**1. Update of Massachusetts Preventive Screening Guidelines for Adults with Intellectual Disability**

PI: Alexandra Bonardi, Clinical Assistant Professor, Family Medicine and Community Health, Commonwealth Medicine: E.K. Shriver Center. Center for Developmental Disabilities Evaluation and Research (CDDER), 465 Medford Street, Suite 500, Charlestown, MA 02129

Student will participate in a review and potential revision of the Massachusetts Preventive Screening Guidelines for Adults with Intellectual Disability, which are a cornerstone of the Massachusetts Department of Developmental Services Health Promotion and Coordination initiative. The current guidelines were originally developed in 2002 through an expert panel process and are updated periodically. Updates require a review of current evidence based preventive screening recommendations for the general population (MHP, USPSTF), population-specific guidelines, recent literature, and the development of a table of recommended changes for review and approval by DDS and UMMS clinical experts. As a complimentary project, CDDER hosts an on-line training on the MA DDS preventive screening guidelines. The project will also include a review of this training module to ensure consistency with current best practice, and the development of other tools for dissemination to clinicians, care providers, and to individuals with intellectual disability and their families.

Student's role:
Student will work with the Project Coordinator and the PI to complete the review of current and available evidence, develop tables, and develop dissemination content.

Required skills:
Basic internet and literature searching skills necessary

Location of research:
EK Shriver center offices: 465 Medford Street, Suite 500, Charlestown, MA 02129

**2. Follow-Up Database for Patients Treated for Prostate Cancer with Radiation Therapy**

PI: Harry Bushe, Instructor, Radiation Oncology
University Campus/Radiation Oncology/ HB200

A prototype database (MS Access) has been developed for the purpose of storing pertinent follow up parameters to help study outcomes and help to potentially optimize treatment.  The database needs to move from the prototype to the clinical stage.  This would include database and input form design, data collection and entry, and analysis tool design. Additional improvements are planned that would interface this database to the department's clinical database (Varian Aria) to automate some of the data collection.

Student's Role:
The Summer Research Fellow would be involved in all aspects of helping the evolution of the prototype into a clinically relevant tool.

Required skills: Familiarity with databases generally, or MS ACCESS specifically, would be helpful.

Location of Research:
UMMS, University and Memorial Campuses

## 3. The Implementation and Data Analysis of Surgical Safety Checklists in the Operating Room at UMMC

PI: Bronwyn Cooper, M.D., Clinical Associate Professor of Anesthesiology
Site Director, Quality Improvement and Patient Safety, University Campus
Department of Anesthesiology, UMMC

The World Health Organization has implemented and studied their original version of the Surgical Safety Checklist and determined, since its implementation in 2008 that it improves patient safety in the operating room, decreases morbidity and mortality and improves teamwork and team communication as well. There are three phases of the checklist the briefing, the time out and the debriefing. As our version is being implemented in all operating rooms at all campuses, we would like to study certain parameters and metrics such as the compliance rate, complication rates, length of surgeries and factors identified as problems.
Having a medical student over the summer would dovetail nicely with the timing of the data collection and analysis before and after of metrics.

Student's Role:
The student would collect data from checklists both online and written, review anesthesia records and review/summarize perioperative screening reports of complications. S/he would also be required to write a report and/or poster presentation summarizing the data collected and interpreted with the primary investigator.

Skills required:
Computer skills including Excel, Word, PowerPoint. Review anesthesia records (with training) and interest in learning poster formats. Good communication and written skills.

Location of Research:
The Anesthesiology Department in the Medical School
Interview requested with the applicant.

**4. NIH/NIMH K23 Study: Neuroimaging and neuroendocrine endophenotypes in perinatal depression**

PI: Kristina M. Deligiannidis, M.D.; Assistant Professor of Psychiatry and Obstetrics & Gynecology, Director, Depression Specialty Clinic, Department of Psychiatry and Obstetrics & Gynecology, Center for Psychopharmacologic Research and Treatment; 328 Shrewsbury Street, Worcester, MA

