at discharge between the two groups. A higher percentage of group prenatal care patients presented for postpartum care (84.2 vs 74.6, P=0.019), but there were no significant differences in LARC utilization or pregnancy rates at one year. Centering patients attended significantly more prenatal visits however also had more triage visits. Other obstetric and infant measures were similar between the two groups.

Conclusion: Although there were no significant differences between Centering and traditional prenatal care patients in regard to LARC desired at discharge and LARC uptake postpartum, there was a trend towards a higher number of Centering patients electing LARC at time of discharge, reflecting the increased education on this topic.
**Title:** Reduction of cesarean delivery surgical site infections using an evidence-based care bundle

**Fellow:** Margaret S. Villers MD MSCR

**Mentor:** Geeta K. Swamy MD

**Objective:** Cesarean delivery (CD) surgical site infections (SSI) are associated with significant patient morbidity and increased health care utilization. In 2013, our institutional CD SSI rate was 10%, which is above the national average. We implemented an evidence-based bundle of initiatives to reduce cesarean delivery SSIs.

**Methods:** Beginning in January 2016, we implemented a bundle aimed at the reduction of CD SSIs. The bundle, utilized for all CDs, consisted of: preoperative skin preparation with 2% chlorhexidine cloths, preoperative vaginal cleansing with chlorhexidine gluconate, and use of fenestrated surgical drapes. Negative pressure wound therapy (NPWT) was utilized in women with a BMI ≥ 40 or with high risk of post-operative infection. We compared the SSI rate from January-December 2016 to the rate from January-December 2014. Bivariable analysis performed using $\chi^2$ and Mann-Whitney $U$ tests. Logistic regression models were fitted to adjust for significant covariates.

**Results:** The pre- and post-bundle cohorts include 1061 and 1010 women who underwent CD, respectively. Compliance with all components of the bundle improved from 72% to 93%. The SSI rate decreased from 7.3% to 3.1% after implementation of the bundle. The overall wound complication rate (infection, seroma, and hematoma) decreased from 9% to 5.3% after bundle implementation. After controlling for covariates, the odds (95% CI) of SSI and wound complication were 0.38 (0.24 – 0.60) and 0.54 (0.37 – 0.78), respectively.

**Conclusion:** Development and implementation of an evidence-based care bundle optimized for our patient population resulted in a significant reduction of CD SSIs.
Title: Prognostic implications of lymphovascular space invasion on nodal recurrence in patients with stage I endometrioid endometrial adenocarcinoma after complete surgical staging

Resident: Ashley E. Veade MD

Faculty Mentor: Laura J. Havrilesky MD MHSc

Objective: To investigate the predictive value of lymphovascular space invasion (LVSI) for nodal recurrence in patients with Stage I endometrioid endometrial cancer (EC) following full surgical staging.

Methods: From 1/1998 to 2/2015, 630 patients undergoing full surgical staging for stage IA or IB endometrioid EC were identified using the Duke EC database. Subjects with lymph node metastasis were excluded. A retrospective analysis was performed using logistic regression to identify predictors of nodal recurrence. Cox proportional hazard modeling was used to predict progression free survival (PFS). Hazard ratios (HR) and 95% confidence intervals (CI) for PFS and overall survival (OS) were estimated using the Kaplan-Meier method. Survival curves were compared using the log rank test.

Results: 275 subjects met inclusion criteria. LVSI was present in 48 subjects (17.5%). Nodal recurrences were identified in 9 LVSI+ subjects (18.8%) compared to 2 LVSI- subjects (0.88%). In bivariate analysis, LVSI (p < 0.001) and grade (p=0.046) were significant predictors of nodal recurrence after adjusting for adjuvant radiation. In multivariate analysis adjusting for competing covariates, LVSI was the only significant predictor of nodal recurrence (p=0.002). LVSI (HR=2.1 CI: 1.05-4.3, p=0.037) and grade 3 (HR=2.5 CI: 1.3-4.9, p=0.01) were significant univariate predictors of PFS. In Kaplan Meier analysis, LVSI + was associated with shorter PFS (p=0.033) and OS (p=0.046).

