Third Annual
Oakland University
Graduate Student
Research Conference
March 9, 2018
Program
## Schedule

**Oakland Center**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:45 – 8:45</td>
<td>Banquet Room A</td>
</tr>
<tr>
<td></td>
<td>Breakfast and Registration</td>
</tr>
<tr>
<td>8:15</td>
<td>Welcome by Provost James Lentini</td>
</tr>
<tr>
<td></td>
<td>Speaker Introduction: Dean Claudia Petrescu</td>
</tr>
<tr>
<td></td>
<td><strong>Speaker: Dr. Susan Bowyer</strong></td>
</tr>
<tr>
<td>9:00 – 10:00</td>
<td>Poster Presentations</td>
</tr>
<tr>
<td></td>
<td>Oakland Room [Abstracts – Page 9]</td>
</tr>
<tr>
<td>15 Minute Break</td>
<td></td>
</tr>
<tr>
<td>10:15 – 11:45</td>
<td>Concurrent Sessions: Oral Presentations</td>
</tr>
<tr>
<td></td>
<td>Breakout Rooms  [See schedule - Page 7] [Abstracts – Page 30]</td>
</tr>
<tr>
<td>15 Minute Break</td>
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<tr>
<td>12:00 – 1:30</td>
<td>Banquet Room A</td>
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<tr>
<td></td>
<td>Lunch</td>
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<tr>
<td>12:30</td>
<td>Opening Remarks by President Ora Pescovitz</td>
</tr>
<tr>
<td></td>
<td>Speaker Introduction: Dr. Frank Giblin</td>
</tr>
<tr>
<td></td>
<td><strong>Keynote Speaker: Dr. Paul Sieving</strong></td>
</tr>
<tr>
<td></td>
<td>Student Awards presented by Dr. Christine Stiller</td>
</tr>
</tbody>
</table>

### Moderators

- Darlene Grooms, Ph.D.
- Suha Kridli, Ph.D., R.N.
- Amanda Nichols-Hess, Ph.D.
- Judith Venuti, Ph.D.
- Steve Weiter, M.L.S
- Virgil Zeigler-Hill, Ph.D.
- Dao-Qi Zhang, Ph.D.

### Judges

- Stefani Attardi, Ph.D.
- Myung Choi, Ph.D.
- Deb Doherty, P.T., Ph.D., CEAS
- Daniel Goble, Ph.D.
- Melodie Kondratek, P.T., M.S., D.Sc.
- Julie Kruse, Ph.D., R.N.
- Melissa McDonald, Ph.D.
- Zorica Kauric-Klein, Ph.D., APRN-BC
- Richard Olawoyin, Ph.D., CEP, CSP
- Gustavo Patino, M.D., Ph.D.
- Linda Pavonetti, Ed.D.
- Lynda Poly-Doulard, M.S.N., M.Ed, R.N., C.N.E
- Michelle Purdie, Ph.D.
- Lakshmi Raman, Ph.D.
- Kanaka Taku, Ph.D.
- Tracey Taylor, Ph.D.
- Jennifer Vonk, Ph.D.
- Chris Wilson, Ph.D.
**Speakers**

**Susan M. Bowyer, M.D., Ph.D.**  
**Henry Ford Hospital**

“What It Takes to be a Successful Graduate Student”

Dr. Bowyer is a medical physicist/neuroimaging scientist in the Department of Neurology at Henry Ford Hospital in downtown Detroit. In her job she uses neuroimaging techniques such as magnetoencephalography (MEG), electroencephalography (EEG), and functional magnetic resonance imaging (FMRI) to understand how the brain processes language, hearing, vision, sensory, and memory functions. She also develops neuroimaging methods to determine the location of abnormal brain areas (such as in epilepsy) prior to surgery. Her research covers a multitude of areas including autism, pain, language processing, tinnitus, meditation and panic attacks.

Dr. Bowyer received an associate’s of applied science degree in business management from Macomb Community College, a bachelor’s degree in applied science in psychology from the University of Michigan, and a Ph.D. in biomedical physics from Oakland University. She performed her postdoctoral training at Henry Ford Hospital. In 2002, she received an adjunct assistant professorship from Oakland University where she teaches general physics classes. She has been named one of the Women in Physics by APS. She is currently the Scientific Director of the Neuromagnetism Lab and Senior Staff Investigator at Henry Ford Hospital (HFH).

**Keynote**

**Paul A. Sieving, M.D., Ph.D.**  
**Director, National Eye Institute National Institutes of Health**

“Ocular Gene Therapy for X-linked Retinoschisis”

Dr. Sieving has been the Director of the National Eye Institute of the NIH since 2001. He came to the NEI from the University of Michigan Medical School where he was Professor of Ophthalmic Genetics. He received his M.D. from the University of Illinois in 1978 and a Ph.D. in Bioengineering from that university in 1981. After completing an ophthalmology residency at the University of Illinois Eye and Ear Infirmary, he studied retinal physiology at the University of California, San Francisco, and later completed a clinical fellowship in genetic retinal degenerations at the Harvard Medical School.

Dr. Sieving is known internationally for his studies of human progressive blinding genetic retinal neurodegenerations. His work led to the first human clinical trial of ciliary neurotrophic factor for retinitis pigmentosa. He also developed a mouse model of X-linked retinoschisis and successfully treated this disease in mice using gene therapy. He maintains a clinical practice at the NEI for patients with these and other genetic retinal diseases. In his role as NEI director, Dr. Sieving initiated the Audacious Goals Initiative, a strategic research effort that aims to regenerate neurons and neural connections in diseased retinas by the year 2025. Success will mean new approaches to prevent and even reverse vision loss in diseases such as age-related macular degeneration, diabetic retinopathy, and glaucoma.

Dr. Sieving serves on a number of vision research award committees including the committee that selects the recipient of the annual $1 million euro 'Vision Award' of the Champalimaud Foundation. He has also received many vision research awards himself including the Research to Prevent Blindness Senior Scientific Investigator Award, the Alcon Research Institute Award and the Pisart Vision Award from Lighthouse International.
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Presentation Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miriam Ahmad</td>
<td>Oakland University William Beaumont SOM</td>
<td>Exploring Trends in Nonmedical Vaccine Refusals in Oakland County</td>
</tr>
<tr>
<td>Hani Alshahrani</td>
<td>Computer Science and Informatics</td>
<td>DDefender: Android Application Threat Detection Using Static and Dynamic Analysis</td>
</tr>
<tr>
<td>Ali Alshehri</td>
<td>Computer Science and Informatics</td>
<td>Risks Behind Device Information Permissions in Android OS</td>
</tr>
<tr>
<td>Amanda Amen</td>
<td>Oakland University William Beaumont SOM</td>
<td>Disparity in Receipt and Utilization of Dispatch Instructed CPR</td>
</tr>
<tr>
<td>Dalton Blood</td>
<td>Oakland University William Beaumont SOM</td>
<td>Hip Labral Tear Diagnosis Trends 2007-2016</td>
</tr>
<tr>
<td>Susanne Boden</td>
<td>Oakland University William Beaumont SOM</td>
<td>A Clinical Outcomes and Economic Perspective On Normal, Obese, and Morbidly Obese Patients Following Total Knee Arthroplasty</td>
</tr>
<tr>
<td>Ryan Brisson</td>
<td>Oakland University William Beaumont SOM</td>
<td>Comparison of Radiation Therapy and Radical Prostatectomy in the Treatment of High Risk Prostate Cancer: A Retrospective Matched Pairs Review</td>
</tr>
<tr>
<td>Cheryl Cheah</td>
<td>Oakland University William Beaumont SOM</td>
<td>Gender Disparities in Total Joint Arthroplasty</td>
</tr>
<tr>
<td>Jacob Corll</td>
<td>Biological Sciences</td>
<td>Maize RNA Binding Motif Protein 48 (RBM48) is Required for Minor Intron Splicing and Promotes Endosperm Cell Differentiation</td>
</tr>
<tr>
<td>Spencer Darlin</td>
<td>Oakland University William Beaumont SOM</td>
<td>Clinical Uncertainty Uncovers Health Care Bias Against Homeless People</td>
</tr>
<tr>
<td>Allyson DiMagno</td>
<td>Oakland University William Beaumont SOM</td>
<td>Chronic Kidney Disease: Its Impact on Total Joint Replacement Interventions</td>
</tr>
<tr>
<td>Elise Doppel</td>
<td>Master of Public Health</td>
<td>The Psychosocial Effect of Chronic Disease</td>
</tr>
<tr>
<td>Azarael Dunbar</td>
<td>Oakland University William Beaumont SOM</td>
<td>Pathway to Health Careers: Impact Evaluation of the Bioengineering and Biomedical Summer Sciences Program</td>
</tr>
<tr>
<td>Moses Evbuomwan</td>
<td>Oakland University William Beaumont SOM</td>
<td>A Survey of Oakland University Students’ Willingness to Submit Their DNA for Medical Research</td>
</tr>
<tr>
<td>Daniel Gildner</td>
<td>Psychology</td>
<td>Hostility Towards Women Moderates the Relationship Between Motivations for Sex and Sexual Assault Perpetration in a Male Collegiate Sample</td>
</tr>
</tbody>
</table>
## Poster Presentations
### Oakland Room

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanav Gupta</td>
<td>Oakland University William Beaumont SOM</td>
<td>Assessing Perceived Life Satisfaction of OUWB Students in the Context of Empathy and Future Patient Care</td>
</tr>
<tr>
<td>Israa Hammood</td>
<td>Mechanical Engineering</td>
<td>Self-crack Healing of Spinel/MoSi2 Tribosystem</td>
</tr>
<tr>
<td>Zamaan Hooda</td>
<td>Oakland University William Beaumont SOM</td>
<td>Anterolateral Ligament Reconstruction Practice Patterns across the United States</td>
</tr>
<tr>
<td>Derrick Huang</td>
<td>Oakland University William Beaumont SOM</td>
<td>Effects of Dual Exercise and Academic Program on Health Perceptions in Youth</td>
</tr>
<tr>
<td>Kristine Huynh</td>
<td>Oakland University William Beaumont SOM</td>
<td>Psoas Compartment Block Versus Periarticular Local Anesthetic Infiltration for Pain Management for Total Hip Arthroplasty: A Prospective, Randomized Study</td>
</tr>
<tr>
<td>Desirae Jemison</td>
<td>Master of Public Health</td>
<td>Oakland County Prescriber Policy for Reducing Overprescribing and Misprescribing of Opioids</td>
</tr>
<tr>
<td>Paula Jeon</td>
<td>Oakland University William Beaumont SOM</td>
<td>Investigating the Downstream Target of ZMIZ1 in T-cell Acute Lymphoblastic Leukemia</td>
</tr>
<tr>
<td>Noel Kelty</td>
<td>Ph.D. Early Childhood</td>
<td>A Tale of Two Preschool Quality Assessments: CLASS and PQA</td>
</tr>
<tr>
<td>Asma Mairaj Khan</td>
<td>Biological Sciences</td>
<td>Caldicellulosiruptor Bescii Regulates its Pilus Expression in Response to the Polysaccharide, Xylan</td>
</tr>
<tr>
<td>Ahmad Masri</td>
<td>Oakland University William Beaumont SOM</td>
<td>A Prospective Study of Patients Presenting to the Emergency Department with Chief Complaint of Dizziness</td>
</tr>
<tr>
<td>Anthony Mells</td>
<td>Oakland University William Beaumont SOM</td>
<td>The Effect of Health Insurance Among Homeless Individuals’ Visits to the Emergency Department</td>
</tr>
<tr>
<td>Megan Miller</td>
<td>Oakland University William Beaumont SOM</td>
<td>Emergency Medical Services (EMS) Providers’ Perceptions of Homeless Patients</td>
</tr>
<tr>
<td>J. Christian Peterson</td>
<td>Oakland University William Beaumont SOM</td>
<td>Factors associated with 90-day readmission rates following total hip and knee arthroplasty</td>
</tr>
<tr>
<td>Pouyan Pourmovahed</td>
<td>Mechanical Engineering</td>
<td>Energy Recovery from Fertilizer via Pressure Retarded Osmosis</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
<td>Title</td>
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<tr>
<td>Md Saon</td>
<td>Oakland University</td>
<td>Comparison of the Incidence Level of Colonic Polyps and Extra Colonic Findings from Computed Tomography Colonoscopy at Beaumont Hospital to the National Levels</td>
</tr>
<tr>
<td>Destaney Sauls</td>
<td>Experimental Psychology</td>
<td>The Connections Between Narcissism and Influence Strategies in Romantic Relationships</td>
</tr>
<tr>
<td>Aryana Sharrak</td>
<td>Oakland University</td>
<td>Women and Malnutrition in Kabale, Uganda.</td>
</tr>
<tr>
<td>Sruthi Sreedhar</td>
<td>Masters of Public Health</td>
<td>Sharing Meals and Micro-financing at Detroit SOUP: Mechanisms Enhancing Community Capacity and Engagement</td>
</tr>
<tr>
<td>Vincent Tang</td>
<td>Oakland University</td>
<td>A Comparison of Medical Student Engagement in DxA Clinician Versus Case-Based Discussion</td>
</tr>
<tr>
<td>Alison Thomas</td>
<td>Oakland University</td>
<td>Anatomical Considerations of the Recurrent Laryngeal Nerve and its Vulnerability during Surgical Procedures of the Neck</td>
</tr>
<tr>
<td>Carla Villarreal</td>
<td>Oakland University</td>
<td>Whole Genome Analysis of Putative Plesiomonas shigelloides Ampicillin Resistance Genes</td>
</tr>
<tr>
<td>Korin Visocchi</td>
<td>Educational Leadership</td>
<td>Academy School Leaders Reflecting on Their Leadership Learning, Organizational Values and Assumptions</td>
</tr>
<tr>
<td>David Wiegmann</td>
<td>Oakland University</td>
<td>P.H.I.T.N.E.S.S. Personal Health Information Toward Nutrition, Exercise, and Sports Science: Gauging the Impact of a Technology Resource</td>
</tr>
<tr>
<td>Dilmini Wijesinghe</td>
<td>Medical Physics</td>
<td>Perturbation Solutions for the Mechanical Bidomain Model Including Anisotropy</td>
</tr>
<tr>
<td>Afue Yorke</td>
<td>Medical Physics</td>
<td>Analysis of Patient Set-Up Verification Methods Employment in a New Pencil Beam Scanning Proton Center</td>
</tr>
<tr>
<td>Brian Yuhan</td>
<td>Oakland University</td>
<td>Osteoradionecrosis of the Temporal Bone: A Systematic Review</td>
</tr>
<tr>
<td>Iva Ziu</td>
<td>Chemistry</td>
<td>Impact of UVA-irradiation and Copper Ion Coordination on Crystallin peptide aggregation</td>
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## Oral Presentation Schedule

<table>
<thead>
<tr>
<th>Room – Gold A</th>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10:15</td>
<td>Rachel Roberts</td>
<td>Masters of Public Health</td>
<td>Food Insecurity and Poverty in Cayo, Belize: Perspectives from One Women’s Group</td>
</tr>
<tr>
<td></td>
<td>10:30</td>
<td>Sameen Ansari</td>
<td>Oakland University William Beaumont SOM</td>
<td>Effectiveness of Health Information Literacy Training for Patients Experiencing Homelessness</td>
</tr>
<tr>
<td></td>
<td>10:45</td>
<td>Timothy Hewitt</td>
<td>Oakland University William Beaumont SOM</td>
<td>Exploring Racial Differences Surrounding Prostate Cancer Screening: Beliefs and Attitudes in Community Dwelling Men Attending an Urban Men’s Health Event</td>
</tr>
<tr>
<td></td>
<td>11:00</td>
<td>Dana Basal</td>
<td>Doctorate of Physical Therapy</td>
<td>Differences Between Predicted and Measured Basal Metabolic Rates Among Women in Breast Cancer Survivorship: a Measurement Focused Study.</td>
</tr>
<tr>
<td></td>
<td>11:15</td>
<td>Sarah Berry</td>
<td>Doctorate of Nursing Practice</td>
<td>Implementation of TeamSTEPPS Communication Methods to Improve Patient Outcomes in the Emergency Center</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Room – Gold B</th>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10:15</td>
<td>Deirdre Pitts</td>
<td>Philosophy in Education: Educational Leadership</td>
<td>The Academic Search: Unconscious Bias and its Impact on the Recruitment and Evaluation of Faculty Candidates</td>
</tr>
<tr>
<td></td>
<td>10:30</td>
<td>Andrea Bittinger</td>
<td>Doctorate of Nursing Practice</td>
<td>Relationship between Emotional Intelligence and Occupational Stress Levels among Certified Registered Nurse Anesthetists</td>
</tr>
<tr>
<td></td>
<td>10:45</td>
<td>Berkley Browne</td>
<td>Education</td>
<td>Medical Students’ Experiences of Well-being Within a Longitudinal Well-being Course</td>
</tr>
<tr>
<td></td>
<td>11:00</td>
<td>Jennifer Vrabel</td>
<td>Psychology</td>
<td>The Importance of Fragile High Self-Esteem</td>
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<tr>
<td></td>
<td>11:15</td>
<td>Brandon Skopek</td>
<td>Master of Public Administration</td>
<td>Unfunded Pensions and Other Post-Employment Benefits: Specific Recommendations on Funding Mechanisms and Promoting Equity</td>
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</table>

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<thead>
<tr>
<th>Room – Gold C</th>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>10:15</td>
<td>Suraj Timilsina</td>
<td>Biological Sciences</td>
<td>Transcription Factors Mediated Activation of MicroRNA 29, ITGA6, and KNAP2 During Human Fibroblast Reprograming to Pluripotent Stem Cells</td>
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<tr>
<td></td>
<td>10:30</td>
<td>Julia Czarnecki</td>
<td>Biological Sciences</td>
<td>Derivation of Cardiac Stem Cells from Human Pluripotent Stem Cells</td>
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<tr>
<td></td>
<td>10:45</td>
<td>Daniel Czarnowski</td>
<td>Biological Sciences</td>
<td>Role of Syndecans and α6β1 Integrin in Maintaining Human Embryonic Stem Cell Pluripotency</td>
</tr>
<tr>
<td></td>
<td>11:00</td>
<td>Jeena Kinney</td>
<td>Biological Sciences</td>
<td>Sth1 bromodomain Affects Genome-wide Chromatin Structure and Transcription</td>
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<tr>
<td></td>
<td>11:15</td>
<td>Justin Kulchycki</td>
<td>Biological Sciences</td>
<td>A 5.8 Kilobase Chromosome 11 Genomic Locus is a Molecular Switch for Cell Type-Specific B4galnt2 Expression in Mice</td>
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<thead>
<tr>
<th>Room – Lake Superior A</th>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>10:15</td>
<td>Modar Horani</td>
<td>Computer Engineering</td>
<td>Using V2X Communication to Improve Lane Line and Road Boundary Detection in Adverse Weather Conditions</td>
</tr>
<tr>
<td></td>
<td>10:30</td>
<td>Liwen Zhang</td>
<td>Mechanical Engineering</td>
<td>A Computational Study on the Critical Ignition Energy and Chemical Kinetic Feature for Li-Ion Battery Thermal Runaway</td>
</tr>
<tr>
<td></td>
<td>10:45</td>
<td>Yang Qi</td>
<td>Mechanical Engineering</td>
<td>Open Source CFD for Reacting Flow Simulation: Bridging OpenFOAM and Cantera</td>
</tr>
<tr>
<td></td>
<td>11:00</td>
<td>Rui Zhu</td>
<td>Computer Science</td>
<td>Optimization of System Secrecy Energy Efficiency for Information and Power Transfer in Mobile Cooperative Networks</td>
</tr>
<tr>
<td></td>
<td>11:15</td>
<td>Syeda Batool</td>
<td>Medical Physics</td>
<td>Quantitative µMRI T2 Imaging of Articular Cartilage at sub-10 µm Resolution</td>
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</table>
## Oral Presentation Schedule