This single-site observational cohort study will prospectively examine perinatal plasma levels of sex hormones and γ–aminobutyric (GABA) in women at High-Risk of developing postpartum depression (PPDHR) as contrasted with Healthy Control Low-Risk (HCLR) women and to evaluate depression, anxiety, functional disability, social support and quality of infant bonding.  In the postpartum, women will undergo functional MRI/Magnetic Resonance Spectroscopy (MRS), resting-state functional connectivity and diffusion tensor imaging (DTI) to measure neurochemistry and brain circuitry in both groups.  We also collect maternal DNA from both groups for genetics studies and umbilical artery cord blood at delivery for neuroendocrine studies in neonates. Approximately 900 pregnant women will be screened with a one page questionnaire that assesses risk of PPD during their routine 28 week gestational age prenatal visit at our UMMMC Ob-Gyn clinic.  High risk and low risk women who meet criteria will be evaluated prospectively through the 9th week postpartum for depressive symptoms.

Student's role:
The medical student's role, once CITI trained, is hands on with research participants.  The medical student will consent and perform depression screening in pregnant women at the Memorial OB clinic (West 4/Levine) and conduct visits on labor/delivery;  learn how research interviews are conducted which assess not only psychiatric symptoms but obstetric information; evaluate participants longitudinally from late pregnancy to the postpartum; learn about neuroendocrine biomarkers and their significance towards understanding the pathophysiology of perinatal depression; attend neuroimaging sessions at UMMS, obtain collaborative skills with PI and research coordinator involved in the study, perform minimal research database entry to be shared with PI and research coordinator, etc.  He/she will be able to learn about clinical trial design, recruitment strategies, research ethics, IRB procedures, etc. as they pertain to the study.  There are numerous facets in which to be involved, and the medical student would have a desk adjacent to the research coordinators in our research suite where the PI's office is within the CPRT research group.  The medical student would attend all research group meetings so that he/she would have exposure to the other studies ongoing in the CPRT research group.  Direct supervision would be by the PI for the entire research fellowship program.

Required skills:
Empathic; pays close attention to detail; strong capacity for both independent work and teamwork; dependable; computer adeptness

Location of research:
Center for Psychopharmacologic Research and Treatment (CPRT) on Shrewsbury Street, West 4 Obstetrics/Gynecology Clinic at Memorial/Levine; Labor and Delivery Unit at Memorial

**5. Synthesis of Laughing Gas**

PI: Manisha S. Desai, M.D., Dept of Anesthesiology,
55 North Lake Avenue, Worcester, MA 01655

Background: Analgesic properties of nitrous oxide (N2O) were known to Humphy Davy as early as the late 18th century. However, it was not until Horace Wells observed its anesthetic properties in 1844 that it began to be used in dentistry. Itinerant showmen used to demonstrate its hilarious properties, and thus it was called 'laughing gas.' The synthesis of nitrous oxide also results in the production of toxic oxides of nitrogen. We wish to examine the methods by which nitrous oxide has been synthesized, identified, purified, and its toxic by-products identified and removed.
Methods: Materials in the public domain will be consulted for this project. These will include textbooks, review articles, research articles, and original descriptions by pioneers.
Expected results: We expect to find a fair amount speculation in the early decades before nitrous oxide's chemical structure was identified, and later methods to avoid toxic oxides to accumulate during synthesis. We will compare earlier methods of obtaining pure nitrous oxide versus modern synthetic techniques.
Expected conclusions: We expect to be amazed by the ingenuity exhibited by early chemists, not only in their ability to synthesize gases, but also how they could identify them. We also expect to be impressed with their ability to know pure from impure mixtures, and whether the gas they had synthesized had been diluted by room air.

Student's role:
Under my direct supervision, become familiar with background information from review articles, textbooks of anesthesia history. Then find suitable additional resources from the basic article references, textbooks of chemistry and analytical chemistry and primary source references. There after, analyze the information and create a power point presentation and a manuscript for submission for publication.

Required skills:
Interest in history, chemistry, good writing skills, good internet search skills, willingness to work hard to finish the project, write the manuscript and be prepared to present at our annual national meeting in 2015.