Conclusion: The presence of LVSI in patients with fully staged, stage I endometrioid EC is a significant independent predictor of nodal recurrence. Given these findings, adjuvant therapy to nodal basins could be considered in these patients.
RESIDENT RESEARCH PROJECT
FIRST PLACE PRIZE WINNERS

1982  Michelle R. Dudzinski MD
1983  Claude L. Hughes PhD MD
1984  Deborah A. Metzger PhD MD
1985  Claude L. Hughes PhD MD
1986  Bruce A. Lessey PhD MD
1987  John W. Schmitt MD
1988  Susan E. Jenkins MD
1989  Margaret A. Dahmus MD
1990  Jodell J. Boyle MD
1991  Clemens M. Grosskinsky MD
1992  Stephen G. Somkuti PhD MD
1993  Kerry J. Rodabaugh MD
1994  Martha L. Ehrmann MD
1995  Amy P. Murtha MD
1996  Susann L. Clifford MD
1997  Angeles A. Alvarez MD
1998  Laura J. Havrilesky MD
1999  Katharine H. Taber MD
2000  A. Marcus Gustilo-Ashby MD
2001  Mildred R. Ridgway MD
2002  K. Quynh Pham MD
2003  Paula S. Lee MD
2004  Serina E. Floyd MD MSPH
2005  Elizabeth L. Jewell MD
2006  Virginia G. Branham MD
2007  Jeanette R. Chin MD
2008  Tina A. Ayeni MD
2009  Kara O. King MD MSPH
2010  Robin A. Laskey MD
2011  Jason S. Yeh MD
2012  Jennifer B. Gilner MD PhD
2013  Lisa N. Brunengraber MD
       Paige W. Halvorson MD MBS
2014  Juan Sebastian Sandoval Leon MD
2015  Joseph A. Dottino MD MPH
2016  Allison M. Puechl MD
2018 Hammond Day Proposals (PGY2 Submissions)

**Project Title:** Impact of a documentation intervention to improve health assessment metrics in gynecologic oncology patients

**Resident:** Jaclyn Arquiette MD

**Faculty Mentor:** Laura Havrilesky MD MHSc

**Research Question:** What is the impact of a documentation intervention on the accuracy of capturing severity of illness (SOI) and risk of mortality (ROM) scores for gynecologic oncology inpatients?

**Planned Methods:** This is a prospective quality improvement project with a research component consisting of an evaluation of SOI and ROM scores for gynecologic oncology inpatients before and after several documentation interventions:

- A 15-minute in-service review of documentation, coding and health assessment metrics was given to faculty and residents in January 2017.
- Daily progress notes have been transitioned to systems-based assessment/plan format
- Documentation reference badge has been introduced to residents and gynecologic oncology fellows for daily use
- A brief video highlighting main documentation issues and recommendations will be made and shown to the new resident team prior to each block
- Weekly chart audits will be undertaken and important discrepancies documentation issues will be communicated to the gynecologic oncology team
- At completion of the 2017 year, ROI and SOM data will be compared to the data from 2015, before any of the interventions were made

**Progress Made:** The new progress note templates have now been in use for several months. Documentation reference badge cards were introduced in January 2017. We have been contacting the team weekly following chart audits with documentation reminders. A research protocol has been written and submitted to the IRB.

**Anticipated Challenges:** Individual adherence to the documentation provided documentation recommendations will be variable.
**Project Title:** Does mesh weight affect time to failure after robotic-assisted laparoscopic sacrocolpopexy?

**Resident:** Amy Askew MD MPH

**Faculty Mentor:** Anthony Visco MD

**Research Question:** To compare time to anatomic failure after robotic-assisted sacrocolpopexy (RA-ASC) with the use of ultra-lightweight vs. heavier weight mesh types.