<table>
<thead>
<tr>
<th>Room – Lake Huron</th>
<th>Time</th>
<th>Name</th>
<th>Department</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:15</td>
<td></td>
<td>Lauren Foster</td>
<td>Oakland University</td>
<td>A Case Report: Primary Sarcoma of the Breast Associated with Secretion of Beta-Human Chorionic Gonadotropin</td>
</tr>
<tr>
<td>10:30</td>
<td></td>
<td>Tyler Parsons</td>
<td>Biological Sciences</td>
<td>Defining How Radiation Delivery Alters the Tumor Microenvironment to Favor Myeloid Development and Tumor Regrowth</td>
</tr>
<tr>
<td>10:45</td>
<td></td>
<td>Gukan Sakthivel</td>
<td>Oakland University</td>
<td>Predicting Post-Stereotactic Body Radiation Therapy Pulmonary Function in High Pulmonary Risk Lung Cancer Patients</td>
</tr>
<tr>
<td>11:00</td>
<td></td>
<td>Katie Hege</td>
<td>Biological Sciences</td>
<td>Target Drug Reaction Variation between the Commercial Renal Cell Carcinoma Line, CAK1-2, and Primary Kidney Tumor Tissue</td>
</tr>
<tr>
<td>11:15</td>
<td></td>
<td>Ian Archbold</td>
<td>Chemistry</td>
<td>Peptide Based Sensor for the Detection of the Therapeutic Antibody Trastuzumab: An Investigation of the Peptide Self Assembly Processes on a Gold Electrode</td>
</tr>
<tr>
<td>11:30</td>
<td></td>
<td>Kharananda Sharma</td>
<td>Medical Physics</td>
<td>Growth of Engineered Tissue Analyzed Using The Mechanical Bidomain Model</td>
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<tr>
<th>Room – Heritage</th>
<th>Time</th>
<th>Name</th>
<th>Department</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:15</td>
<td></td>
<td>Thomas LaRouere</td>
<td>Oakland University</td>
<td>Incidence and Etiology of Extreme Thrombocytopenia in a Neonatal Population</td>
</tr>
<tr>
<td>10:30</td>
<td></td>
<td>Eric Pai</td>
<td>Oakland University</td>
<td>Effect of a Deep Vein Thrombosis Management Protocol on Admissions at Beaumont Hospital - Troy</td>
</tr>
<tr>
<td>10:45</td>
<td></td>
<td>Khashayar Arianpour</td>
<td>Oakland University</td>
<td>Opioid Prescribing Patterns among Otolaryngologists: Are We Contributing to the Opioid Epidemic?</td>
</tr>
<tr>
<td>11:00</td>
<td></td>
<td>Brandon Nguyen</td>
<td>Oakland University</td>
<td>Perioperative Analgesia for Patients Undergoing Endoscopic Sinus Surgery: An Evidence-Based Review</td>
</tr>
<tr>
<td>11:15</td>
<td></td>
<td>Tejas Shah</td>
<td>Oakland University</td>
<td>Cardiovascular and Internal Environmental Parameters of a Lower Body Negative Pressure Device during Stimulated Hypovolemic Conditions</td>
</tr>
<tr>
<td>11:30</td>
<td></td>
<td>Simi Jandu</td>
<td>Oakland University</td>
<td>Therapeutic hypothermia Effects on Patient’s Electrocardiogram</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
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<tbody>
<tr>
<td>10:15</td>
<td></td>
<td>Han Lin</td>
<td>Mechanical Engineering</td>
<td>Effects of intermediates from ignition chemistry on laminar flame propagation</td>
</tr>
<tr>
<td>10:30</td>
<td></td>
<td>Gucheng Yuan</td>
<td>Mechanical Engineering</td>
<td>Energy Conversion Based On a Humidity Gradient System</td>
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<tr>
<td>10:45</td>
<td></td>
<td>Christopher Slon</td>
<td>Industrial Systems Engineering</td>
<td>Predicting the Assembly Variation Induced by Fastener Torque Using Finite Element Analysis and Monte Carlo Simulation</td>
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**Miriam Ahmad**

**Exploring Trends in Nonmedical Vaccine Refusals in Oakland County**

Advisor: Mark Navin

**Introduction:** In 2015, Michigan implemented a policy change requiring parents who want nonmedical exemptions from school or daycare vaccination requirements to attend education sessions at public health offices. The Oakland County Health Division (OCHD) provided 4,167 waiver education sessions in 2015. This study’s goal was to analyze electronic medical record (EMR) data to identify (1) the most commonly given reasons for refusing school- and daycare-mandated vaccines; and (2) discover what percentage of children later received school mandated vaccines (MMR, DTaP, Polio, Meningococcal, Hepatitis B, Varicella) their parents initially refused. **Methods:** This retrospective cohort study used data from two sources: the Michigan Care Improvement Registry (MCIR) and the OCHD EMR (Insight) records for the 4,167 children for whom parents attended waiver education sessions in 2015. Analysis was performed on pooled data from both sources using SPSS Statistics software. **Results:** Out of 4,098 pooled records from MCIR and Insight, 3,999 parents refused a vaccine at the education session. Reasons for refusal were grouped together into 5 categories. In order of greatest to least they were: (1) safety concerns (n=2055), (2) alternative schedulers (n=1181), (3) religious reasons (n=542), (4) specific disease beliefs (n=342) and (5) multiple reasons (n=111). Alternative schedulers were most likely to receive a vaccine they had initially refused (39.2%) and people citing religious beliefs were least likely (4.4%). 657 children out of 3,999 (16.4%) subsequently received vaccines that initially were refused at the vaccine education session. For DTaP, Polio, HepB, MMR, Varicella, and Meningococcal vaccines, rates of subsequent vaccinations after the sessions varied between 4.3%-9.2% of total refusers. **Conclusion:** Although the overall rate of subsequent vaccinations after waiver education sessions was not very high (16.4%), certain groups of parents were more likely to subsequently vaccinate their children depending on the initial reason for refusal and on the vaccine type that was initially refused.

**Hani Alshahrani**

**DDefender: Android Application Threat Detection Using Static and Dynamic Analysis**

Coauthors: Harrison Mansour & Seaver Thorn

Advisor: Huirong Fu

Android is the most widespread mobile operating system in the world. Due to its popularity, malware has been increasing every year steadily, which causes lots of problems to users, such as using the device’s resources and transmitting private information without user’s awareness. As malware has increased, anti-malware solutions have as well. Current antimalware solutions often have very serious limitations and malware is becoming more apt to take advantage of them. In this paper, we present DDefender, a user-friendly application that detects Android malicious applications on device. DDefender is a comprehensive solution that utilizes static and dynamic analysis techniques to extract features from the user’s device, then applies deep learning algorithm to detect malicious applications. At first, we use dynamic analysis to extract system calls, system information, network traffics, and requested permissions of an inspected application. Then we use static analysis to extract significant features from the inspected application such as application’s components. By utilizing neural network and a large feature set of 1007 features, we evaluated our system with 4208 applications (2104 benign applications and 2104 malicious applications) and we achieved up to 95% accuracy.

**Ali Alshehri**

**Risks Behind Device Information Permissions in Android OS**

Coauthors: Hani Alshahrani & Anthony Hewins

Advisor: Huirong Fu

In the age of smartphones, people do most of their daily work using their smartphones due to significant improvement in smartphone technology. When comparing different platforms such as Windows, iOS, Android, and Blackberry, Android has captured the highest percentage of total market share. Due to this tremendous
growth, cybercriminals are encouraged to penetrate various mobile marketplaces with malicious applications. Most of these applications require device information permissions aiming to collect sensitive data without user’s consent. This paper investigates each element of system information permissions and illustrates how cybercriminals can harm users’ privacy. It presents some attack scenarios using READ_PHONE_STATE permission and the risks behind it. In addition, this paper refers to possible attacks that can be performed when additional per- missions are combined with READ_PHONE_STATE permission. It also discusses a proposed solution to defeat these types of attacks.

Amanda Amen
Disparity in Receipt and Utilization of Dispatch Instructed CPR

Introduction: Dispatch-assisted cardiopulmonary resuscitation (DA-CPR) has been shown to be independently associated with improved survival and improved functional outcome after Out of Hospital Cardiac Arrest (OHCA). The objective of this study is to evaluate whether there are racial and socioeconomic disparities in the receipt of DA-CPR instructions and subsequent CPR performance. Methods: This study is a retrospective review of the Cardiac Arrest Registry to Enhance Survival (CARES) dispatch registry from 1/2014-12/2016. Data was collected from a convenience sample of dispatch agency supervisor audits of 911 OHCA audio recordings in one state. Elements related to dispatcher CPR instruction, barriers to bystander CPR performance, patient race (white, black, or other) and Utstein data were captured from the CARES database. This data was merged with census tract data of incident locations. The effects of race and SES were analyzed using multivariate logistic regression. Results: 1872 cases from 23 dispatch agencies were identified. The population was predominantly white (70.0%), male (66.0%), with an average age of 63.5 +/-18.7. DA-CPR instructions were more commonly associated with an incident that occurred in a private residence (ORadj 3.8, 95% CI (2.5-5.8)) or in highest income quartile census tracts (ORadj: 1.65; 95%CI (1.01 - 2.72)). Older patient age (ORadj: 0.99; 95% CI (0.98 - 0.99)) and black race (ORadj: 0.61; 95% CI (0.39- 0.98)) were negatively associated with receipt of DA-CPR instructions. Subsequent performance of CPR after DA-CPR instruction was more common in witnessed arrests (OR 2.0, (95% CI 1.3-3.0)) and negatively associated with black race (ORadj: 0.31; 95% CI (0.16 - 0.58)) but not significantly different by socioeconomic or demographic characteristics. Conclusion: Although this preliminary study is limited by incomplete demographic and dispatch data, racial disparities in provision of DA-CPR instructions and subsequent CPR performance were identified. These findings varied minimally by income or other demographic characteristics.

Dalton Blood
Hip Labral Tear Diagnosis Trends 2007-2016

Advisor: James Bicos

Introduction: Tearing the acetabular labrum, a ring of fibrocartilage, destabilizes the hip joint and increases stress which increases risk for articular damage. Patients with symptomatic acetabular labral tears complain of hip pain, clicking, catching, locking, or giving way. However, up to 96% of the population experiences asymptomatic hip labral tears. Past research demonstrated a marked increase in the diagnosis rate of hip labral tears from 2006 to 2010. This research examines the trends in this diagnosis from 2007 to 2016 and attempts to explain changes by looking at demographics data including sex, age, and body mass index (BMI). Methods: 2,843 Beaumont Royal Oak Hospital patients with hip labral tears diagnosed between 2007 and 2016 were identified and compared to 34,184 hip pain patients using Cochran-Armitage Tests for Trend. The age, sex, BMI data from these patients was compared over time using linear regression. 1784 received a direct arthrogram, indirect arthrogram, or no contrast MRI. The presence of para-labral cysts, full-thickness tears, and location of the labral tear were compared. Results: The proportion of hip pain encounters presenting as labral tears increased significantly from 3.68% in 2007 to 8.62% in 2016 (Trend P = 0.0013). This trend was significant in the female subset 3.13% in 2007 to 8.77% in 2016 (Trend P = < 0.0001) while the trend was not significant in males (Trend P = 0.9288). The patient average age did not change, but the average BMI showed an upward trend (P=0.0007) Discussion and Conclusions: Hip labral tear diagnosis rate has been
proportionally increasing from 2007 to 2016. This trend is significant in females. While a higher hip dysplasia prevalence makes females more susceptible to labral tears, it does not explain an increasing trend. Increasing BMI could play a role.

Susanne Boden
A Clinical Outcomes and Economic Perspective On Normal, Obese, and Morbidly Obese Patients Following Total Knee Arthroplasty

Advisor: Inaya Hajj Hussein

Introduction: The association between obesity and postoperative outcomes after total knee arthroplasty (TKA) has been widely debated. There is limited research that has analyzed the impact of obesity on economic outcomes, such as length of stay and total hospital cost for TKA. The purpose of this study is to assess clinical and economic outcomes following TKA of obese patients in comparison to non-obese patients, and to assess whether the pre-TKA medical optimization efforts implemented since 2010 have had a significant impact on the postoperative clinical and economic outcomes in this unique patient population. Methods: Data for this study were obtained using the National Inpatient Sample (NIS) database from 2007 to 2011. A total of 3,092,309 TKA patients were identified and divided into 3 cohorts, non-obese (19-29 kg/m2), obese (30-39 kg/m2), and morbidly obese (> 40 kg/m2). In-hospital postoperative outcomes and resource utilization among the cohorts were comparatively analyzed and stratified by 2007-2009 and 2010-2011. A T-test was used to analyze the collected results. Significance was assigned at P value < .05. Results: Obese patients undergoing TKA had a higher rate of any complication compared with non-obese patients (odds ratio [OR], 1.09; 95% confidence interval [CI], 1.04-1.15; p = 0.0008). Obese patients had a higher risk of wound dehiscence (OR, 1.35; 95% CI, 1.14-1.61; p = 0.0007), pulmonary embolism (OR, 1.50; 95% CI, 1.36-1.64; p < 0.0001), and postoperative anemia (OR, 1.10; 95% CI, 1.04-1.16, p = 0.0007). Total hospital cost (USD 47,081 versus USD 45,311, p < 0.0001) and length of stay (3.47 days versus 3.41 days, p < 0.0001) were higher in obese patients. Conclusion: The results indicate that obese patients are more likely to have postoperative complications and greater resource utilization. This serves a purpose in allowing orthopedic surgeons to better predict patient outcomes.

Ryan Brisson
Comparison of Radiation Therapy and Radical Prostatectomy in the Treatment of High Risk Prostate Cancer: A Retrospective Matched Pairs Review

Advisor: Karna Sura & Daniel Krauss

Background: Prostate cancer is the most common malignancy affecting men, accounting for over 160,000 new diagnoses in 2016 and 8% of cancer related deaths. Once diagnosed with high risk prostate cancer, patients have a 10-year prostate cancer specific mortality of 20%. Both definitive radiation therapy (RT) and radical prostatectomy (RP) +/- adjuvant RT are considered standard of care treatment for patients with high risk disease. In this study, we utilized a retrospective matched pairs analysis to determine which regimen was superior for survival and disease control. Methods: 1436 patients diagnosed with high risk prostate cancer between August 1985 and October 2016 were analyzed. All eligible patients were treated with RP +/- adjuvant RT and androgen deprivation therapy (n=774) or RT alone (n=660), which consisted of either High Dose Rate (HDR) Brachytherapy Boost or Adaptive Radiation Therapy (ART). A 1:1 matched pairs analysis was completed, which paired 196 patients based on three poor prognostic characteristics: pre-treatment prostate-specific antigen (PSA) ≥ 20, Gleason score ≥ 8, and clinical T stage ≥ T2c. Results: There was no statistical difference between patients treated with RT and those treated with RP for overall survival (p =0.21), cause specific survival (p=0.28), or distant disease control (p=0.88). RT was statistically different than RP in regard to local regional control (p=0.015). When analyzing the two modalities of RT used to treat high risk prostate cancer in this patient cohort compared to RP, both ART and HDR were statistically different compared to RP in regard to local regional disease control (p=0.049). Conclusions: Based on this retrospective matched pairs analysis of 196 patients with high risk prostate cancer, RT was superior to RP in local regional control of disease. Both RT and RP were similar in regard to overall survival, cause specific survival, and distant disease control.
Cheryl Cheah
Gender Disparities in Total Joint Arthroplasty "Gender Disparities in Total Joint Arthroplasty
Advisor: Inaya Hajj Hussein

Disparities in the health care system signify potential risks for vulnerable groups whose needs are not appropriately addressed and met. Specifically, studies showed that there are basic inequalities between men and women with respect to health services availability, including surgical procedures such as total joint arthroplasty (TJA). TJA procedures have been successful in treating end stage arthritis, resulting in a steady increase in demand for the procedure over the last decades. This project aims to highlight the different in-hospital outcomes and complications experienced by patients of different gender undergoing TJA.

Methods: Our study utilized de-identified patient data from the National Inpatient Sample (NIS) database from 2006 - 2011. The NIS records ICD-9CM codes to identify granular data involved in a patient’s in hospital stay. Our data was further stratified to create two cohorts of male and female patients that underwent primary TJA. We further stratified each cohort by batching for additional comorbidities using the Elixhauser Comorbidity Index. Postoperative and economic outcomes were measured for matched cohorts, respectively. Specifically economic variables used to assess resource utilization included length of stay (LOS [days]), amount charged ($USD), and discharge disposition (Home, Subacute Nursing Facility (SNF), or Home-Health). Descriptive statistics were obtained, univariate analyses using t-tests and chisquared statistics were conducted for contnous and categorical data, respectively. Odds ratios with respective confidence intervals were calculated to assess the association of gender and post-TJA complications. Results: Results showed that female TKA patients have a significantly higher rate of any complications (22.81%) than male TKA patients (18.92%) (P = < 0.0001). This trend was similar in female THA (29.78%) and male THA (22.10%) patients (P = < 0.0001). In addition, female TKA patients had an average inpatient stay of 3.47 days, which is significantly longer than male TKA patients of 3.36 days (P = < 0.0001). Female TKA patients incurred an average of $45,342 in total charges, which is significantly less than those of male TKA patients of $46,021 (P = < 0.0001). Similar trends were also observed between male and female THA patients. Conclusion: Understanding these factors will help address the unmet needs and concerns of both genders regarding TJA, and to ensure that qualified patients are able to access the necessary procedures for pain relief and functional improvement.

Jacob Corll
Maize RNA Binding Motif Protein 48 (RBM48) is Required for Minor Intron Splicing and Promotes Endosperm Cell Differentiation
Advisor: Shailesh Lal & A. Mark Settles

The last eukaryotic common ancestor had two classes of introns that were spliced by different spliceosome complexes. The vast majority of introns, termed U2-type introns, are spliced by the major spliceosome. There are also rare U12-type introns, which are spliced by the minor spliceosome. The biological significance of these rare minor intron genes (MIGs) are not well understood. Mutations in minor spliceosome genes disrupt normal growth and development in both plants and animals. There are relatively few splicing factors that have been shown to be specific to the minor spliceosome. We found that the maize RNA Binding Motif Protein 48 (RBM48) is a minor spliceosome factor that functions to promote cell differentiation and repress cell proliferation. Transposon-induced mutations in rbm48 cause a rough endosperm (rgh) defective kernel phenotype that alters endosperm cell differentiation to promote aleurone differentiation over basal endosperm transfer cells and embryo surrounding region. Moreover, rbm48 endosperm is more proliferative in a callus culture system than normal sibling endosperm tissues. RNA-seq and RT-PCR data show that rbm48 mutants have splicing defects in approximately 60% of MIGs, while U2-type introns are largely unaffected. These developmental and molecular phenotypes are similar to the maize rgh3 mutant, which encodes a U12 splicing factor. RBM48 is highly conserved among organisms that retain the minor spliceosome. Protein-protein interactions and co-localization between RBM48, RGH3, and U2 Auxiliary Factor (U2AF) subunits suggests major and minor spliceosome factors may form complexes as part of recognizing introns. Maize RBM48 also shows a conserved interaction with the maize homolog of human Armadillo Repeat Containing Protein7 (ARMC7). Our data predict
that RBM48 will have a conserved function in U12 splicing throughout eukaryotes and that a major function of U12 splicing in maize is to promote endosperm cell differentiation.

Spencer Darlin
Clinical Uncertainty Uncovers Health Care Bias Against Homeless People
Coauthor & Advisor: Jason Wasserman

Introduction: Although health care professionals often provide equal treatment to homeless and non-homeless individuals, social stigma against homeless individuals prevails when clinical uncertainty exists. That is, only when the appropriate course of treatment of a patient is relatively unclear (clinical uncertainty), differences between the treatment of homeless and non-homeless individuals appear. In the ultimate interest of pursuing health care equity, this paper attempts to illuminate those differences. Methods: The study will be conducted using statistical analysis of a national compilation of data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), a survey designed to provide objective, reliable information about ambulatory medical care services in the United States. The medical treatment of homeless and housed patients will be compared at equivalent situations of clinical uncertainty using the NHAMCS data. Results: Exclusively for triage level 3 visits, homelessness patients are less likely than non-homeless patients to be cared for by an attending physician and more likely to receive care from a mid-level provider. Visits by homeless patients where the patient presents with pain levels of 8 or more, are less than half as likely to result in prescription for a schedule I, II, or III medication than housed patient visits with the same presenting level of pain. Conclusion: To suggest that someone deserves inferior health care because they are homeless, one must make a foolish assumption that all homelessness is the result of poor character or poor life decisions. Additionally, the decision to provide a patient with narcotics is multifactorial and should be individualized for each patient while avoiding clinically relevant incorrect assumptions about homeless people as a whole. The evidence of prejudice against homeless people will hopefully inspire health care providers to be vigilant about making assumptions about homeless people.

Allyson DiMagno
Chronic Kidney Disease: Its Impact on Total Joint Replacement Interventions
Advisor: Inaya Hajj Hussein

Introduction: In the United States, chronic kidney disease (CKD) affects roughly 11% of the population or 19.2 million people. As the prevalence of CKD continues to increase it will be necessary to consider its association with total joint replacement and address how CKD may affect post-operative total joint arthroplasty (TJA) clinical and economic outcomes. We hope that by conducting a retrospective study using a nationally representative sample, we may be able to predict outcomes for CKD patients undergoing total joint replacement. Our findings may help develop new protocols which ensure the highest level of patient safety. Methods: Our study utilized de-identified data from the National Inpatient Sample (NIS) database from 2006-2011. The NIS houses ICD-9-CM codes to identify patients who are 45 and older with osteoarthritis and underwent TJA. The data was further stratified to CKD and non-CKD patients while matching for gender and additional co-morbidities using the modified Elixhauser Comorbidity Index. Postoperative outcomes and economic outcomes were also measured for matched cohorts, respectively. Specifically, economic variables assessed length of stay (LOS [days]), amount charged ($USD ), and discharge disposition (Home, Subacute Nursing Facility (SNF), or Home-Health). Descriptive statistics will be used to analyze the collected results. Univariate analysis using t-tests and chi-squared statistics were conducted for continuous and categorical data, respectively. Odds ratios with respective confidence intervals were calculated to assess the association of CKD and post-TJA complications. Results: The initial univariate results indicate that patients undergoing TJA who have CKD, have a significantly higher rate of postoperative cardiac issues, deep vein thrombosis, and gastrointestinal complications compared to those without CKD (P=<.0001). Additionally, individuals undergoing TJA with concurrent CKD have longer length of stay (almost a day longer) and incur a greater average total charge (P=<.0001). The initial univariate results suggest that CKD confers worse postoperative clinical and economic outcomes on patients undergoing TJA. Further data analysis matching gender and co-morbidities will be
completed in the future. **Conclusion:** Based on these initial univariate results, CKD patients undergoing TJA demonstrate a higher association of postoperative complications and greater resource utilization. Our results are expected to help orthopedic surgeons identify the risks that may be present for patients with CKD undergoing TJA in the future and help achieve the highest level of patient safety.

**Elise Doppel**  
The Psychosocial Effect of Chronic Disease  
Advisor: Caress Dean

**Introduction:** Half of the adult population in the United States was diagnosed with a chronic disease in 2012, many having more than one. Currently, a third of the country is obese and arthritis is the leading cause of disability. Negative psychosocial experiences can cause exacerbation of symptoms, leading to additional chronic diagnoses and over-utilization of healthcare services. Therefore, this study examines the impact of psychosocial status on multiple, major chronic conditions affecting populations in the United States. **Methods:** Data from the Health Information National Trends Survey (HINTS) 4 Cycle 4 (N=3,464) was analyzed to determine the relationship between chronic condition diagnoses and psychosocial status of a nationally-represented adult sample in the United States. Cross-tabulations and ordered logistic regressions analyses were performed using STATA/IC 15.1. We combined variables representing chronic condition diagnosis to encompass all major conditions surveyed in HINTS, including high blood pressure, lung disease, arthritis, heart disease, depression, and diabetes. Psychosocial status was represented by the Patient Health Questionnaire (PHQ-4) scale, which is a validated instrument in depicting subjective reports of little interest/pleasure in doing things, hopelessness/depression, uncontrollable worry, and nervousness/anxiety. Additional demographic variables were included as covariates in the model. **Results:** Approximately 61% of respondents were female, and an average age of 55 years. Over two-thirds of the respondents had five or more chronic conditions. A significant association was found between the number of chronic conditions and PHQ-4 score (p=0.00). As the number of chronic conditions increased, perceptions of a very good general health status significantly decreased (OR=0.44; p=0.00). **Conclusion:** Findings of this study indicate that additional efforts are warranted to better understand and address the psychosocial status of individuals found to have multiple chronic conditions. Additional research is needed to inform the appropriate interventions for populations.

**Azrael Dunbar**  
Pathway to Health Careers: Impact Evaluation of the Bioengineering and Biomedical Summer Sciences Program  
Advisor: Inaya Hajj Hussein & Celeste Farr

**Introduction:** Science, Technology, Engineering and Math (STEM) workers are necessary to sustain U.S innovation enterprise, global competitiveness and national security. Bioengineering and biomedical sciences are STEM fields that are in particular demand. Evaluating the effectiveness of the Bioengineering and Biomedical Summer Sciences Program (BBSSP), which builds student competencies in STEM, can be used as a template for current and future pipeline programs. **Methods:** Two standardized tools, a Career Interest Likert Questionnaire and a Subjective Disposition Semantics Evaluation, were administered to 30 participants of the BBSSP offered by Oakland University William Beaumont School of Medicine. The program recruited students from sociocultural groups that are traditionally underrepresented in medicine. The independent variables in the pre and post-tests evaluated the students’ interests, confidence and disposition relative to STEM courses and careers. Analysis of this data assessed the dependent variables of attitude change and desire to pursue STEM careers as a result of participating in the BBSSP. A two-sample t-test was utilized to assess attitude changes over time. **Results:** Twenty-eight students participated in the study. A two-samples t-test was conducted comparing thirty-eight constructs before and after participation; five of them were found to be significant. The results suggest that students’ desire to pursue STEM careers did not increase significantly from participation in the BBSSP, however it provided a real world view of the complexities of STEM careers in that it is complex, dynamic and reasoned through rather than strictly discovered. **Conclusion:** Attitudes towards STEM careers can be
positively influenced amongst high school students that are underrepresented in medicine through participation in the BBSSP, a foundationally sound pipeline program.

Moses Evbuomwan  
A Survey of Oakland University Students’ Willingness to Submit Their DNA for Medical Research  
Advisor: Inaya Hajj Hussein

**Introduction:** The concepts of personalized medicine and pharmacogenomics have been firmly established and hold the promise to better healthcare delivery while reducing healthcare cost. Numerous studies have assessed students’ attitude towards genetic testing, but few studies have investigated the willingness of students to submit their DNA. The aims of this study were (1) to assess Oakland University (OU) students’ willingness to submit their DNA to OU for medical research and (2) to evaluate factors that may influence their decision.

**Methods:** A cross-sectional study was conducted among OU students using an online self-administered questionnaire distributed through Qualtrics survey software to collect data. In addition to the respondents’ biographical data section, the questionnaire assessed the respondents’ general knowledge and attitude about DNA sequencing and personalized medicine, and their willingness to submit their DNA as well as factors influencing their decision. **Results:** From the 653 questionnaires completed, 91.6% were between 18 to 30 years and 69.5% identified as females. A total of 71.0% of respondents were willing to submit their DNA samples to direct-to-consumer (DTC) genotyping companies and 72.5% of respondents were willing to consent to DTC to use their DNA for medical research. While 64.9% would be concerned about their genetic privacy, 61.8% would not be concerned about the possibility of discrimination based on their genetic profile. Lastly, the majority of respondents (81.2%) were willing to submit their DNA to OU to sequence for medical research purposes. **Conclusion:** Preliminary data analysis showed that OU student respondents were willing to submit their DNA to sequence for medical research despite concerns about their genetic privacy. Based on these initial results, it is hoped that this study will start a dialogue about research universities in the U.S. using their capacity to house and sequence their students’ DNA for societal benefits and advancement of the health care system.

Daniel Gildner  
Hostility Towards Women Moderates the Relationship Between Motivations for Sex and Sexual Assault Perpetration in a Male Collegiate Sample  
Coauthor: Daniel Lanni  
Advisors: Michele Parkhill & Scott Pickett

Previous research suggests that men who have hostile attitudes toward women (HTW; Loh, Gidycz, & Lobo, 2005) and use sex to cope with negative affect (Jung & Jamieson, 2014) may be at a higher risk of perpetrating sexual assault. Similarly, it has been suggested that men who engage in sex to elevate their sense of masculinity are also at a higher risk of perpetration (Abbey, Zawacki, Buck, Clinton, & McAuslan, 2004). Participants were 276 Male college students who completed the self-esteem and coping subscales from the Motivations for Sex Scale (Cooper et al., 1998), the Sexual Experiences Survey (Parkhill & Abbey, 2008), and the Hostility towards Women Scale (Lonsway & Fitzgerald, 1995). Results of the hierarchical regression revealed a significant interaction between HTW and having sex to cope to predict sexual assault perpetration (β = .91, t = 4.16, p < .001). Simple slopes analysis revealed that when there was low HTW there was no association between having sex to cope and perpetration (β = .08, t = 1.00, p = .36). However, when there was high HTW there was a significant association between having sex to cope and perpetration (β = .461, t = 6.67, p < .001). A similar set of hierarchical regression analyses revealed a significant interaction between HTW and having sex for self-esteem (β = 1.10, t = 4.51, p < .001). Simple slopes test revealed that when HTW was low there was no association between having sex for self-esteem and perpetration (β = .09, t = 1.16, p = .25). However, when HTW was high there was a significant association between having sex for self-esteem and perpetration (β = .57, t = 7.33, p < .001). Results suggest that men who have HTW and attempt to have sex to cope or who have sex to increase self-esteem are more likely to perpetrate sexual assault. Thus, future intervention work should focus on both attitude change and proper emotion regulation.
Kanav Gupta
Assessing Perceived Life Satisfaction of OUWB Students in the Context of Empathy and Future Patient Care
Advisor: Roberto Rinaldi

Emerging adulthood is a period of life where individuals attain the independence and status of adulthood without many of the full-fledged responsibilities that accompany it. It often characterized as an age of instability, self-focus, and identity exploration. The challenges emerging adults encounter often negatively impact their mental status and levels of life satisfaction. These challenges are only increased in severity for medical students, the majority of whom are emerging adults. We explored these challenges, in the context of life satisfaction and patient empathy, for OUWB School of Medicine students in their pre-clinical vs. clinical years. Data was collected via two standardized indexes utilizing the Qualtrics platform. The sixty-two participants included students in all four years of the OUWB curriculum. The assessments asked the participants to rank how well they identify with a number of statements. The two assessments were modified versions of the Life Satisfaction index (Diener, E., et al., 1985) and the Jefferson Scale of Physician Empathy index (Hojat, M., et al., 2001). This poster presents data that demonstrates OUWB students reported decreased levels of life satisfaction and empathy for patients during their clinical years of the curriculum. This data also informs of a relationship between the degree of reported life satisfaction among students as well as their perceived empathy for patients. These results will assist to produce curricular recommendations and a better understanding of potential curricular revisions that could improve the life satisfaction of OUWB students and their empathy for patients.

Israa Hammood
Self-crack Healing of Spinel/MoSi2 Tribosystem
Coauthors & Advisors: Gary Barber & Dave Schall

The conducted research is focusing on investigating the Self-crack healing ability of a tribosystem consisting of Spinel/MoSi2 nanoparticles. A hardened steel die was used to prepare the samples and uniaxially pressing the mixture of nanoparticles into small round pellets. The objective of the research is to fill out the induced racks with the reaction products. Different conditions beside the room temperature ranging from (450- 900 °C) for different holding times were used to investigate the healing ability, the mechanism responsible for self-healing as well. The prepared crack-healing tribosystems showed a partial to complete healing of the intentionally induced cracks on the surface of the prepared specimens.

Zamaan Hooda
Anterolateral Ligament Reconstruction Practice Patterns Across the United States
Coauthors: Mohsin Fidai & Terrence Lock
Advisors: Inaya Hajj Hussein & Terrence Lock

Background: Anterior cruciate ligament (ACL) reconstruction has been shown to have positive outcomes. However, some patients that undergo the procedure still experience instability of the knee joint and are unable to return to their normal level of activity. The anterolateral ligament (ALL) has been reported to add translational and rotational stability to the knee joint in conjunction with the ACL. The significance of the ALL has been rediscovered through recent studies that demonstrate the high frequency of ALL injuries occurring concurrently with ACL injuries. Currently, more attention is dedicated to the once abandoned lateral extra-articular tenodesis procedure as well as the development of ALL reconstruction. The purpose of this study was to survey orthopedic surgeons to determine the current state of practice with regards to ALL reconstruction. Our hypothesis is that the majority of surgeons surveyed will not perform ALL reconstruction frequently in their practice. Methods: 137 orthopedic surgeons nationwide were surveyed through an online survey. A 7-question survey assessed surgeon experience, indications, technique, graft choice, and post-operative rehabilitation when performing ALL reconstructions. Results: Surveys were completed by 119 surgeons in the United States, a response rate of 86.86%. Of those that responded, 37.9% perform ALL reconstruction/lateral extraarticular tenodesis in conjunction with ACL reconstruction. Grade III pivot shift and revision ACL reconstruction were the most common indications for ALL reconstruction. 60.4% use the “anatomic” ALL reconstruction with
hamstring method for this procedure. 60.92% of responders reported that they perform ALL reconstruction in less than 10% of ACL reconstruction surgeries. 87.5% stated that post-operative rehabilitation is the same if an ALL reconstruction or LT is performed with ACL reconstruction. **Conclusions:** Despite the recent surge in literature surrounding ALL reconstruction, the majority of orthopedic surgeons surveyed do not perform ALL reconstruction or lateral extraarticular tenodesis with ACL reconstruction. Most surgeons perform ALL reconstruction on patients with a grade III pivot shift or on patients undergoing revision ACL reconstruction, however we did not find a consensus regarding the indications or technique for ALL reconstruction. The majority of surgeons do not change their post-operative protocol if an ALL reconstruction is performed.

**Derrick Huang**

**Effects of a Dual Exercise and Academic Program on Perceptions of Health and Fitness in Detroit Youth**

Advisor: Lucia Victoria

**Background:** The Downtown Boxing Gym is an inner city Detroit nonprofit that serves youth through after-school academic support while also promoting fitness through boxing and exercise. This pilot study explored if the dual focus approach positively influences both academic and fitness perceptions in students, regardless of academic or fitness activity participation, in order to assess program effectiveness in ameliorating health and academic disparities in urban youth. **Method:** A quantitative cross-sectional multiple choice online survey was administered to students ages 13-17 in June 2017 who participated in 3 activity groups: fitness only (FIT), education only (EDU), or both activities (BOTH), and focused on exploring whether the gym improved interest in both academics and fitness regardless of activity. Chi-square analysis identified statistical differences in variables such as age and time spent at gym. ANOVA identified statistical differences of gym impact on academic and fitness perceptions, assessed by agreement level on a 5-point Likert scale, with questions generally focusing on whether the gym increased interest in educational and fitness activities. **Summary Findings:** 41 students were surveyed (n = 14, 6, 21, for FIT, EDU, and BOTH, respectively). EDU participants spent less time hanging out with friends, were less likely to enjoy working with others or feel comfortable with teachers at the gym, and less likely to want to be at the gym compared to FIT and BOTH (p<0.05). Despite these differences, there were no statistical differences between the groups with respect to gym participation increasing interest in educational activities, maintaining health, furthering education or career goals, or improving self-esteem. In conclusion, results show a positive influence on perceptions of health and fitness regardless of gym participation group, underscoring the potential of dual focus programs in ameliorating health and academic disparities in urban youth.

**Kristine Huynh**

**Psoas Compartment Block Versus Periarticular Local Anesthetic Infiltration for Pain Management for Total Hip Arthroplasty: A Prospective, Randomized Study**

Coauthor: Denise Koueiter

Advisor: James Verner

**Background:** The psoas compartment block (PCB) or periarticular soft tissue local anesthetic injection are forms of regional anesthesia often used as one of the components in multimodal anesthesia applied during total hip arthroplasty (THA). The most efficacious form of regional anesthesia for total hip arthroplasty has yet to be determined. **Methods:** In a single-surgeon, prospective, clinical trial, patients undergoing THA via direct anterior approach were randomized to receive an intraoperative periarticular local anesthetic infiltration (periarticular injection) or a PCB. Postoperative pain scores, narcotic consumption, and complications were recorded. **Results:** Forty-nine patients were randomized to the PCB and 50 were randomized to the periarticular injection. The resting pain score 3 hours postoperatively was statistically significantly lower in the periarticular injection group by 1.1 point (2.9 ± 2.2 vs 4.0 ± 2.2, P=0.036). No difference was found in resting pain scores or ambulatory pain scores in the morning or evening of postoperative day one, two, or at the 3-week follow visit. There was no difference in in-hospital narcotic consumption between groups (P=1.0). There were
no major complications directly related to the block in either group. A total of six patients reported complaints of transient numbness, five in the PCB group (5/49, 10.2%) and one in the periarticular injection group (1/50, 2%, P=0.087). Conclusion: These results demonstrate equivalency between the two methods. We prefer periarticular anesthetic infiltration over PCB due to improved immediate postoperative pain scores, and avoidance of potential symptoms associated with nerve blockade.”

Desirae Jemison
Oakland County Prescriber Policy for Reducing Overprescribing and Misprescribing of Opioids
Coauthor: Chloe Johnson
Advisor: Caress Dean

Introduction: Prescription drug abuse has become the nation’s fastest growing drug problem, with opioids being the most often abused prescription drug. In Oakland County, enough prescriptions written so that every resident could have more than 1 prescription with over 75 doses per year. The goal of this qualitative study was to gain key stakeholders insights into a state-level policy and propose an alternative that could be implemented locally to assist in addressing the opioid crisis in the county. Methods: This study uses a qualitative approach in which three key stakeholders, who actively work in the opioid environment in the county, were interviewed and asked in-depth information on opioid policies, such as awareness of opioid-related policies in other states, challenges to implementing opioid-related policies in Oakland County. Results: A health educator from Oakland County Health division hoped that the Oakland County Opioid Prescribing Policy would ultimately saves lives as more and more people are overdosing. The majority of stakeholders interviewed agreed that implementing a policy that allows healthcare professionals to be properly educated on opioid prescribing would help in reducing overprescribing in the county. Conclusion: The interviews emphasized a strong interest in mimicking State Opioid Prescribing Policy: Florida, which outlines prescribing guidelines, and adding an educational component to help diminish the opioid epidemic in Oakland County.