**Planned Methods:** To perform a retrospective cohort study of women who underwent RA-ASC, for either uterovaginal prolapse (UVP) or post-hysterectomy vaginal vault prolapse (VVP), from 1/2012 to 9/2016. We plan to include only those who had at least one postoperative visit. We will compare two groups: 1) RA-ASC with ultra-lightweight mesh (<20 g/m2) (ULM) versus 2) RA-ASC with heavier weight mesh (>35 g/m2) (HWM). Our primary outcome is time to composite anatomic failure, which is defined as recurrent prolapse in any vaginal compartment beyond the hymen or retreatment for prolapse with either surgery or pessary. A secondary outcome is mesh exposure. Continuous variables will be analyzed using the t-test or Mann-Whitney U for nonparametric data. Categorical variables are analyzed using Χ2 test; P<0.05 is considered significant.

**Progress Made:** Submitted an IRB to add to an existing database by expanding date parameters. Obtained IRB approval. Began data collection through chart review. Started an initial statistical analysis using SPSS.

**Anticipated Challenges:** Will likely require statistical support through biostatistics department for more complicated statistical analysis.
**Project Title:** Does a freeze-all policy lead to better IVF outcomes?

**Resident:** Katherine Bishop MD

**Faculty Mentor:** Suheil Muasher MD

**Research Question:** Is there a benefit to undergoing a freeze-all IVF cycle regardless of the number of oocytes retrieved and progesterone level on day of ovulation trigger?

**Planned Methods:** This is a retrospective cohort study using data from 2013-16 comparing outcomes among two different cohorts of patient based on the number of oocytes retrieved and progesterone level on day of trigger. The first group includes all donor/recipient IVF cycles in which a transfer occurred, and the second group includes all autologous IVF cycles in which a fresh or frozen transfer occurred. Primary outcomes include clinical pregnancy rate and live birth rate. Secondary outcomes include number of gestational sacs, birth weight, and gestational age at delivery.

**Progress Made:** We have obtained IRB approval and are in the process of a chart review to collect our data. We sent preliminary data to our statistician for analysis.

**Anticipated Challenges:** Missing data during chart review; number of patients with elevated progesterone may be low, leading to an underpowered study.
Project Title: External validation of the Maternal Fetal Medicine (MFMU) network’s VBAC calculator in the Duke Birthing Center: a retrospective cohort analysis

Resident: Benjamin Harris MD MPH

Faculty Mentor: R. Phillips Heine MD

Research Question: To assess the performance of the MFMU VBAC calculator (Grobman et al.) and the Simple VBAC Prediction Model (Metz et al.) in the Duke Birthing Center and to determine the need for an institution-specific VBAC prediction model.

Planned Methods: Retrospective cohort analysis including women with a vertex singleton presentation and one prior low-transverse cesarean delivery who underwent a trial of labor after 36 6/7 weeks gestation between May 2013 and March 2016. Women with an antepartum intrauterine fetal demise or fetal anomalies will be excluded.

Progress Made: IRB approval obtained in March 2016. We have abstracted approximately 900 of 1152 medical records. Anticipate finishing data collection in May 2017.

Anticipated Challenges: Missing data, small sample size, and the potential for an underpowered study.
Project Title: Factors associated with embryo attrition rates during in vitro fertilization

Resident: Carrie Jones MD

Faculty Mentor: Suheil Muasher MD

Research Question: Are embryo attrition rates during in vitro fertilization (IVF) cycles dependent upon certain IVF characteristics, such as the number of oocytes retrieved, or the patient’s estrogen and progesterone levels on the day of trigger?

Planned Methods: This retrospective study will utilize Duke Fertility Center’s data on all autologous and donor IVF cycles resulted in blastocysts from January 31, 2013 to February 15, 2017. Attrition rate is defined as the loss of embryos from the pronuclear stage (day 1) and cleavage stage (day 3) to the blastocyst stage (days 5-6). The dataset will include patient demographics, ovarian reserve testing, infertility diagnoses, characteristics of sperm, cycle type, stimulation protocol, hormone levels on day of trigger, retrieved oocyte number, method of fertilization, fertilization rate, embryo quantity and quality on day 3 and on day 5-6.