Paula Jeon
Investigating the Downstream Target of ZMIZ1 in T-cell Acute Lymphoblastic Leukemia
Advisors: Mark Chiang & Dwayne Baxa

Introduction: NOTCH1 was found to be the most frequently mutated oncogene in T-cell acute lymphoblastic leukemia (T-ALL), raising hopes for first targeted therapy. However, Notch inhibitors exhibited severe toxicity because Notch also has important physiologic roles. Zmiz1 was identified as a direct and selective cofactor of Notch1 in T Cell development and leukemia, and target genes regulated by Zmiz1-Notch1 interaction were identified. The purpose of this project is to identify Zmiz1-regulated target genes that specifically drive leukemic cell growth for potential therapeutic targets while preserving physiologic roles of Notch1 and bypassing the side effects of total Notch1 blockade. Methods: We transduced target genes into primary murine T-ALL cell line that depend on Zmiz1-Notch1 interaction for proliferation, engineered to express activated NOTCH1 allele, Zmiz1f/f, and Rosa26-CreERT2 transgene. 4-hydroxytamoxifen (OHT) induces Cre, deleting endogenous Zmiz1 which normally results in cell death. Important target genes would sufficiently compensate for endogenous Zmiz1 and rescue leukemic cell growth, measured with flow cytometer and compared using Prism one-way ANOVA. Because of the strong NOTCH1 dependence of the cells, we also tested the effect of low-dose gamma secretase Notch inhibitor (GSI), to lower the Notch signal to levels seen in primary human T-ALL cells in order to create a cellular environment that is more dependent on Zmiz1-Notch1 interaction for growth. Summary of Findings: Compared to the untreated cells, low-dose treated cells showed greater rescue overall. Compared to the empty vector, Zmiz1 rescue was at 98x with GSI compared to 19x without treatment. Intracellular Notch1 (ICN1) rescue was at 66x compared to 3.1x. Similar trend was observed with Wnt pathway mediators Tcf1 and Lef1. Data suggest that T-ALL cells are more dependent on Zmiz1 to help raise Notch signal and maintain cell proliferation when the intramolecular concentration of Notch1 is limiting, that Zmiz1 inhibitors would be more effective when combined with Notch1 inhibitors.
Noel Kelty
A Tale of Two Preschool Quality Assessments: CLASS and PQA
Advisor: Tomoka Wakabayashi

High-quality, intensive early childhood education programs have positive impacts on children's early literacy, math, and social emotional learning. Quality early experiences in the first five years of life alter a child's brain through a variety of social and cognitive activities, preparing children for elementary school, and reducing behavior and achievement gaps. The purpose of this study was to study and develop a crosswalk between the Preschool Program Quality Assessment (PQA) and the Classroom Assessment Scoring System for Prekindergarten (CLASS-PreK). This study explored whether the quality of early childhood programs can continue to be assessed on the same continuum with the use of two assessments. This study was designed to assess the viability of utilizing either the CLASS or the PQA, both as part of the QRIS system and state-funded preschool monitoring and continuous improvement efforts. PQA and CLASS scores were obtained from the same Head Start and Great Start Readiness Program (GSRP) classrooms (n=388) to gain an increased understanding of similarities and differences between the two tools. Results yielded a moderately significant correlation between the two assessments, leading to several implications for implementation and program staff training, including recommendations for a program pilot, the development of a checklist in conjunction with the CLASS to ensure fidelity of implementation to the state-funded prekindergarten implementation requirements which are aligned to Michigan’s Early Childhood Standards of Quality, and additional training for program staff.

Asma Mairaj Khan
Caldicellulosiruptor Bescii Regulates its Pilus Expression in Response to the Polysaccharide, Xylan

Coauthor: Valerie Bell
Advisor: Sara Blumer-Schuette

The genus Caldicellulosiruptor include extremely thermophilic, anaerobic plant biomass degraders. Owing to their modular, multi-functional carbohydrate acting enzymes, some members, such as Caldicellulosiruptor bescii are highly cellulolytic. In addition to its cellulolytic capacity, mechanisms that C. bescii uses to facilitate attachment to plant biomass are equally important if these thermophiles are to be developed as biocatalysts. Bioinformatics analysis of the genome from C. bescii predicted that it possesses a type IV pilus operon upstream of its glucan degradation locus. Based on pilin-like protein domains, transcriptomics analysis and protein expression, we annotated the hypothetical protein Athe_1880, as the major pilin. Interestingly, the pilins from highly cellulolytic Caldicellulosiruptor are evolutionarily divergent from those pilins from weakly cellulolytic species. Here, we sought to determine if the C. bescii type IV pilus plays a role in attachment to plant biomass. In order to confirm a role for the predicted major pilin, Athe_1880, recombinant, soluble protein was produced by truncating both the pre-pilin cleavage site and the hydrophobic domain. Xylan appears to be the main inducer of expression of Athe_1880 as immunoblots detected the highest presence of Athe_1880 on cell surfaces in comparison to other representative plant polysaccharides. Immunofluorescence microscopy showed that Athe_1880 is localized within C. bescii cells, at the poles. Here we show that C. bescii cells adhere to plant biomass and that Athe_1880T significantly interferes with this adherence. Based on these observations we propose that the major C. bescii pilin Athe_1880 and by extension its T4P plays a role in cell adherence plant biomass.
Ahmad Masri
A Prospective Study of Patients Presenting to the Emergency Department with Chief Complaint of Dizziness
Advisor: Shana Jones

Background: Dizziness accounts for a staggering 7.5 million visits to US emergency departments (ED) annually. The clinical outcomes of patients with dizziness are numerous and complex, the majority of which are vaguely identified in the literature. The goals of this study is to determine the 7 and 30-day outcomes of patients presenting with the chief complaint of dizziness to the ED. Methods: This was a single site prospective observational pilot study. Any non-pregnant patient of 18 years or older presenting to the ED with primary complaint of dizziness, lightheadedness, or vertigo was screened for inclusion during a one-month period. Patients with a clear cause of dizziness, such as gastrointestinal bleed or arrhythmia, were excluded. The baseline characteristics, imaging results, and disposition information were collected. Patients were then followed at 7 and 30 days after the visit via a scripted phone survey. The primary outcome was resolution or persistence of symptoms at 7 and 30 days. Descriptive statistics and Logistic regression were used to analyze results. Results: A total of 105 patients were included in the study. Eighty-three percent of patients had resolution of symptoms at 7 days and 86.7% had resolution at 30 days. Patients presenting with sudden onset of symptoms were more likely to have resolution of dizziness at 7 days as opposed to patients with gradual onset, OR 3.81 (95% CI 1.15-14.92, p=0.0285). A head CT or MRI was performed in the ED on 62% of patients of which 8.6% had significant findings. Fifty-six percent of patients were discharged, 38.1% where admitted, 5.7% were placed in observation. A significant finding on CT or MRI did not correlate with worse symptoms at 7 days, OR 0.61 (95% CI 0.12-4.24, p=0.6404). Conclusion: This observational study reveals that most patients presenting with dizziness have improvement in symptoms at 7 days and continue to be symptom free at 30 days. Despite that fact, many patients undergo CT scans and admissions. Likely due to a difficulty in discerning benign from serious diagnoses for patients with dizziness. A large prospective multi-center study is warranted in further evaluating the presentation and treatment of patients with undifferentiated dizziness.

Anthony Mells
The Effect of Health Insurance Among Homeless Individuals’ Visits to the Emergency Department
Coauthor: Spencer Darlin
Advisor: Jason Wasserman

Introduction: The volume of uninsured patients treated by U.S. Emergency Departments (ED) puts substantial strain on the healthcare system, as uncompensated medical care costs hospitals $40 billion annually. This study examines the relationship between homelessness, insurance status, and patterns of ED use. Methods: Data from over 506 million patient visits recorded in the National Hospital Ambulatory Medical Care Survey (NHAMCS) from 2007 – 2011 was analyzed using SPSS 24.0.0.0. Four subsets of homeless populations were studied: insured-recidivistic, uninsured-recidivistic, insured-nonrecidivistic, and uninsured-nonrecidivistic. Recidivism was defined as four or more ED visits in the last twelve months. Other variables included common diagnoses, wait times, length of visits (LOV), triage acuity levels, and prevalence of tri-morbidities (coexisting diagnoses of substance abuse, mental illness, and a chronic condition). Results: Homeless patients average 14 minutes of additional wait time despite similar triage acuity (2.90 and 2.96 respectively). Interestingly, insured-nonrecidivistic homeless patients have the longest wait time (71 minutes), despite having the highest acuity (2.34). Insured-recidivistic patients are most quickly seen by a physician (53 minutes). The LOV is significantly longer for homeless patients (5.52 hours), compared to housed patients (3.33 hours). Homeless, uninsured-recidivistic patients spend 8.18 hours in the ED, by far the highest. Housed uninsured-recidivistic have the shortest LOV (2.98 hours). Four of the top ten diagnoses for homeless ED patients involve substance abuse or mental illness. On disposition, homeless patients are 9.8 times as likely to be admitted to a psychiatric hospital compared to housed patients (4.9% versus 0.5%). Consequently, homeless patients are also 7.5 times more likely to exhibit tri-morbidity (5.3% versus 0.7%). Conclusion: Longer wait times for homeless patients show a bias for treating housed patients first, while extended LOV for homeless
patients exemplify the difficulties of proper dispositions. Importantly, the higher percentage of homeless patients experiencing tri-morbidity demonstrates their increased susceptibility to serious medical conditions.

Megan Miller
Emergency Medical Services (EMS) Providers’ Perceptions of Homeless Patients
Advisor: Jason Wasserman

Introduction: Patient trust is an important indicator of treatment adherence and improved health outcomes. However, homeless patients exhibit greater mistrust of health care providers. Paramedics and emergency medical technicians (EMTs) are often the first point of contact in health care for homeless patients because of the high frequency of emergency department encounters among the homeless population. Promoting positive interactions between EMS providers and homeless patients is therefore important in fostering the latter’s trust with health care. This study investigates the perceptions of EMS providers toward homeless individuals.

METHODOLOGY This qualitative study includes paramedics and EMTs, who have experience in ambulatory care, employed at three different EMS locations in the Metro Detroit area. Participants were recruited via email by their respective EMS coordinators. Data was collected via semi-structured interviews with individual respondents and was analyzed using coding and categorization techniques akin to grounded theory. SUMMARY OF FINDINGS EMS providers collectively emphasize the importance of providing quality care to all patients, regardless of socioeconomic background. However, EMS providers also consistently recognize that the physical and mental demands of the job leads to substandard care. This study identifies that past experiences serving homeless patients creates expectations for future encounters with homeless individuals. Additionally, personal political beliefs on social assistance, workplace morale and each EMS providers’ sense of self-worth influence general attitudes toward the homeless population and develops inherent biases when treating homeless patients. Further, the level of insight into external factors contributing to homelessness corresponds with the ability to empathize with homeless individuals. Overall, EMS providers feel limited in providing beneficial resources to relieve the challenges that homeless individuals face and require more knowledge of local community resources to offer to patients seeking care.

J. Christian Peterson
Factors Associated with 90-day Readmission Rates Following Total Hip and Knee Arthroplasty
Advisors: Kevin Baker & Erin Baker

Introduction: To improve patient outcomes, meet federal guidelines, and reduce cost, research has focused on variables associated with elective total hip arthroplasty (THA) and total knee arthroplasty (TKA) that lead to readmissions. In this study, a comprehensive evaluation of pre and postoperative patient and surgical factors associated with 90-day readmission rates will be performed. Methods: After obtaining IRB approval, a retrospective review of 8,563 cases was performed to calculate the readmission rate after elective THA and TKA readmissions from 1/1/2014 – 9/30/16. Statistical analysis (analysis of variance with a Dunn’s post-hoc test) was performed to compare patient and surgical variables of the cohort without readmission (control) vs. the cohort readmitted within 90-day postoperative. Planned statistical analyses include correlation analysis as well as logistic regression analyses to predict the risk factors of readmission following elective THA or TKA. Results: Body mass index in the readmission cohort (avg=31.60) was significantly greater than the control cohort (avg=30.47) (p≤0.001). Length of stay (LOS) was also significant, with a shorter length of stay in the control group (avg=2.44 days) compared to the readmitted cohort (avg=3.20 days) (p≤0.001). Postoperative hemoglobin levels were significantly lower in the readmitted group (avg=9.68) compared with the control group (avg=10.445) (p≤0.001); and, operative time was significantly greater in the readmitted group (avg=1:34:45) compared to the control group (avg=1:28:00). Conclusion: These factors—BMI, LOS, postoperative hemoglobin, and operative time—may be related directly to readmission rate, but also may be associated with pre-existing patient comorbidities (e.g. diabetes) preoperatively, which may lead to additional complications in the postoperative period. Additional statistical analyses (analyses of variance, chi square, correlation, logistic regression) will provide insight regarding drivers of readmission in this patient population, leading to follow
quality initiative to decrease 90-day readmission rates as well as improve clinical practice and patient outcomes following THA and TKA.

**Pouyan Pourmovahed**  
**Energy Recovery from Fertilizer via Pressure Retarded Osmosis**  
Adviser: Jonathan Maisonneuve

Mixing a concentrated fertilizer with irrigation water releases large amounts of energy. This means that in fertigation processes throughout the world, there is an energy potential that has not yet been harnessed. Recovering this energy can be a step towards improving life cycle efficiency, reducing cost of fertilizer, and reducing cost of food production in controlled plant environments. It also has promise for water filtration and purification. Fertilizer gradient energy can be converted to useful work via several means including pressure retarded osmosis (PRO), which is a membrane-based process. The PRO concept involves introducing concentrated fertilizer solution and irrigation water on to opposite sides of a semi-permeable membrane. The potential difference between the two drives permeate from the feed side to the draw side, even when a load (up to some limit) is placed on the draw side. The result is an expanding volume of pressurized solution that does work against the load. The load can be a hydro turbine coupled to a generator for electricity production. This paper analyzes the power production potential of a fertilizer driven PRO system. The results of thermodynamic and energy efficiency analysis are discussed. The trade-off between maximum energy harvesting versus maximum power production is presented as the primary challenge that faces fertilizer gradient energy conversion.

**Md Saon**  
**Comparison of the Incidence Level of Colonic Polyps and Extra Colonic Findings from Computed Tomography Colonoscopy at Beaumont Hospital to the National Levels**

**Introduction:** Computed Tomography Colonography (CTC) provides a non-invasive modality to screen patients for colorectal cancer (CRC). This study aims to determine the performance of CTC in the detection of colonic polyps and extra-colonic findings from CTC screening for our patient population and compare those values to the national values. **Methods:** CTC cases were retrospectively reviewed to determine the incidence of colonic polyps (≥6 mm). Retrospective review of 310 patients (age ≥ 50) screened with CTC between 1/1/2010 to 1/1/2015 was conducted. Clinical data was classified based on the CT Colonography Reporting and Data System (C-RADS) for colonic and extracolonic findings and then compared to national values. The indications, recommendations, and follow up data were documented. Chi-square test of independence, two tailed hypothesis test of proportion, and descriptive statistics were performed. **Results:** The incidence of significant colonic polyps for the patient population is 9.27% (30/313 patients) which is significantly lower than the national benchmark level of 14.3% (p=0.019). The study identified 34 polyps (≥6 mm) with an average size of 8.58 mm. Most polyps were detected in the ascending colon (26.5%) followed by sigmoid (20.6%) and cecum (17.6%). 78.71% (244/310 patients) presented with at least one extracolonic finding. C-RADS classification rates were as follows: C0 (0.1%), C1 (89.8%), C2 (2.9%), C3 (5.1%), and C4 (1.3%). Significant difference for C1 and C2 C-RADS scores (P-value 0.019 and <0.001, respectively). E-Categories for C-RADS rates were 86.77% (E1 or E2), 11.29% (E3) and 2.90% (E4) showed no statistically significant difference compared to benchmark. **Conclusions:** The study showed a significantly lower incidence of colonic polyps compared to benchmark (p = 0.019). There is statistically significant difference between C1 and C2 C-RADS scores indicating a higher incidence of normal colonic findings and a lower incidence of an intermediate polyp (6-9 mm). The extracolonic findings are within national range.
Destaney Sauls
The Connections Between Narcissism and Influence Strategies in Romantic Relationships
Coauthor: Mark Lehtman
Advisor: Virgil Zeigler-Hill

The present study focused on gaining a more nuanced understanding of the influence strategies that characterize the dimensions of narcissism described in the Narcissistic Admiration and Rivalry Concept (NARC) model (Back et al., 2013). The NARC model describes two dimensions of narcissism: narcissistic admiration (an agentic form of self-enhancement and self-promotion) and narcissistic rivalry (an antagonistic form of self-defense and self-protection). These two dimensions of narcissism represent very different approaches to interacting with the social environment that may have implications for the strategies that individuals adopt when attempting to influence their romantic partners. We expected narcissistic admiration to be positively associated with influence strategies that involved manipulation, bullying, and autocracy, whereas we expected narcissistic admiration to be negatively associated with the use of supplication. For narcissistic rivalry, we predicted there would be positive associations with all of the influence strategies that we examined (i.e., manipulation, supplication, bullying, autocracy, disengagement, and bargaining). Participants were 405 undergraduate students (67 men, 338 women) who reported being in a serious relationship for at least three months at the time of this study. Participants completed the Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013) and the Influence Strategy Questionnaire (Howard, Blumstein, & Schwartz, 1986). A path analysis revealed narcissistic admiration had a positive association with the manipulation strategy but was not significantly associated with any of the other influence strategies. Furthermore, narcissistic rivalry had positive associations with manipulation, supplication, bullying, autocracy, and disengagement as well as a negative association with bargaining. Our results showed that narcissistic admiration and narcissistic rivalry had very different associations with the influence strategies individuals may use in romantic relationships. These results suggest that it is important to distinguish between narcissistic admiration and narcissistic rivalry when considering how individuals attempt to influence their romantic partners.

Aryana Sharrak
Women and Malnutrition in Kabale, Uganda.
Coauthors: Jessica Robbins & Cheryl Baraza
Advisor: Jessica Robbins

Background: As of 2010, USAID reported that 38% of Ugandan children under 5 years old suffer from malnutrition. Southwest Uganda, where the Kabale region is located, is one of the regions where high rates of malnutrition and stunting of children in this age group are most prevalent. GlobeMed at Wayne State University conducted this study through KIHEFO with the aim to further improve nutritional community health interventions by targeting mothers’ and grandmothers’ lifestyles. Methodology: The purpose of this study was to understand the connections between women’s lifestyles and malnutrition. With ethnographic methods and analysis from interviews conducted (n = 12), conclusions were drawn about what aspects of women’s lives connect to food insecurity and malnutrition, and how community health interventions could be better tailored to their lifestyles. Results/Findings: From this ethnographic study, we were able to learn about aspects of women’s lives that are connected to food insecurity. The findings of this ethnographic study suggest that NGOs and researchers need to address the following issues in sequential order: women’s low incomes, difficulty in acquiring land for personal farming, nutrition lessons and interventions, and providing trade skills to increase job diversity. Once that is addressed, women will have more time, energy, and resources to providing proper nutrition to their families. Conclusions: After women’s families are nutritionally healthy, learning skills and trades will allow them to reach out to more diverse jobs and begin investing money. These methods and ideas can be applied to other similar communities in designing community health interventions. From these research findings, NGOs will be able to make health interventions community specific by understanding how relationships, emotions, and everyday lifestyles have an important impact on the women’s lives and may change the approach in which community health interventions are used.
Fahad Sheckley
Perioperative Risk Factors for Post-Op Urinary Retention After Elective Spine Surgery
Advisor & Coauthor: Melissa Fischer

Introduction: Postoperative Urinary retention (POUR) is a common complication of spinal surgeries. POUR is characterized by difficulty of voluntary urination for hours/days after surgeries with incidence of 5-13%. Patients require catheterization, leading to morbidities. Studies have suggested that POUR develops due to factors like age, duration of procedure, comorbidities and more. However, there is no consensus about the direct causes of POUR. The primary goal of this study is to determine factors that might lead to POUR. Methods: Data were extracted from 477 patients (age >18) who underwent elective spinal surgery at William Beaumont Hospital-Royal Oak from Dec 2013 to Aug 2014. Data included preoperative, perioperative and postoperative factors (age, duration of procedure, concomitant medications, and perioperative comorbidities). Data analyses performed are multivariate logistic regressions that predict the odds of developing POUR. Since males and females had significant difference, we performed two separate analyses: one for males and one for females. Results are presented in terms of Odds Ratios (OR), corresponding 95% confidence intervals, and P-Values.

Results: POUR developed in 21% of all patients (18.8% in females, 23.7% in males). In males, history of Benign Prostatic Hyperplasia (OR: 7.91, P = < 0.001), Anti-Cholinergic Prescription (OR: 5.27, P = 0.0281), Gout (OR: 14.5, P = 0.0303), and Hypothyroidism (OR: 6.29, P = 0.0218) are significantly and independently associated with higher odds of developing POUR. In females, increasing Age (OR: 1.19, P = 0.0296) and Arthritis (OR: 2.34, P = 0.0143) are significantly and independently associated with higher odds of developing POUR.

Conclusion: An assessment of risk factors in patients undergoing spinal surgeries could help predict the development of POUR. Perioperative and postoperative clinical pathways could be developed to minimize the occurrence of this adverse event. An ongoing effort to address POUR could result in improving outcomes.

Sruthi Sreedhar
Sharing Meals and Micro-financing at Detroit SOUP: Mechanisms Enhancing Community Capacity and Engagement
Coauthor: Alicia Tollefson
Advisor: Laurel Stevenson

Introduction: Detroit SOUP, a micro-grant making organization, promotes community-based development by holding monthly dinners to share meals, ideas, and award seed-funding to one of four organizations whose goal is to enrich Detroit. Since 2013, SOUP has expanded and integrated into 11 localized neighborhood SOUP groups. This qualitative study identifies and explores important factors that lead attendees to engage in philanthropic helping behavior resulting in enhanced community capacity and engagement. Methods: One-on-one in-depth interviews were conducted with six attendees of the monthly city-wide SOUP to explore meanings associated with attendance and participation at SOUP. The interview protocol was based on helping behavior concepts of empathy, perceptions and explanation of needs, motivation for helping, and community capacity and enhancing protective qualities of communities. Interviews were coded for emerging themes.

Results: Emerging interview themes include: to support people helping other people, to make a difference, to be engaged and involved in the community, to create community, to learn what is going on, and to be inspired to do good for the community. Conclusions and Implications: Detroit SOUP is a highly successful organization that engages participants in philanthropic helping behaviors by granting seed-funding to projects that result in improving the community. SOUP and other organizations that rely on community engagement should focus on clear messaging to constituents to highlight benefits of involvement. Additionally, such programs should be introduced in areas that would benefit from community engagement to increase neighborhood assets.
Vincent Tang  
A Comparison of Medical Student Engagement in DxR Clinician Versus Case-Based Discussion  
Advisors: Bhavin Balal & Dwayne Baxa  

Introduction: In today’s medical school curriculum, there is ongoing need to pioneer novel teaching methods that integrate expanding knowledge requirements with student engagement. Exposed to a variety of teaching modalities, medical students seek practical didactic means to further their clinical performance. DxR Clinician is an interactive digital tool that utilizes real patients to adopt virtual encounters covering a broad spectrum of clinical problems. The application allows students to formulate hypotheses, test interpretation, make diagnoses and create treatment plans using patient interviews, exams, modern imaging and diagnostic procedures. The purpose of this study is to collect data on student perceptions to evaluate whether students find DxR computer-based activities more beneficial and functional than professor moderated case-based teaching. Methods: The overall strategy in this crossover study is to divide the participants into two groups: DxR Clinician and professor led case discussion. After completing their first session, participants cross into the opposing group and complete a second session. Following the intervention, student responses are collected via survey for analysis of their perceptions. The inclusion criteria for this study is 125 M1 students at Oakland University William Beaumont in the year 2017. Statistical analysis of the data is performed by comparing the frequencies and proportions of student agreement. Results: Compared to the case-based discussion, rough examination of results demonstrate that a significant proportion of students find DxR Clinician to better promote their interest, engagement, understanding and collaboration in learning. The results illustrate that students are more receptive to an interactive digital tool that allows them to facilitate their didactic learning. Conclusion: The results support the hypothesis that the utilization of a virtual patient encounters through DxR Clinician promote student engagement in the classroom setting. Providing educators with a valuable resource for curriculum development, this study has the potential to positively impact medical education delivery.

Alison Thomas  
Anatomical Considerations of the Recurrent Laryngeal Nerve and its Vulnerability during Surgical Procedures of the Neck  
Advisors: Jisksaa Gemechu & Daniel Fahim  

Purpose: Accurate knowledge of anatomical variation provides important information for preventing inadvertent intraoperative injury, improving patient safety, optimizing clinical outcomes, and ultimately guiding best clinical and surgical practice. The present study aims to assess the potential anatomical variations of recurrent laryngeal nerve (RLN) pertaining to its course, branching pattern, and its relationship to the inferior thyroid artery, which potentially makes it vulnerable to injury, compression, or stretch during surgical procedures of the neck. Methods: The study was done on 38 formalin fixed cadavers used for dissection as part of Gross Anatomy at Oakland University William Beaumont School of Medicine in 2016-2017. Following critical observation, and careful dissection, all cadavers with anatomical variation were photographed and the data was analyzed in a qualitative and descriptive methods. Results: Our findings indicate branches coming off of the recurrent laryngeal nerves on both the right and left side. On the right side, 71% of the cadavers demonstrated 2-5 extra-laryngeal branches. On the left side, 53% of the cadavers demonstrated 2-3 extra-laryngeal branches. In relation to the inferior thyroid artery, 62.5% of right RLNs were related anteriorly, while 33% were related posteriorly. On the other hand, 37.5% of left RLNs were anterior to the inferior thyroid artery, while 66.7% were posterior to it. Conclusions: Altogether, the findings show a significant amount of variations in the course and branching pattern of the RLN. Accurate knowledge of the variations is essential to minimize complications associated with surgical procedures of the neck, especially in the anterior cervical spine surgery and thyroidectomy procedures. The information gained in this study may have implications for surgical technique and consideration of the side of approach for preserving the extra-laryngeal branches of the RLN during surgical procedures of the neck.
Carla Villarreal  
**Whole Genome Analysis of Putative Plesiomonas Shigelloides Ampicillin Resistance Genes**  
Advisor: Tracey Taylor  

**Introduction:** Plesiomonas shigelloides are water-borne bacterial pathogens, known to cause gastrointestinal infections in humans. Though most infections are mild, in severe cases antimicrobial intervention is warranted. Antimicrobial susceptibility tests of P. shigelloides strains, including the ATCC 14029 type strain, show widespread ampicillin resistance. Generally, ampicillin resistance can be due to modifications in Penicillin Binding Proteins or by the production of beta-lactamase enzymes (inactivating the beta-lactam ring). However, recent data shows that there may be multiple mechanisms of resistance in P. shigelloides. This study aims to elucidate the ampicillin resistance mechanism(s) of P. shigelloides by identifying target resistance genes through genome sequencing. **Methods:** MiSeq NextGen DNA sequencing of the ampicillin-resistant P. shigelloides type strain following DNA extraction and digestion yielded 655,994 reads. Due to the lack of an annotated reference strain, we identified contigs of homology from two P. shigelloides reference genomes. Concurrently, we compiled known ampicillin resistance (beta-lactamase) genes from three genetically similar human pathogens Escherichia coli, Aeromonas hydrophila, and Vibrio cholera and systematically compared the sequences to P. shigelloides contigs using the publically available software, nucleotide BLAST (Basic Local Alignment Search Tool; NCBI). Knowing that P. shigelloides are aquatic, we also compared the contigs to beta-lactamase genes of aquatic Enterobacteriaceae family species Dickeya, Erwinia, Edwardsiella, Cronobacter, Pantoea and Morganella. **Results:** Thirty-five homologous beta-lactamase sequences from ten bacterial species did not show significant regions of overlap with 53 P. shigelloides type strain DNA contigs that had significant homology to our type strain reads. **Conclusion:** Our results could signify that the ampicillin resistance mechanism(s) for P. shigelloides may be novel, although investigation of penicillin binding protein modifications is also required. Elucidation of the mechanism(s) of ampicillin resistance by this pathogen would allow for more targeted therapies for these infections as well as shed light into antibiotic resistance mechanisms of pathogens.

Korin Visocchi  
**Academy School Leaders Reflecting on their Leadership Learning, Organizational Values and Assumptions**  
Advisor: Jana Nidiffer  

The purpose of this paper is to report on a small pilot study in which a heuristic (a process which enables a person to discover for themselves) was used, to enable Academy School learning community leaders (principals) to reflect on their leadership journey and perceptions of leadership within a Network of Independent Catholic schools. In addition to the heuristic leadership learning timeline pre-reflection exercise, this hermeneutic phenomenological study also utilized two semi-structured interviews. The goal of this study was to gain insight into the “essence” or phenomena of lay (non-vowed religious sisters, or nuns) leadership in an independent Catholic school. The motivation for the study arose after I gained experience as a teacher within a Network of Independent Catholic schools and was awed with the 200 year tradition of female directed educational leadership in North America by the same order of Catholic vowed religious nuns. A review of the literature identified potential "mission drift" problems many Catholic schools are facing where leadership positions are filled by lay leaders in response to declining membership in religious vocations. Validity and reliability measures included respondent validation between the first and second interview, where the I shared the tentative interpretations and transcripts for plausibility and accuracy. The piloting of the heuristic shifted the emphasis from researcher directed questioning, to a collaborative semi-structured interview, intended to empower the voices of the participants in the construction of an Academy School leadership model. Emerging from this pilot study was an Academy School leadership model which included love of learning, love the Academy School “story”, problem solving, and community bridge building.
David Wiegmann
P.H.I.T.N.E.S.S. Personal Health Information Toward Nutrition, Exercise, and Sports Science: Gauging the Impact of a Technology Resource

Advisors: Virginia Uhley & Lisa Wiegman

**Introduction:** Currently there are few resources dedicated to high school students to address the area of nutrition and fitness. Many available online resources today are devoted either to children or adults. The resources developed within the P.H.I.T.N.E.S.S. platform utilized numerous multi-media technologies and tools to promote focused high school student engagement and improve health and nutrition knowledge. **Methods:** We designed the P.H.I.T.N.E.S.S. platform to provide high school students with an online resource to enhance their knowledge of health and fitness related topics. P.H.I.T.N.E.S.S. includes various multi-media tools such as: videos to introduce fitness and nutrition topics; tutorials to provide definitions and related information; surveys and flashcards to test and challenge student progress; and interactive lessons. To determine the effectiveness of P.H.I.T.N.E.S.S., participants were asked to complete a pretest and posttest to assess the impact that this online-based learning platform had on their health and nutrition knowledge. **Results:** There was a significant improvement in mean test score after the utilization of P.H.I.T.N.E.S.S. (P=0.000135), with an average improvement in score of 2.81 ± 3.93 points (maximum score of 26 points). Data of the pretest results indicated that participating students had a mean score of 10 questions answered correctly. Subsequently, posttest results showed a mean score of 13 questions answered correctly. A linear regression model demonstrated an R2 value of 0.60 when comparing percent increase or decrease on posttest in accordance to time spent utilizing the P.H.I.T.N.E.S.S. **Conclusion:** The impact of an online-learning technology resource developed to engage high school students about health and nutrition was effective in improving overall knowledge in a relatively short time span. Utilizing P.H.I.T.N.E.S.S., there was a measurable improvement in the student’s knowledge of health and nutrition. Further investigation is needed to determine if students are using this newly acquired knowledge to make healthier lifestyle decisions.

Dilmini Wijesinghe
Perturbation Solutions for the Mechanical Bidomain Model Including Anisotropy

Advisor: Bradley Roth

The mechanical bidomain model is a mathematical model of how biological tissue responds to mechanical signals, a process known as mechanotransduction. This research provides an analytical approach to determine the effect of intracellular anisotropy on the mechanical bidomain model. The model differentiates properties of the intracellular and extracellular spaces, which are coupled through membrane proteins called integrins. In the model, the intracellular anisotropy is described by a dimensionless parameter ζ, which is zero when the tissue is isotropic. A perturbation expansion of the equations was performed in terms of ζ. The model was applied to the case of a region of ischemia in a sheet of cardiac tissue. The active tension produced by the cardiac fibers was large in the surrounding normal tissue and went to zero in the region of ischemia, as might occur during a heart attack. Two different forms of active tension were considered, one that changed gradually between the normal and ischemic regions, and another that changed more abruptly. Because the intra- and extracellular spaces are each incompressible, their displacements are described by stream functions. Analytical solutions of the equations were obtained in terms of ζ. The results were divided into two parts: a monodomain term which was the same in the intra- and extracellular spaces, and a bidomain term which was different in the two spaces. The bidomain term activates integrins and causes mechanotransduction. When the active tension varied gradually, anisotropy affected the magnitude of the bidomain displacement but not its spatial distribution. However, when the active tension that varied abruptly, anisotropy changed both the magnitude and distribution of bidomain displacement. In conclusion, tissue anisotropy can affect the spatial distribution of mechanotransduction in cardiac tissue. This result could have implications for understanding how cardiac tissue grows and remodels after a heart attack.
Afua Yorke  
**Analysis of Patient Set-Up Verification Methods: Employment in a New Pencil Beam Scanning Proton Center**  
Advisor: Thomas Guerrero

**Background:** Patient-positioning verification is a very important step taken before beam delivery for pencil beam scanning. One of the ways in verifying patient positioning is to perform image registration, by registering a set of oblique kV radiographs to corresponding set of digitally reconstructed radiographs (DRRs) or by registering a CBCT to a CT. **Methods:** We report on the patient set-up verification methods used for 21 patients over a period of 6 months. Of these patients, 12 head and neck, 3 thoracic and 6 abdominal cases. Patients demographic were, 7 females, 11 males and 3 pediatrics. These patients were followed throughout the course of treatment and their set-up verifications using oblique kV radiographs and CBCT were observed. The data was categorized for patients who were treated with one single couch position and for patients with two or multiple couch positions. The report includes the average set-up time, average number of oblique images, intra-fraction motion due to different treatment table angles, and the average couch shift per table angle. **Results:** The mean IGRT shift for patients with one table angle was 1.10 cm and for multiple table angles 1.80 for first angle and 0.60 cm for subsequent angles. Mean number of images for single position 3, and for multiple table positions 3 for the first and 2 for multiple positions. The average set-up time for single table position was 4 min, and about 8 mins for multiple table positions. **Conclusion:** There were less number of images, less set-up time and less IGRT shifts for patients who were treated with one couch position as compared to patients who were treated with two or more couch positions.

Brian Yuhan  
**Osteoradionecrosis of the Temporal Bone: A Systematic Review**  
Coauthor: Brandon Nguyen  
Advisor: Peter Svider

**Objectives:** The objective of this evidence-based review (EBR) was to evaluate etiologies, associated complications, and management of osteoradionecrosis of the temporal bone (ORNTB). **Methods:** The authors searched the PubMed, Embase, and Cochrane Library databases for relevant literature. Patient demographics, etiologies, treatments, and other clinical characteristics were obtained. Treatment success was defined as resolution of symptoms at last follow-up. **Results:** 366 cases of ORNTB were identified in forty studies. The most common etiologies for radiotherapy included: nasopharyngeal carcinoma (n=133 [36.6%]), parotid tumors (n=73 [20.1%]), and external auditory canal tumors (n=59 [16.3%]). The mean dose of initial radiation was 57.4 (11-160 Gy). The mean lag time between radiotherapy and ORN symptoms was 7.6 years (0-48 years), with lag time for parotid tumors less than that for brain tumors (6.0 vs 8.0, p = 0.04). Presenting symptoms included purulent otorrhea (33.1%) and hearing loss (29.3%). ORNTB complications included tympanic membrane perforation (n=102 [63.8%]) and chronic suppurative otitis media (n=16 [10%]). Treatments included lateral temporal bone resection (n=99 [38.2%]), mastoidectomy (n=82 [33.7%]), and conservative treatment (n=71 [21.5%]), with 90.9%, 59.76%, 77.1% considered successful, respectively. **Conclusions:** ORNTB is a rare complication of radiotherapy that may present years after initial radiation exposure. Management should be aimed at relief of presenting symptoms and treatment of ORNTB associated complications. Both conservative and surgical measures may adequately control the disease process and symptomatology, however randomized controlled studies comparing treatments would serve to further corroborate these findings.
The crystallin protein, normally found in the eye lens and in other distinct areas of the body, acts as a molecular chaperone preventing proteins denaturation and/or aggregation, which lead to diseases. Particularly, protein aggregation leads to clouding/opacification of the eye lens causing degeneration or cataracts. One of the mechanisms associated to cataracts is the formation of radicals induced by environmental factors or some biological factors. UVA-irradiation and metal ion coordination have been associated to the formation of reactive oxygen species (ROS), responsible for aA-crystallin protein degradation and eye lens degeneration. However, the exact mechanisms of crystallin aggregation remain unclear. Understanding how UVA-irradiation and metal ions influence aA-crystallin protein structure and function will provide a better understanding of the mechanisms involved in eye diseases. Here we specifically evaluated the aggregation propensities of aA66-80 crystallin peptide (79His), commonly found in eye lens cataracts, and its mutant (79Ala). Peptides were mixed with copper ions and/or UV-irradiated. The aggregation propensities were examined by Fluorescence Spectroscopy, while morphologies of crystallin aggregates were characterized by Transmission Electron Microscopy (TEM). The high fluorescence signal was observed for aggregated peptides. TEM analysis showed formation of fibrils. UVA-irradiation reduced the fibrils formation and caused disaggregation, as evidenced by TEM and Fluorescence Spectroscopy. The copper ions did not inhibit peptide aggregation, since fibrils were detected in TEM images. However, we discovered that the copper ions dramatically reduced fluorescence signal, and this signal loss may be unrelated to aggregation inhibition.
Oral Presentations

Sameen Ansari
Effectiveness of Health Information Literacy Training for Patients Experiencing Homelessness
Advisors: Misa Mi & Jason Wasserman

Background: Low health literacy has significant implications for health care including increased hospitalizations and health care disparities. This is exacerbated in patients experiencing homelessness who are at greater risk for many health conditions. Although studies have been conducted that aim to assess and teach health literacy, there are limited studies concerning health literacy programs for homeless patients. This study seeks to engage medical students in community-based research projects and to use health information training to improve the health literacy of homeless patients, which will help combat the health or health care disparities faced by this group. Methods: A medical student in collaboration with faculty and librarians developed health literacy training workshops. We established a health information station with a computer, printer, and educational materials, as well as a website with frequently used health resources. We assessed the efficacy of our training using a pre and post questionnaire. Modules covering key aspects of the training were provided to participants for review after the workshop. Results: 23 homeless clients were surveyed in this study. 75% of clients showed an increase of health literacy scores between the pre and post training questionnaire. From the pre to post questionnaire, we saw an increase of 4.5% to 31.8% of clients indicating that the HOPE Resources Website was a main source of health information (p-value = 0.02). Similarly, clients indicating MedlinePlus as a main source of health information increased from 4.5% to 54.5% from the pre to post questionnaire (p-value = 0.0003). Conclusion: Health literacy training can significantly increase clients’ awareness of positive health information seeking behavior and reliable health resources. The results suggest implications for creating opportunities for medical students to engage in community-based projects and providing health information literacy education as a feasible intervention to increase health literacy of homeless patients and to help reduce health care disparities.