Progress Made: The IRB has approved the study. Currently in the data collecting stage.

Anticipated Challenges: None currently
Project title: Penicillin prophylaxis for group B streptococcal early-onset disease of newborn: protocol compliance with antibiotic administration at the Duke Birthing Center, a retrospective cohort analysis.

Resident: Andrew Rivara MD

Faculty Mentor: R. Phillips Heine MD

Research Question: To assess adherence to recommended timing of antibiotic prophylaxis for early onset GBS disease at the Duke Birthing Center. We will use time from antibiotic order to administration as a surrogate for suboptimal newborn treatment and neonatal sepsis due to the low numbers associated with these events.

Planned Methods: Retrospective cohort analysis including women with singleton pregnancy at or greater than 37 0/7 weeks gestation who are admitted in labor and meet criteria for administration of GBS prophylaxis based on intrapartum vaginal swab culture, urinary culture, or elevated risk factors (Verani et al.). Women with an antepartum intrauterine fetal demise will be excluded. We will obtain the time of antibiotic order as well as the time of therapy initiation and consider a greater than one hour difference between order and administration suboptimal. We will then look at varying factors that might be associated with suboptimal timing in order to develop an intervention plan. After implementation of the plan we will repeat data collection to assess the success of the intervention.

Progress Made: IRB application drafted for final review. Discussions with Kristen Weaver, Emily Reiff and Phillip Heine regarding data collection as well as identification of potential risk factors for suboptimal therapy administration.

Anticipated Challenges: Our time from order to administration is excellent and no intervention will be required. There also may be associated factors that we are unable to identify and therefore, we cannot develop effective interventions.
Project Title: Predictors of peer-review publication of Obstetrics and Gynecology trainee research projects from 1989 to 2016

Resident: Ja’Pel Sumpter MD MPH

Faculty Mentor: Laura Havrilesky MD MHSc

Research Questions:

1. Is trainee research funding associated with a higher probability of peer reviewed publication?

2. Does winning a research day competition result in a higher probability of peer-reviewed publication?

3. Describe the rate of publication of trainee research day projects

Planned Methods: This research project will explore the associations between Charles Hammond grant awards, Research Day awards, and peer-review publication. Annual Research Day booklets from 1989 to 2016 will be collected and used to create a database of the past awardees (i.e., project titles, research funding, year of presentation, subspecialty topics presented). A literature search using PubMed will be conducted to determine publication of research. A statistical analysis will determine associations between research funding, Research Day awards, and peer-review publication.

Progress Made: I have met with my mentors and discussed primary and secondary research questions. I have collected annual Research Day booklets from 1989 to 2016 and started compiling information for the database. I have received the list of research funding winners. Lastly, we have scheduled a meeting with our departmental statisticians for analytical support.

Anticipated Challenges: One challenge might be conducting a literature search of publications for past winners (i.e., name changes). Power will be limited by the number of research awards since 2008 and may be insufficient to statistically demonstrate true associations.
Project Title: Maternal weight gain and infant birth weight in Class III obesity

Resident: Ann Tucker MD

Faculty Mentor: Haywood Brown MD

Research Question: What is the effect of the amount of maternal weight gain during pregnancy on infant birth weight in the setting of Class III obesity? Is neutral or negative weight gain associated with low birth weight or SGA infants in women with Class III obesity?

Planned Methods: This is a retrospective chart review examining maternal weight gain during pregnancy and subsequent infant birth weight. We plan to analyze data over the past 10 years extracted from Epic and previously TraceVue. We will include women with a pre-pregnancy BMI >40. Total maternal weight gain during pregnancy and infant birth weight will then be recorded. We will examine additional variables including age, race, the presence of pre-existing diabetes or gestational diabetes, tobacco use during pregnancy, and the presence of chronic or gestational hypertension.

Progress Made: A research proposal has been submitted and approved by the IRB.

Anticipated Challenges: None
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RESEARCH DAY

May 19, 2017