Ian Archbold
Peptide Based Sensor for the Detection of the Therapeutic Antibody Trastuzumab: An Investigation of the Peptide Self Assembly Processes on a Gold Electrode
Advisor: Xiangqun Zeng

Trastuzumab (Herceptin) is a recombinant DNA-derived humanized monoclonal antibody, that binds selectively to the extracellular domain of the human epidermal growth factor receptor 2 (HER2). HER2 is a ligand free tyrosine kinase, that is expressed in 20-25% of breast cancers. Immunosensors are important to improving the treatment outcome of patients treated with monoclonal antibodies, by providing a quantitative measure of a monoclonal antibody drugs ability to bind to the over expressed HER2 receptors, or the bodies resistance to treatment. A nineteen amino acid, peptide (CH-19) was used because of its ability to mimic the epitope region of HER2. The epitope was immobilized via a N-terminal cysteine, onto the gold electrode of a Quartz Crystal Microbalance (QCM), forming a self-assembled monolayer. The self-assembly process was monitored by observing the change in the oscillating frequency of the crystal with an Impedance Analyzer. Using a microfluidic system, CH-19 was added to the electrode surface, and its self-assembly process at the electrode surface was monitored at varying pH values: 5, 7, and 8. This study examines how the pH of the environment affects the packing density and structure of the peptide CH-19 self-assembled monolayer. The modified sensor was then tested in a pH 7 environment to monitor the effect immobilization at various pH conditions had on the self-assembly process of the peptide CH-19. This final experiment allowed for the quantification of the effect of varying the pH environment of the peptide CH-19 during immobilization, and how this impacts the sensitivity and selectivity of the Immunosensor.
Khashayar Arianpour
Opioid Prescribing Patterns among Otolaryngologists: Are We Contributing to the Opioid Epidemic?

Advisor: Adam Folbe & Peter Svider

Objectives/Hypothesis: There has been growing recognition of the role prescription drug misuse and diversion play in facilitating the ongoing opioid epidemic. Our objective was to evaluate opioid prescription patterns among practicing otolaryngologists. Methods: Medicare Part D beneficiary data from 2015 was accessed for a list of otolaryngologists. Opioid prescription rates, amount, and supply were calculated. Factors including board certification, experience, gender, and location were also obtained for the 9,068 unique otolaryngologists represented in this dataset. Results: In 2015, otolaryngologists wrote 133,779 opioid prescriptions for 922,806 days (6.9d/per prescription). The majority of prescriptions were for hydrocodone-acetaminophen (64.0%). Most otolaryngologists (51.2%) prescribed < 10 opioids; 6.1% offered > 50 opioid prescriptions. Men wrote more prescriptions on average. The opioid prescription rate was greatest in the Midwest (4.6%) and least in the Northeast (1.8%), with the highest/lowest state rates in Delaware (8.6%) and New York (1.3%). The greatest proportion of otolaryngologists writing > 50 prescriptions was among those with 11-20 years of experience. The opioid prescription rate declined with greater experience. Conclusion: Opioid prescriptions written by otolaryngologists may play a significant role in the availability of these agents, as otolaryngologists wrote nearly 1 million days worth of opioids to Medicare beneficiaries in 2015. Although the majority of otolaryngologists write fewer than 11 prescriptions annually, those writing more prescriptions also write lengthier courses. There is significant geographic variation in prescribing patterns, highlighting a lack of consensus, and mid-career otolaryngologists are more aggressive in offering opioids. These findings highlight an urgent need for strengthening educational resources aimed at minimizing unnecessary prescriptions.

Dana Basal

Coauthor: Jennifer Duggan
Advisor: Jacqueline Drouin

Purpose/Hypothesis: Basal Metabolic Rates (BMR) that are 15% lower than predicted values are associated with obesity. After breast cancer treatments, 59-96% of women experience significant weight gains that increase cancer reoccurrence risk. Although, BMR appears to remain stable before and after treatment, it has not been measured in extended survivorship or in relation to aerobic training. Therefore, this study determined whether measured BMR was significantly lower than predicted BMR and whether measures for an exercise group were higher than for a control group. Number of Subjects: 22 Materials/Methods: Participants were 3 months to 4 years post cancer treatment. Ten were randomly assigned to a 6 month moderate intensity aerobic exercise group and 12 to a non-exercise group. The BMR in kcal/kg/hr. was measured in the morning according to standard technique after an overnight fast and no exercise for the prior 24 hours. Subjects rested for 20 minutes in supine prior to the assessment and BMR was measured with open circuit spirometry using a metabolic cart. The Intraclass Correlation Coefficient assessed overall agreement between predicted and measured BMR and the independent samples t-test assessed differences between groups with probability of p<.05 Results: The measured BMR (0.67 +/- 0.11 kcal/kg/hr) was significantly lower (ICC=.11; p=.99) than the predicted BMR (0.82 +/- 0.03 kcal/kg/hr). Differences between exercise (0.69 ± 0.11 kcal/kg/hr) and non-exercise (0.640 +/- 0.10 kcal/kg/hr) BMR of 6.7% were not significant at p=.31. Conclusions: The BMR measures were significantly lower than predicted values and the 19.4% +/- 14.0% difference exceeded both the minimal detectable difference and the minimally clinically important difference (10-15%) associated with weight gain. Differences between groups related to aerobic exercise were not remarkable. Clinical Relevance: The BMR measures were remarkably lower than predicted values and these reductions may contribute to obesity post breast cancer treatments. Further study that obtains measures at seminal times during survivorship would better define the contribution of BMR to weight gain in this population. Adding resistance training to an exercise program may also provide increases in BMR to reduce weight gain in this population.
**Syeda Batool**  
**Quantitative µMRI T2 Imaging of Articular Cartilage at sub-10 µm Resolution**  
Advisor & Coauthor: Yang Xia  

**Introduction:** This work aims to study the degradation of articular cartilage in a rabbit model of osteoarthritis (OA). Since the humeral cartilage in rabbits is thin (~200-300 µm), any quantitative work to characterize the tissue demands high spatial resolution. Here we report the first sub-10 µm resolution quantitative T2 imaging study of rabbit cartilage.  

**Materials and Methods:** A shoulder joint was obtained from a 14 weeks old healthy, male rabbit. Three cartilage-bone plugs each ~2.5 mm thick were obtained from the central locations of lesser tubercle. Quantitative T2 imaging used a magnetization-prepared 2D spin-echo imaging sequence at slice thickness 1 mm.  

**Results:** The depth-dependent T2 profiles were obtained at 0° and 55° orientations. The thickness of cartilage was found to be ~242.5 µm. At the 0° orientation, the articular cartilage appeared bi-laminar and its T2 profile had an asymmetrical bell-shaped curve that resembles the appearance of a classical three zone structures in tissue. It has been found that three zone structures at central load-bearing location are common among some species. A more homogenous appearance of cartilage at the magic angle (55°) was also observed. Together, these quantitative T2 profiles reflect the organizational anisotropy of the collagen matrix in tissue.  

**Discussion:** It has been shown in our previous study that T2 increases in degraded cartilage, which could be used as a biomarker for early OA. Quantitative µMRI can be used to better understand tissue degradation and benefit clinical practice. Further multi-parametric experiments (T2, T1, and T1p) using healthy/diseased samples from different topographical sites is ongoing.  

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**Sarah Berry**  
**Implementation of TeamSTEPPS Communication Methods: to Improve Patient Outcomes in the Emergency Center**  
Advisor: Colleen Meade-Ripper  

The purpose of this study is to determine if utilizing TeamSTEPPS standardized communication methods among registered nurses (RN) and other medical professionals influences patient outcomes in the Emergency Center (EC) setting. The research design was a pre-test, post-test comparison of patient outcomes and staff satisfaction data as it relates to the implementation of TeamSTEPPS communication methods. Implementation of TeamSTEPPS was done using multiple four-hour educational sessions which staff were required to attend. The specific patient outcomes of EC arrival to intervention (CT of the head, CT of the abdomen, CT of the chest, and intubation), EC arrival to disposition, and EC mortality were analyzed via chart review of Level 1 and 2 trauma patients (n=100). Staff satisfaction with the TeamSTEPPS communication methods was measured by comparing survey results from pre-and post- implementation. Using a paired t-test, EC arrival to intervention time was found to be statistically significant (p<0.0001). Time from EC arrival to disposition from EC was found not to be statistically significant (p<0.4601). EC mortality was not able to be used as an outcome for this study because there were no deaths in the study population pre- or post-intervention. For staff outcomes, there was a positive change (p= 0.05) in the surveys that demonstrates an increased knowledge of the importance of communication to patient care. In conclusion, this study supports TeamSTEPPS communication methods as a plausible way to positively affect patient outcomes in the EC. The study also supports the TeamSTEPPS framework as a useful tool in improving the knowledge of staff related to the importance of communication to patient care.
Andrea Bittinger  
**Relationship Between Emotional Intelligence and Occupational Stress Levels Among Certified Registered Nurse Anesthetists**  
Advisor: Karen Dunn

Certified Registered Nurse Anesthetists (CRNAs) are exposed to a wide range of stressors (eg., patient care-related, workload, operating room environment, and interactions with operating room personnel) and therefore experience high levels of occupational stress and job burn-out. Within healthcare systems, burnout from job-related stress can ultimately have harmful effects on patients and patient safety. Having higher levels of Emotional Intelligence (EI) may be a key coping mechanism in CRNAs to decrease and/or ameliorate occupational stress. Within the nursing literature, nurses who showed higher levels of EI had significantly more positive outcomes that included improved quality of care, increased patient safety, lower work-related stress, and less job burnout than nurses who showed lower levels of EI. Thus, the purpose of this cross-sectional descriptive study is to determine if a statistically significant relationship exists between levels of EI and stress levels among CRNAs. Other factors (age, gender, practice setting, and years of experience) were also explored. A convenience sample of 295 CRNAs who were current members and had an active email address with a Midwestern Association of Nurse Anesthetists list-service completed the survey. A significant relationship was found between the levels of EI and levels of stress ($r = -0.20, p = .01$), CRNAs who reported higher levels of EI reported less work place stress than those CRNAs who reported lower levels of EI. Women CRNAs were also found to have higher EI levels than CRNA men ($r = 0.22, p = .01$). Results from this study support other research findings that have suggested individuals who have higher levels of EI are more able to cope with the stressors of daily living and occupational stressors. Therefore, developing and implementing strategies to increase EI among CRNAs may be key to decreasing work-related stress and burnout.

Berkley Browne  
**Medical Students’ Experiences of Well-being Within a Longitudinal Well-being Course**

Stress among medical students has been a focus of medical education research for some time, and over the last few decades, much of this research has broadened from studying stress in particular to examining overall student well-being, including the role that depression, anxiety, stress, and burnout play in overall success and satisfaction during medical school and in residency. At Oakland University William Beaumont School of Medicine (OUWB), a primary method of delivering educational well-being programming is through a required four-year long course called PRISM (Promoting Reflection and Individual growth through Support and Mentoring). The mandatory nature of personal well-being education at OUWB led to the following research question: what are medical students’ experiences of well-being within the context of participating in a required well-being course? This qualitative study used interpretive description to examine first how students used their experiences in the course to construct their knowledge of well-being then whether the PRISM course allows students to construct the knowledge necessary for embracing lifestyles of well-being as they progress through medical school. Documents containing de-identified narrative feedback from 175 students in two cohorts were analyzed using NVivo software along with an independent coding process for validation. Findings suggest that, overall, OUWB students gain deeper understanding of and appreciation for their personal well-being through the PRISM course. Findings also reveal four dominant themes students identified as influential in constructing their understandings of well-being: relevance of course content, the role of mentors and small group interactions, successfully navigating medical school transitions, and opportunities to pause and reflect. Giving students regularly scheduled opportunities to process what they experience as physicians-in-training with the support of a physician mentor and small group discussions provides avenues through which medical students can engage with well-being in a multidimensional way.
Julia Czarnecki  
**Derivation of Cardiac Stem Cells from Human Pluripotent Stem Cells**  
Coauthor: Cody Howe  
Advisor: Luis Villa-Diaz

Cardiovascular disease continues to be the leading cause of death worldwide. In the United States alone, more than 1 in 3 adults suffer from cardiovascular disease. It is imperative to advance the treatment of this disease and find preventative measures to battle its effect. Stem cell technology has shown promising effects on regenerative medicine, but more specifically, regeneration of the heart. Human induced-pluripotent stem cells have the capacity to be derived into cardiomyocytes, along with smooth muscle and endothelial cells, all of which are required for effective regeneration of the heart. These three cell populations have their origin in cardiac stem cells, which remains to be differentiated from pluripotent stem cells. Therefore, we aim to identify and isolate cardiac stem cells during the cardiac differentiation process of induced pluripotent stem cells, using the transmembrane protein integrin α6 and the transcription factor Isl-1 as positive biomarkers to identify cardiac stem cells. We have successfully differentiated induced pluripotent stem cells into a) spontaneous, contracting cardiomyocytes showing positive expression of both MYL2/MYL7, markers of mature cardiomyocytes, b) endothelial cells with expression of PECAM-1; and smooth muscle expressing smoothelin. During this process of differentiation, cells co-expressing integrin α6 and Isl-1 have been identified, suggesting a possible identity of a cardiac stem cell population. In future experiments, we will confirm the identity of the stem cell nature of these cells by testing their self-renewal and expansion potential. We will further investigate the role of integrin α6 in cardiac stem cell formation by performing gene knockout using the CRISPR/Cas9 system. The isolation of cardiac stem cells from induced pluripotent stem cells will allow patients to have an unlimited supply of cells to regenerate their damaged heart from their own cells.

Daniel Czarnowski  
**Role of Syndecans and α6β1 Integrin in Maintaining Human Embryonic Stem Cell Pluripotency**  
Advisor: Luis Villa-Diaz

Syndecans (SDCs) are a family of four transmembrane proteins (SDC1, SDC2, SDC3, and SDC4), that have many functions in vertebrates. Prior research has shown their roles in cell-to-cell adhesion, tumor growth regulation, and interaction with growth factors, but their potential roles in maintenance of pluripotent stem cells (PSC) has not been explored. We seek to shed light on possible mechanisms syndecans may use to maintain PSC undifferentiation. We first characterized syndecan expression in PSCs before and after differentiation. Differences in relative mRNA expression of the four syndecans were explored between colonies of undifferentiated human embryonic stem cells (hESCs) and differentiated hESC colonies. Additionally, immunolocalization was performed on undifferentiated hESCs and compared to differentiated hESCs. To investigate how syndecans are potentially involved in PSC maintenance and self-renewal, we will investigate relationships between syndecans and other proteins that play key roles in stem cell maintenance. Next, we will investigate syndecan interactions with integrin α6 and its heterodimer partner integrin β1, due to the cardinal role of integrin α6β1 in PSC maintenance. To explore the role of syndecans, a CRISPR/cas9 knockout of each syndecan will be used to explore the effects on self-renewal of PSCs and downstream signaling pathways of integrin α6, such as Focal Adhesion Kinase (FAK). Should a decrease in syndecan expression interfere with integrin α6 expression or signaling, FAK could potentially become phosphorylated, driving the hESC differentiation process forward. Our data has shown increases in syndecan expression among cells when cultured in retinoic acid media, which induces hESCs into neuroectodermal cells; while an increase in SDC2 and SDC4, yet a decrease in SDC1 expression when cultured in a generalized differentiation media supplemented with 20% fetal bovine serum. These preliminary results suggest that changes in syndecan expression after differentiation are indicative of a role in stem cell maintenance.
Lauren Foster
A Case Report: Primary Sarcoma of the Breast Associated with Secretion of Beta-Human Chorionic Gonadotropin
Advisor: Rohan Deraniyagala

Introduction: Primary sarcomas of the breast are rare tumors that arise from the connective tissue within the breast. Due to their rarity there is a lack of clinical trials to provide therapy recommendations and therefore treatment is based on case reports and case reviews. Within this case report we discuss a patient who presented with a left sided breast mass that was diagnosed as a primary sarcoma of the breast associated with β-HCG production. This is the first documented case of a primary breast sarcoma secreting β-HCG. Methods: Immunohistochemistry was performed using an automatic immunostainer. β-HCG antibodies were used to determine tumor-specific production of β-HCG. Results: Immunohistochemical studies showed a diffuse pattern of β-HCG expression within the spindle cells of the sarcoma. Conclusion: Heterodimeric placental HCG provides a protective effect on the mammary gland and mimicking pregnancy might be a strategy for breast cancer prevention. Additionally, targeting tumor expressed β-HCG has been demonstrated to be a promising approach to breast cancer therapy. Specifically, monoclonal antibodies directed against β-HCG and conjugated to cytotoxic drugs or immunotoxins. Given the role that β-HCG plays in breast cancer we hypothesize that this finding may provide clinical benefit by using the β-HCG expression as a means of cancer detection, prognosis, and immunologic targeted therapy in a tumor type that has a limited response to traditional treatment modalities.

Katie Hege
Target Drug Reaction Variation Between the Commercial Renal Cell Carcinoma Line, Caki-2, and Primary Kidney Tumor Tissue
Coauthors: Kaitlin Budd & Zachary Walker
Advisor: Amy Banes-Berceli

The main challenge of RCC diagnosis is that most symptoms of kidney cancer only appear after it has advanced to metastasis, the most common subtype being clear cell renal carcinoma (ccRCC). At this point, the cancer may have already gained resistance to current treatments, possibly with aid by the upregulated JAK/STAT pathway. As an additional challenge, chemotherapy outlook predictions are unreliable, as the commonly prescribed, sunitinib for RCC patients has shown a high ratio of resistance. Even in vitro analysis of the commercial ccRCC cell line, Caki-2, shows resistance and even viability increases to sunitinib, before reaching its EC50 value of 16.5 µM. However, drug resistance is not as extreme towards the JAK/STAT inhibitors, zerumbone, ruxolitinib, and AG490. Viability of the Caki-2 cell line does not increase with these treatments before reaching their EC50 values. Combined treatment of sunitinib and either JAK/SAT inhibitor decreases resistance to sunitinib. However, a commercial RCC cell line can not be an ideal representation of the in vivo RCC tumor physiology. The ability of these target drugs can vary from patient to patient depending on the grade and stage of metastasis. In vitro tissue culture revealed that zerumbone was more effective towards inhibiting JAK phosphorylation in one patients lower grade kidney tumor tissue but not for another, who had more advanced and possibly metastasized. This includes treatments of both single and combined with sunitinib. This analysis is continued with other known JAK inhibitors including ruxolitinib and AG490. Direct in vitro analysis of target drug efficacy towards cancer cell pathways in the kidney tumor that has been surgically removed is essential to the development of the most effective personalized treatments.
Timothy Hewitt
Exploring Racial Differences Surrounding Prostate Cancer Screening: Beliefs and Attitudes in Community Dwelling Men Attending an Urban Men’s Health Event
Advisors: Michael Lutz & Kim Killinger

Objective: To explore attitudes/beliefs in men attending an urban health fair to explore barriers to prostate cancer (PCa) screening. Methods: Men attending the fair in 2014 or 2015 completed questionnaires about health issues including PCa. Data were examined using Pearson’s Chi-square, Fisher’s Exact, and Wilcoxon rank tests after grouping men by black race (BR) and non-black race (non-BR). Results: Of 1334 men, 792 visited the PCa screening booth, and 544 provided race and questionnaire data. 326 (60%) were BR and 218 (40%) were non-BR (89% Caucasian). Median age (54 vs. 56 yrs.) and prior PCa screening were similar between BR and non-BR; income (p=0.044) and education (p=0.0002) differed. BR men were less likely to have researched PSA on the internet (p=0.003), but more used TV (p=0.003) and media (p=0.0014) as information sources. Family members had a stronger influence over screening decisions for BR men (p=0.005). After reading PSA information, BR were more likely to still be confused (p=0.008). A higher proportion of BR men felt that treatment helped men live longer (p=0.035), were less worried about dying from PCa (p=0.0006), and would want treatment immediately instead of watchful waiting (p<0.0001). Interestingly, a higher proportion of BR men indicated that they would prefer not to know if they had PCa (p=0.001). Ultimately, more BR men had a PSA done (98.4% vs. 95.1%; p=0.031). Conclusions: Black men’s beliefs surrounding PCa differ from non-Black men, and should be considered when developing culturally appropriate education, screening, and treatment strategies for this high risk group.

Modar Horani
Using V2X Communication to Improve Lane Line and Road Boundary Detection in Adverse Weather Conditions
Advisor: Osamah Rawashdeh

Lane line and road boundary detection are very critical elements for both Advanced Driver Assistance Systems and Autonomous Driving features. Although, there has been significant amount of research dedicated to the detection and localization of lane lines and road boundaries in the past decade, there is still a gap in the robustness of the implemented systems. A major challenge to the existing lane line and road boundary detection algorithms stems from coping with bad weather conditions (e.g. rain, snow, fog, haze, etc.). Snow offers an especially challenging environment, where lane marks and road boundaries are completely covered by snow. In these scenarios, on-board sensors such as cameras, LIDAR, and radars are of very limited benefit. In this research, the focus is on solving the problem of improving robustness of lane lines and road boundary detection in adverse weather conditions, especially snow. A method is proposed that relies on using V2X communication to access reference images stored in the cloud. These reference images were captured at the same geographical location when visibility was clear and weather condition was good (day time, clear weather). The reference images are used to detect and localize both lane lines and road boundary. This information is then used to superimpose virtual lane lines and road boundary to the local map built by the ADAS or Autonomous driving system. An experiment is designed to offer initial evaluation of improvements. The experiment uses a vehicle equipped with a monocular camera, forward looking radar, and a GPS/IMU. The results show good potential for improving upon current state-of-the art approaches used in today’s automotive industry.
Simi Jandu
Therapeutic hypothermia Effects on Patient’s Electrocardiogram
Coauthor: Nana Sefa
Advisor: Robert Swor

Introduction: Therapeutic hypothermia (TH) is the standard therapy in comatose patients with an out-of-hospital cardiac arrest and return of spontaneous circulation (ROSC) due to its ability to reduce neurological damage and improve outcomes. However, TH may prolong QT and QTc intervals, which is linked with life-threatening arrhythmias. There are currently a limited number of large studies showing the association of prolonged QT interval with TH and its correlation with cardiac dysrhythmias. Thus, this project aims to describe the frequency of ECG interval changes and clinically relevant dysrhythmias in TH patients. Methods: This is a retrospective observational study from January 2009 to December 2015. Patients who qualified for the study, i.e. had a non-traumatic cardiac arrest with a return of spontaneous circulation, received TH, 33.5°C for 24 hours. ECG interval changes and dysrhythmias were recorded immediately after ROSC, at 33.5°C, and after rewarming. Results: A total of 322 patients (age 61.0 ± 16.9 years) initiated TH during the study period, of which 13 died prior to or during treatment and 170 had complete data. There were statistically significant decreases in heart rate during TH (96.1 ± 25.8/min before TH; 69.5 ± 19.1/min during TH, p<0.005); QRS duration (115.7 ± 32.0 ms before TH; 108.1 ± 27.9 ms during TH, p<0.005); and QTc (488.0 ± 51.9 ms before TH; 527.8 ± 61.0 ms during TH, p<0.005). Compared to before treatment, there was no recorded development of VT/VF in patients, and 3 developed atrial fibrillation, 1 atrial flutter, and 6 AV nodal rhythms. Conclusion: There was a statistically significant decrease in heart rate and QRS with a significant increase in QTc interval during TH that resolved with rewarming. Despite the prolongation, few patient developed dysrhythmias, none of which were clinically significant cardiac dysrhythmias.

Jeena Kinney
Sth1 Bromodomain Affects Genome-wide Chromatin Structure and Transcription
Coauthors: Sudha Ananthak & Christian Rizza
Advisor: Chhabi Govind

Eukaryotic DNA is wrapped around a histone octamer to form the fundamental unit of chromatin, called a nucleosome. Nucleosomes pose a significant impediment to DNA-dependent processes, including gene transcription. The nucleosome-imposed barrier is alleviated, in vivo, by the activities of histone modifiers, chaperones and chromatin remodelers. Remodels Structure of Chromatin (RSC) is one such chromatin remodeling complex in the budding yeast Saccharomyces cerevisiae. Many RSC subunits are essential for cell viability. RSC harbors nearly half of the total bromodomains found in yeast. RSC subunits Rsc1, Rsc2 and Rsc4 have two bromodomains (acetyl-lysine recognition domains) each, and one bromodomain is present in the catalytic subunit, Sth1. Bromodomains are suggested to promote recruitment of such complexes to chromatin by recognizing acetylated histones. In this study, we examined the role of the Sth1 bromodomain in regulating chromatin structure and transcription. Towards this end, we deleted the bromodomain of Sth1 (sth1ΔBD), and examined changes in chromatin structure, transcription and RSC occupancy genome-wide. Examining RSC occupancy genome-wide by ChIP-chip revealed that many promoters and coding regions were depleted of RSC in the strain lacking the Sth1 bromodomain. These data suggested that bromodomain present in the Sth1 is important for recruiting RSC to a subset of genes. RSC modulates chromatin structure by assisting in generating a nucleosome depleted region (NDR) near the transcription start sites (TSSs). MNase-seq data was generated to analyze nucleosome position and NDRs. As expected, very defined NDRs were observed in the WT cells. In contrast, the NDRs were smaller in the mutant. Finally, genome-wide RNA polymerase ChIP-seq experiments showed that the changes in NDR/nucleosome positioning were also accompanied by reduction in transcriptional activity, suggesting that transcription initiation and elongation were compromised in the mutant. Collectively, our results suggest that Sth1 bromodomain not only helps in recruiting RSC, but also regulates catalytic function.
Justin Kulchycki

A 5.8 Kilobase Chromosome 11 Genomic Locus is a Molecular Switch for Cell Type-Specific B4galnt2 Expression in Mice

Advisors: Randal Westrick & Amy E. Siebert

Type 1 von Willebrand disease (VWD) is the most common inherited bleeding disorder in humans. VWD is characterized by a quantitative reduction of plasma von Willebrand factor (VWF) to 10-45% its normal circulating levels. VWF is an adhesive multimeric glycoprotein that functions during platelet plug formation in the process of hemostasis. The VWD phenotype is present in the wild-derived LEWES/EiJ mouse strain, but absent in the laboratory-derived C57BL/6J (B6) strain. The VWD phenotype in LEWES/EiJ is due to a 30 kilobase (kb) modifier locus (Mvwf1) upstream of the glycosyltransferase B4galnt2 gene on chromosome 11. When expressed in the vascular endothelium, B4galnt2 modifies VWF with a GalNAc residue, which results in its rapid clearance from circulation (resulting in VWD). We performed chromosome walking and RNA analysis to refine the Mvwf1 locus and determine its mechanistic role in VWD. Comparative bioinformatic analysis of the polymorphisms between B6 and LEWES/EiJ followed by chromosome walking enabled us to narrow the 30 kb Mvwf1 locus to a 5.8 kb region. Analysis of B4galnt2 mRNA expression determined by both RT-PCR and RTq-PCR revealed tissue-specific alterations between B6 and LEWES/EiJ intestinal epithelium and vascular endothelium. These results suggest that the refined 5.8 kb locus contains an element responsible for the observed B4galnt2 tissue-specific expression pattern in mice. In future studies we will perform CRISPR/Cas9 genome editing to determine the precise polymorphisms responsible for the cell type-specific molecular switch.

Thomas LaRouere

Incidence and Etiology of Extreme Thrombocytopenia in a Neonatal Population

Advisor: Brian Berman

Introduction: Thrombocytopenia is a common incidental laboratory finding in neonates. Although usually moderate and self-limited, if severe, it can result in bleeding complications that can have short and long-term consequences, including death. There is little existing data that defines etiologies for extreme thrombocytopenia (platelet count <30,000/μL) in this population. In this study, we seek to define the incidence and etiologies of extreme thrombocytopenia in a neonatal population at Beaumont Health. Methods: Using the electronic medical records system, we conducted a retrospective chart review to identify newborns born between 1/1/2008–12/31/2016 who were <28 days of age and had at least one documented platelet count <30,000/μL. The incidence and etiology of extreme thrombocytopenia were then determined. Other patient risk factors, including gender, race, birth weight, and gestational age, were analyzed against each etiology using fifth logistic regression to determine odds ratio (OR) and p-values. A p-value <0.05 indicates statistical significance. Results: Over the 9 year period, there were approximately 87,500 live births. Fifty-five neonates met our inclusion criteria, giving an incidence of extreme thrombocytopenia of approximately 63 cases/100,000 live births. We identified 16 different etiologies. Neonatal alloimmune thrombocytopenia was the most common (24%), followed by sepsis/infection (16%) and necrotizing enterocolitis (11%). African American neonates were more likely to have sepsis/infection (OR: 7.62; p-value=0.0098). Preterm neonates (gestational age at birth <34 weeks) were more likely to have necrotizing enterocolitis (OR: 43.5; p-value=0.0135) and sepsis/infection (OR: 5.73; p-value=0.0215). Late pre-term neonates (gestational age at birth 34 – 36 6/7 weeks) were more likely to have trisomy 21–myeloproliferative disorder (OR: 22.7; p-value=0.0468). Conclusion: We have created a profile of neonates at risk of developing extreme thrombocytopenia. This information should help clinicians in the early identification and care of these patients."
Han Lin

Effects of Intermediates from Ignition Chemistry on Laminar Flame Propagation
Advisor: Peng Zhao

Engine knock has been a widely-known issue in automobile industry, which could impose severe damage to the engine components. It is recognized that engine knock is frequently caused by the auto-ignition of end-gas before the arrival of the spark initiated flame. The goal of this study is to identify the thermal and chemical effects of fuel/air ignition progress on the flame propagation during the combustion process. Iso-octane, n-heptane and dimethyl-ether (DME) as typical fuels exhibiting the negative-temperature coefficient (NTC) were selected for study. The computation of laminar flame speed of stoichiometric mixture of fuel/air at different ignition progress was performed, by selecting the thermal chemical state corresponding to different residence time during auto-ignition as the inlet condition of the flame. The result under for both constant pressure and constant volume conditions shows that the flame speed of the mixture with low temperature chemistry products increases earlier and its flame speed is higher than that of the stoichiometric mixture until the end of first-stage ignition under the same thermodynamic condition, whereas, the flame speed of the initial stoichiometric mixture at the selected thermal state becomes higher than that of the mixture with low temperature reforming for all the selected fuel. The identification of the effect of the chemical products on the flame speed contributes to future research of promoting the flame propagation in the engine cylinder to eliminate knock.

Brandon Nguyen

Perioperative Analgesia for Patients Undergoing Endoscopic Sinus Surgery: An Evidence-Based Review
Coauthor: Brian Yuhan
Advisors: Adam Folbe & Peter Svider

Objectives: Misuse and diversion of prescription opioids have been critical in facilitating the opioid epidemic. Our objective was to perform a systematic evidence-based review delineating perioperative regimens (including opioid alternatives) evaluated for endoscopic sinus surgery. Methods: PubMed/MEDLINE, Cochrane Library, and EmBase databases were evaluated for studies detailing analgesics employed after endoscopic sinus. Studies were assessed for level of evidence. Bias risk was evaluated using the Cochrane Bias tool and GRADE criteria. Medication, administration, adverse effects, pain scores, and rescue analgesic consumption were evaluated. A summary of evidence detailing benefits, harm, and cost was prepared. Results: Thirty-two studies encompassing 1812 patients were included. The GRADE criteria determined the overall evidence to be of moderate quality. Perioperative acetaminophen had few adverse events and reduced immediate need for opioid rescue after sinus surgery; studies evaluating acetaminophen demonstrate a preponderance of benefit over harm. NSAIDs also reduce post-operative opioid consumption, although a small portion of patients undergoing sinus surgery harbors the potential for NSAID intolerance. The aggregate level of evidence for studies evaluating NSAIDs was A, while the aggregate grade of evidence for several other agents was B. Conclusion: There is evidence supporting the use of NSAIDs and Gabapentin for the control of pain following sinus surgery (Summary of Evidence). Acetaminophen, alpha-agonists, and local anesthetics are also viable options for post-operative analgesia. Familiarity with these data is essential to facilitate the use of opioid alternatives. Further large-scale multi-institutional randomized trials are needed in order to provide conclusive recommendations for these perioperative analgesics."

Eric Pai

Effect of a Deep Vein Thrombosis Management Protocol on Admissions at Beaumont Hospital – Troy
Advisor: Monika Gugneja

Background: Each year there are approximately 1 million cases of deep vein thrombosis (DVT) and upwards of 500,000-700,000 hospital admissions in the United States. Patients seen in the emergency department (ED) have traditionally been admitted to the hospital and started on bridging anticoagulation therapy. However, with the emergence of oral anticoagulants, there has been growing evidence that selected low risk patients can be
safely managed as outpatients. The primary goal of this study is to develop a protocol for optimal treatment of patients with newly diagnosed lower extremity DVT and assess the potential impact on reducing hospital admissions. **Methods:** A protocol was developed primarily guided by 2016 guidelines from the American College of Chest Physicians (CHEST). This was applied to a comprehensive chart review on 286 patients who were seen at Beaumont Hospital Troy in 2015 with a DVT diagnosis: those admitted as an inpatient (IP), an outpatient (OP), and discharged from the ED (DC). Patients’ charts were analyzed according to their medical symptoms, past medical history/co-morbidities, and clinical risk factors. The data collected was run through the protocol as a simulation of the possible outcomes had the protocol been in place. **Results:** Upon simulation through our protocol, we found that 13% of IP admissions and 52% of OP admissions would have been discharged, and 18% of those discharged from the ED (DC), would in turn have been admitted. **Conclusion:** The results support the hypothesis that the creation of this type of protocol would reduce the number of unnecessary admissions for DVT. It also highlights the importance of further investigation into patients who were discharged from the ED for DVT, as to not miss situations in which admission might be preferred.

**Tyler Parsons**

**Defining How Radiation Delivery Alters the Tumor Microenvironment to Favor Myeloid Development and Tumor Regrowth**

Advisors: Gerard Madlambayan & George Wilson

The normal tumor microenvironment (TME), comprised of tumor tissue, stromal cells, and extra cellular matrix (ECM), rarely remains static responding to both internal and external stimuli. These interactions not only promote tumor growth and survival, but also regrowth after radiation therapy. This analysis provides novel insights into TME modifications in Lewis Lung Carcinoma, an established murine model of Non-small Cell Lung Cancer, following an array of clinically relevant radiation treatment. We conducted an analysis of variances in bio-marker and DNA expression associated with differentiation of hematopoietic stem cells (HSCs) from the murine model from four radiation dosage cohorts: 2x15 Gray (Gy), standard clinical radiation treatment, a novel pulsed radiation treatment, and no radiation treatment. Additionally, each was treated with and without Plerixafor, which blocks HSC recruitment. Our interest includes defining a pre and post treatment TME model describing the biochemical mechanisms, genetic variables, and stimulating factors which promote tumor regrowth. We show that integrin α6β1/4, an extracellular HSC protein, increases with radiation dosage strength suggesting their presence on recruited HSCs. In addition, a radiation induced decrease of laminin 3-3-5, the laminin conformation on the tumor ECM required for integrin α6β1/4 stem cell maintenance. Once the capability of stem cell maintenance is lost, HSCs are highly susceptible to stimulating factors within the TME which we show to have been significantly altered to stimulate myeloid differentiation into tumor promoting M2 macrophages. Our data demonstrates that 2x15 Gy and standard treatment induces a TME response to favor stem cell differentiation into M2 macrophages compared to pulsed treatment and no treatment. Our data also suggests that pulsed radiation in conjunction with Plerixafor creates a TME which is less favorable for myeloid development and one that is void of recruited HSCs which may lead to long-term treatment benefits in patients.

**Deirdre Pitts**

**The Academic Search: Unconscious Bias and its Impact on the Recruitment and Evaluation of Faculty Candidates**

Advisors: Thandi Sule

In this study, I examined the academic search process and the role that unconscious bias plays in the evaluation and recruitment of faculty candidates. The academic search process and participants’ beliefs, values, and attitudes regarding how they evaluated faculty candidates and made decisions regarding shortlist placement were examined. I used a descriptive exploratory design employing a mixed method methodology. Data were collected from an online survey extended to 3,978 participants. The survey was administered to sociologists across the United States who had served on an academic search committee. I examined the attributes that were important to search committee members when evaluating or ranking candidates for shortlist placement, investigated search committee members’ awareness of their propensity to express subtle bias behavior against
African American faculty candidates, and analyzed responses to open-ended questions that were designed to examine personal search committee experiences. Social identity theory (SIT) and critical race theory (CRT) provided the theoretical frameworks for investigating the following primary research question: What influence, if any, does unconscious bias have on the evaluation of applicant suitability for shortlist placement? The findings revealed that non-White faculty placed less importance on all of the attributes identified in the study in comparison to their White faculty colleagues. The data obtained indicated that race and ethnicity impacts bias against African American faculty candidates, bias mitigation, and the level for which participants seek out candidates with characteristics similar to their own. Findings also revealed differences by academic characteristics such as tenure status, academic rank, institution type, and the number of search committees served. Six major themes became evident and were derived from written responses to open-ended questions: (a) Paradoxical Experiences of Sociology Faculty, (b) Personal Bias Absolutely Influences Decisions, (c) Personal Mitigation Strategies and Coping Mechanisms, (d) To Call or Not to Call Out, (e) Trial by Fire, and (f) Fix It Talk.

Yang Qi

Open Source CFD for Reacting Flow Simulation: Bridging OpenFOAM and Cantera
Advisor: Peng Zhao

Chemically reacting flows involving the complex interaction of chemical kinetics and fluid flow science impact many aspects of human life and play a dominant role in combustion, power generation and energy conversion. With enhanced computation power, the computational fluid dynamics (CFD) method has become a major tool in understanding and predicting the behavior of reacting flows in a direct and reliable manner. In this work, an integrated open source CFD platform for chemically reacting flow is constructed by joining two mature open source packages written in C++, namely, OpenFOAM and Cantera. The main advantages of C++ toolbox OpenFOAM include its object orientated framework for specific problem and free availability, however, weaknesses have been found for its incomplete transport models including the mostly commonly used mixture-averaged and multicomponent models for diffusivity. The inconvenient lexer for chemical mechanism and unstable chemical ODE solvers also constrain its application in reacting flow simulations. To compensate these shortcomings and achieve simultaneous robustness and accuracy, another well-developed open source C++ toolbox Cantera specialized in chemical kinetics and transport properties is utilized. A couple of new variable fields like mixture averaged/multi-component diffusion coefficients, thermal diffusion coefficients and chemical source terms are calculated in Cantera and input into modified models of OpenFOAM through the interface. The effectiveness and robustness of the interface has been carefully validated from ignition delay and flame speed calculations, and the new platform is further tested by performing multidimensional reacting flow simulations.

Ke Qu

A Redox Conjugated Polymer-based All Plastic Reference Electrode
Advisor: Xiangqun Zeng

The combination of the common redox label quinone and the versatile pai-conjugated polyaniline has been accomplished to give a novel redox conjugated polyaniline, with the redox label as pendant group decorated along the pai-conjugated chain covalently. The union of the two electro-active categories starts with the chemical synthesis of the para-dimethoxybenzene-functionalized aniline as the monomer in an efficient manner with the help of the palladium-mediated coupling chemistry. The successful polymerization of the as-prepared monomer has been achieved in the organic solvent system without the acid additives. Its post-modification with the strong Lewis acid boron tribromide furnishes the unique redox conjugated polyaniline with improved quality. It has been found that the electrochemical and optical responses from the polyaniline backbone in this unique polymer have been “shielded” or “suppressed” by the pendant quinone. The control experiments with poly (3-ethynylaniline) provide some further supporting insights. The resulting unique poly (aniline quinone) showed a quasi-reversible redox process from the redox behavior of the pendant quinone. The electrochemical stability of this quinone-decorated polyaniline is excellent, with 95% peak current retention after the continuous cyclic
voltammetric testing. Its simple and unique redox property was excellent as a reference electrode in aqueous and non-aqueous media, being useful in both non-zero current and zero-current techniques and providing the stable potential with a maximum potential drift of ~4.7 mV over ten consecutive days and being better than the reported reference electrodes.

Rachel Roberts
Food Insecurity and Poverty in Cayo, Belize: Perspectives from One Women’s Group
Advisor: Laurel Dolin Stevenson

Introduction: Belize experiences high poverty rates and high prevalence of malnutrition and food insecurity, which are linked to disease and premature death. A study was conducted to address the community’s needs by exploring food insecurity and poverty in Cayo, Belize. Within this study, a women’s group was surveyed to gain female perspective on food insecurity and barriers that impact a healthy well-being. Methods: The cross-sectional, community-based survey was a modified version of the United States Department of Agriculture Food Security Module. Eighteen women completed a self-administered, paper-based survey with open- and closed-ended items. Descriptive statistics and qualitative data were coded for themes. Results: Women reported a mean age of 36 and identified as Mestizo (75%) or Kriol (25%). Nearly 59% were married or common law and 41% were single. Over 94% had one or more children. Women reported completing high school (31%), primary school (25%), or post-secondary (19%). The median annual household income was $2,550 USD. One-third of women reported missing a meal in the last week. Nearly 61% of women believe buying foods with their salary is difficult. On average, each participant consumed less than ½ cup of fruits and vegetables per day. Women suggested that lack of employment opportunities, low wages, high costs of healthy foods, high cost of living, and market accessibility were barriers that made obtaining healthy foods difficult in Cayo. Members of the women’s group also suggested that increased wages, reduction in food prices, taxes, and cost of living, and increased employment and education opportunities would improve well-being. Conclusion: These findings provide an understanding of how poverty rates, food insecurity, and health-related outcomes can be addressed in Cayo. The research can raise awareness and initiate additional research to support policy change and mechanisms to improve health in Belize.

Gukan Sakthivel
Predicting Post-Stereotactic Body Radiation Therapy Pulmonary Function in High Pulmonary Risk Lung Cancer Patients
Advisor: Thomas Guerrero

Introduction: Lung cancer is the leading cause of death in the United States. Stereotactic body radiation therapy (SBRT) in the Radiation therapy Oncology Group 0236(RTOG 0236) trial, achieved a 3-year survival of 90.6% for stage 1 lung cancer in surgically inoperable patients compared with 40% for conventional radiation therapy. However, RTOG 0236 also noted 14.5% of patients experienced grade 3 or 4 respiratory toxicity. Unlike pulmonary risk assessment used for thoracic surgery, there is no method to assess lung function post-SBRT. The current research hopes to fill the void and provide radiation oncologists with tools to assess lung toxicity post SBRT treatment. Methods: Pre-treatment inhale and exhale of 4D-CT scans were segmented to identify the lung parenchyma. Deformable image registration was applied to map each inhale voxel to the corresponding exhale phase voxel. Following which a 4D spatial map of ventilation was calculated using a, density change based approach dosage was then superimposed on ventilation to visualize area of treatment. To determine the effect of radiation therapy, the dosage plan on ventilation was multiplied. This allows the evaluation of post-SBRT lung function. After which correlation between predicted SBRT forced expiatory volume in 1 second (FEV1) from our mathematical model and those obtained from spirometry, was tested using Pearson correlation coefficient. Results: Correlation form Pearson correlation between FEV1 obtained from our model and spirometry is 0.99. The empirically derived lambda value utilized to predict post – SBRT in our lung function model is λ = 4.30x10⁻³ with a standard error of mean of 0.004. Conclusion: The correlation from our current data set is 0.99. This suggests that utilization of our model can predict post SBRT toxicity with high degree of accuracy in surgically inoperable patients undergoing SBRT.
Tejas Shah  
**Cardiovascular and Internal Environmental Parameters of a Lower Body Negative Pressure Device during Stimulated Hypovolemic Conditions**  
Coauthor: Shane Zeshonsk  
Advisors: Lonnie Grove Peterson & Alan Hargens

**Background:** Lower Body Negative Pressure (LBNP) devices are used to stimulate hypovolemic conditions by translocating blood from the upper to lower body. However, traditional LBNP devices are cumbersome, require large degree of subject cooperation to climb into the device, and are too uncomfortable for long-term application. A collapsible, easily deployable, and comfortable LBNP-device was developed and patented at the University of California, San Diego (UCSD).  

**Aim and methods:** The aim of this study was to evaluate the UCSD-patented LBNP device in terms of cardiovascular responses and stability of internal environment during use. Six healthy volunteers were tested. Temperature and humidity (hygrometer) inside the device along with cardiovascular variables (Nexfin monitor) were recorded during 20 mmHg LBNP to stimulate hypovolemic conditions.  

**Results:** One-way analysis of variance (ANOVA) for three time points of overlapping data (30° HUT baseline, 30 minutes 30° HUT at -20mmHg, and 60 minutes 30° HUT at -20mmHg) shows no statistically significant differences in either mean arterial pressure (p = 0.73, α = 0.05) or heart rate (p = 0.99, α = 0.05). Additionally in 30 minutes of subjects’ exposure to LBNP, humidity decreased from 55.8 ± 3.9 % to 47.2 ±1.8 % (p = 0.001) and temperature increased from 72.3 ± 0.5°F to 73.5 ± 1.2 °F (p = 0.013).  

**Conclusion:** The collapsible LBNP-device proved high levels of comfort and was easy to don and duff without cooperation from subject. Internal environment remained within acceptable range. The decrease in humidity likely followed the increase in temperature. Current work is optimizing mechanisms to better regulate airflow through the device to ensure comfort during extended use. Supported by a Novo Nordisk Foundation Postdoctoral Fellowship to Dr. Lonnie Grove Peterson and NASA grant NNX13AJ12G to Dr. Alan R. Hargens.

Kharananda Sharma  
**Growth of Engineered Tissue Analyzed Using The Mechanical Bidomain Model**  
Advisor: Bradley Roth

Experiments show that when engineered cardiac tissue is stretched, cells grow preferentially at the free edge of the tissue compared to the interior. In order to understand why cells grow near the edge, the mechanical bidomain model is used to simulate these experiments. The model describes how extracellular matrix and the intracellular cytoskeleton are coupled by integrin proteins. This mathematical model of mechanotransduction treats the intra- and extracellular spaces individually, and predicts the force on integrin proteins in the cell membrane. A tissue sheet is stretched in one direction and it is free in the other direction. A stretched tissue sheet experiences mechanical signals in response to mechanical forces. Mechanotransduction is the mechanism by which mechanical forces cause tissue to grow and remodel. The bidomain equations are solved numerically using the finite difference method. The simulations predict that the difference between intra- and extracellular displacements, which the model assumes is the driving force behind cellular growth and remodeling, is largest near the free edge of a sheet of tissue, and is smallest at the center, consistent with experiments.

Brandon Skopek  
**Unfunded Pensions and Other Post-Employment Benefits: Specific Recommendations on Funding Mechanisms and Promoting Equity**  

This study sought to provide and establish a long-term funding strategy for pensions and OPEB for the City of Brighton, Michigan to ensure the city is in a financial position to continue to provide phenomenal core service delivery and to ensure that best practices are followed while establishing a long-term funding strategy. Research of municipalities that have shown success in altering benefit packages has been conducted as part of this study where the data collected from these municipalities include personnel policies, budgets, and comprehensive annual financial reports (CAFRs). This data has provided insight on common themes and employment best practices being adhered to that may be utilized as benchmarks. Another source of data utilized for this project
is the review of case law, and Federal and State Court rulings related to public sector pensions and post-employment benefits. The collection and review of these case laws and court rulings provide insight into the legalities of public sector post-employment benefits, as well as ensuring recommendations are within the confines of the law. Semi-structured interviews with Brighton’s Organizational Relations Manager, Finance Director, and Municipal Employees’ Retirement System (MERS) representative were also completed. Although not directly involved with the study, considerations of Brighton’s elected officials, retirees, and current employees have been included in the analysis. It was found that local governments may be best suited by reforming retiree healthcare in the short-term due in part that retiree health care benefits may not possess the legal status afforded to pensions. Of the municipalities researched, benefit reduction by closing defined benefit packages has been the most common approach with bonding for OPEB being the next most common approach to funding mechanisms. Further, effective communication strategies are necessary to ensure employees and retirees are made aware of any proposed benefit changes early in the process.

Christopher Slon
Predicting the Assembly Variation Induced by Fastener Torque Using Finite Element Analysis and Monte Carlo Simulation
Advisor: Vijitashwa Pandey
Threaded fasteners are commonly used in attaching parts together in industrial assembly lines. The specification of the fastener torque is governed by the required clamping force needed to hold the parts together under operating loads. However, the torque applied to the fastener during assembly is partly conducted to the assembled part and can distort the part during application and induce dimensional variation in the assembly, negatively affecting the aesthetic and functional requirements of the assembly. Typically, the possible effects of torque on assembly variation, if identified at all, are usually addressed in the ramp-up phase of production when real parts are available in initial builds. This is late in the product development cycle where changes to fastener joint design can be costly and cause program delays. This paper proposes a method of predicting the effects of fastener torque during the assembly process on the dimensional variation of an assembly of parts in the design phase. It combines a mathematical model of the fastener joint with finite element analysis and Monte Carlo simulation to estimate the location and spread of the dimensional variation of critical features on the assembly. It demonstrates the accuracy of the prediction in an application to an automotive component, a fender, fastened to a car body. Predicted geometric deviations based on the fastener joint design show high correlation to measurements from actual assemblies.

Mingyuan Tao
Fuel Wall Film Effects on Premixed Flame Propagation, Quenching and Emission
Advisor: Peng Zhao
The formation of fuel wall film is a primary cause for efficiency loss and emissions of unburnt hydrocarbons and soot in modern internal combustion engines, especially during cold start period. When a premixed flame propagates towards a wall film of liquid fuel, flame structure and propagation will be fundamentally affected by the fuel vaporization flux and the resulted thermal and concentration stratifications upstream of the flame. It is therefore of both fundamental and practical significance to investigate the consequent effect of a wall film on flame quenching. In this work, the interaction of a laminar premixed flame and a fuel wall film has been studied based on one-dimensional direct numerical simulation with detailed chemistry and transport, under both constant volume and constant pressure conditions. Parametric studies are conducted with varying initial temperature, pressure, film and wall temperature. By comparing the case with an isothermal dry wall, it is found that the existence of a wall film always promotes flame quenching and causes more emissions. It is also seen that although quenching distance can vary significantly among different cases, the equivalence ratio at quenching is largely constant, suggesting the controlling effect of the rich mixture on flame quenching. By comparing constant volume and constant pressure conditions, it is observed that pressure variation has a dominant effect on vaporization boundary layer development and flame quenching, which further suggests that increased pressure during compression stroke in engines can significantly elevate the boiling point and suppress
wall film vaporization. Emissions of unburnt hydrocarbon, soot precursor and low temperature products before and after flame quenching are also investigated in detail. The results lead to useful insights on the interaction of flame propagation and wall film in relevant engine combustion conditions, and shed light on development of potential wall film functions in three-dimensional in-cylinder combustion simulation.

Suraj Timilsina
Transcription Factors Mediated Activation of MicroRNA 29, ITGA6, and KNAP2 During Human Fibroblast Reprograming to Pluripotent Stem Cells

Advisor: Luis G. Villa-Diaz

Somatic cells can be reprogrammed into induced pluripotent stem cells (iPSCs) by defined transcription factors and other modifiers such as microRNAs. Although iPSCs hold great promise for personalized regenerative medicine, it remains incompletely understood how individual transcription factors affect epigenetic decisions during the reprogramming process. Here, we analyzed the expression of microRNA-29 (miR-29) family composed by three mature members: miR-29a, miR-29b, and miR-29c; the transmembrane receptor integrin alpha6 (ITGA6, also known as CD49f); and the importin protein Karyopherin (KNAP2) during reprogramming of human fibroblasts transduced with lentiviral vectors carrying the Yamanaka reprogramming factors: Oct4, Sox2, Klf4, and c-Myc. We found that addition of c-Myc - known to stimulate both somatic cell reprogramming and tumorigenesis - to the reprogramming factor cocktail represses miR-29a and miR-29c expression levels to enhance reprogramming of human fibroblasts to iPSCs. We observed that Oct4 directly enhances the expression of endogenous miR-29b during iPSC generation. Furthermore, it was observed that Klf4 mediates a significant increase in ITGA6 and KNAP2 during reprogramming of human fibroblasts. This significant up-regulation of KNAP2 may be responsible for the nuclear localization of Oct4 during reprogramming to iPSCs, and we will determine this in future experiments. Together, our findings contribute to the understanding of the multistep molecular mechanisms by which individually the Yamanaka reprogramming factors may influence reprogramming of somatic cells into iPSCs by modifying the expression of miR-29, ITGA6, and KNAP2.

Jennier Vrabel
The Importance of Fragile High Self-Esteem

Advisor: Virgil Zeigler-Hill

Self-esteem can be defined as a global judgment of self-worth, self-respect, or self-acceptance such that individuals with high levels of self-esteem have favorable evaluations of themselves and individuals with low levels of self-esteem have unfavorable evaluations of themselves (Rosenberg, 1965). The vast majority of past research concerning self-esteem has focused exclusively on its level (i.e., whether self-esteem is high or low), however researchers have recognized that self-esteem is a complex construct that cannot be adequately understood by merely attending to its level (see Jordan & Zeigler-Hill, 2013, for a review). In particular, high self-esteem has been shown to be a heterogeneous construct consisting of both a secure and fragile form. Individuals with secure high self-esteem have feelings of self-worth that are realistic, well-anchored, and resistant to threats, whereas individuals with fragile high self-esteem have feelings of self-worth that are uncertain, vulnerable to threats, and require constant validation. One way to distinguish between secure and fragile high self-esteem is by examining self-esteem’s temporal variability (i.e., moment-to-moment feelings of self-worth over time) which is often referred to as self-esteem instability. Across three studies, participants completed an array of measures (e.g., self-esteem level, basic personality traits) and self-esteem instability was assessed each evening for up to seven consecutive days via a secure website. Conceptually similar results emerged across all three studies such that self-esteem instability appeared to play an important role in moderating the relationships that self-esteem level had with a wide variety of outcomes (e.g., perceived aggression, envy, basic personality dimensions). Discussion focuses on the implications of these results for understanding the important differences between “secure” and “fragile” forms of self-esteem.
Gucheng Yuan

Energy Conversion Based On a Humidity Gradient System

Advisor: Jonathan Maisoneuve

Humidity gradients exist throughout the natural and man-made environment, for example at building exhaust systems, and at thermal power plant flue gas exhausts. Where these gradients exist, dry air can be used to draw vapor driven by the partial pressure difference between the air streams. There exists a potential for this water vapor transfer to do useful work, which has not been studied yet. This project studies an energy conversion process driven by humidity gradient potential. Humid and dry air are introduced on opposite sides of a membrane that is permeable to water vapor and selective to air. Under these conditions, water vapor is driven from the wet side to the dry side by the partial pressure difference between the gases. If a load is placed on the dry side, then mechanical work can be extracted as the load is acted upon. The energy and power density of the process will be a function of the membrane’s properties, the relative humidity difference in feed (wet) and draw (dry) airs, and the external pressure on the draw side applied by load. This project consists of mathematical modelling to calculate theoretical performance and experimental analysis to verify performance under various conditions.

Liwen Zhang

A Computational Study on the Critical Ignition Energy and Chemical Kinetic Feature for Li-ion Battery Thermal Runaway

Advisor: Peng Zhao

Lithium-ion (Li-ion) batteries and issues related to their thermal management and safety have been attracting extensive research interests. In this work, based on a recent thermal chemistry model, the phenomena of thermal runaway induced by a transient internal heat source are computationally investigated using a three-dimensional (3D) model built in COMSOL Multiphysics 5.1. Incorporating the anisotropic heat conductivity and typical thermal chemical parameters, temperature evolution subject to both heat transfer from an internal source and the activated internal chemical reactions is simulated in detail. Parametric studies are conducted to identify the effects of the heat source intensity, duration, geometry, as well as their critical values required to trigger thermal runaway. The characteristics of different concentrations and heat release from each chemical reaction in the scenario of thermal runaway are discussed. Based on the current kinetic model, the simulation results further suggest that the concentration of negative-electrolyte is closely related to the occurrence of thermal runaway. This study provides useful guidance on the simulation and control of thermal runaway of battery systems.
Rui Zhu  
**Optimization of System Secrecy Energy Efficiency for Information and Power Transfer in Mobile Cooperative Networks**  
Advisor: Huirong Fu

In secure communications, energy consumption is becoming a major concern due to the requirement of green communications, especially in applications where devices have battery limitation, such as mobile cooperative network. In a mobile cooperative network, multiple mobile users (relays) cooperate together to form a distributed virtual antenna array by sharing their antennas. In this case, the users with single antenna can inherit MIMO's characteristics. The cooperative mobile relaying scheme has been used as a practical technology to provide transmission secrecy, and to approach requirements of future next generation communication system (5G). However, the enhancement of secrecy performance by adding relay nodes (antennas) may also result in a high-power consumption of whole network. Considering the recent requirement of green communications, it is necessary to achieve a balance between secrecy performance and power consumption. Fortunately, in recent years, radio frequency (RF) energy harvesting (EH) technology has been proposed to improve the energy utilization efficiency of wireless network. EH has already become a research hot spot in wireless communication community. This technology allows the source node transmit wireless information and power simultaneously to the destination node. Under this scheme, the nodes in wireless networks can be energy self-sufficient by harvesting RF signals from the surrounding environment. In this paper, we study the problem of optimal node selection and power allocation that maximizing the secrecy energy efficiency (SEE) of whole mobile cooperative network. This is the first work to propose relay selection strategy that is jointly consider the secrecy rate and energy consumption. And this is the first work to consider the battery re-charging model in the analysis of network SEE. We use semi-definite-relaxation approach to provide the approximate solution to this nonconvex optimization problem. Our simulation results show the comparison of SEE performance under different strategies.
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