Location of research:
UMass, anywhere with internet facility

## 6. Historical Examination of the Hippocratic Oath

PI: Manisha S. Desai, M.D, Department of Anesthesiology, UMMHC
55 North Lake Avenue, Worcester, MA 01655

Background: The father of Western Medicine, Hippocrates lived in ancient Greece, and was the founder of the Hippocratic School. Although none of his personal writings survive, what is considered the Hippocratic Corpus most likely originated over decades, or centuries, through the work of guardians of this school. We wish to examine the original intent of the Hippocratic Oath, as judged by their writings and appropriateness to those times. We then examine its use in current US Medical Schools, and how appropriate its rules might be in modern medical practice.

Methods: After studying the main points of the Hippocratic Corpus, and understanding the tenets of those beliefs, we plan on surveying practices of all US Medical Schools – whether the schools practice any sort of graduation or other ceremonial ritual where medical students take the Hippocratic Oath. Next we examine how appropriate each of his tenets is to modern medical practice.

Expected Results:We expect only a minority of medical schools to administering the Hippocratic Oath to graduating medical students.

Conclusions: Some values change over time, while others remain timeless. We provide reasons why the value of some of his tenets is no longer applicable in modern medicine.

Student's role:
Under my direct supervision, become familiar with background information from review articles, textbooks of medical history. Then find suitable additional resources from the basic article references, textbooks of medical history and writings of the Hippocratic School and primary source references. Thereafter, analyze the information and create a power point presentation and a manuscript for submission for publication.

Required skills:
Interest in history of medicine, good writing skills, good internet search skills, willingness to work hard to finish the project, write the manuscript and be prepared to present at our annual national meeting in 2015.

Location of research:
UMass, anywhere with internet facility

**7. Should Infants with Down Syndrome Be Screened More Frequently for Thyroid Dysfunction?**

PI: Penny Feldman M.D, Department of Pediatrics
UMMC, University Campus, S5-824

Will study thyroid function in infants with Down syndrome who are <5 months of age.  TSH and T4 will be measured by heel stick procedure onto filter paper and tested at the New England Newborn Screening Program.  All abnormal samples will be confirmed by venipuncture prior to instituting treatment.  We have IRB approval to obtain consent by telephone and to  have families mail in a signed consent form. Goal of the study is to determine whether the current AAP recommendations for monitoring TFTs ( birth, 6 and 12 months of age) are adequate or whether thyroid function needs to be monitored at more frequent or different intervals during the first year of life in infants with Down syndrome.


 Student's role:
Track and recruit study subjects for study visits, consent newly recruited study subjects and data entry

Required skills:
Personable, works well with people

Location of research:
University Campus, S5-824

## 8.  Phenotypic and Genotypic Characteristics of Human Peri-aortic Fat

PI: Timothy P Fitzgibbons, MD, PhD, Department of Medicine
Division of Cardiovascular Medicine, H2-443, UMMS

This study is an ongoing collaboration between Dr. Fitzgibbons and Dr. Cooper and the Department of Surgery.  The goal is to determine if human peri-aortic fat is brown or white in morphology and whether or not it responds to a cold stimuli by induction of a genetic program stimulating adaptive themogenesis (UCP-1, PGC1alpha, etc).  This question builds upon prior studies by Dr. Fitzgibbons which demonstrate that the mouse thoracic aorta is surrounded by brown peri-vascular fat. This hypothesis will be tested by obtaining peri-aortic fat samples from patients undergoing elective open heart surgery before and after exposure to cardiopulmonary bypass.

Student's Role:
The student's primary role will be consenting patients for the study in cardiac surgery clinic and collecting samples from the operating room.  However, during the course of this rotation, the student will be immersed in a broad spectrum of research activities including: informed consent, learning how to write and modify IRB proposals, cardiac physiology/anatomy, interaction with cardiac surgeons and cardiologists, specimen processing and banking, RNA preparation, qPCR, and immuno-histochemistry.  There will be daily one on one interaction with the mentor during this rotation.

Required skills:
The student should have completed CITI training, and be enthusiastic, and have a flexible schedule.

Locations: Hospital, ACC building, Biotech 2

**9. Clinical Research Immersion**

PI: Stephen O. Heard, M.D., Dept. Anesthesiology and Surgery, S2-751

The student will be exposed to 4 different research projects: Titration of positive end-expiratory pressure (PEEP) to transpulmonary pressure in patients with the acute respiratory distress syndrome (ARDS); Reduction in 30-Day Postoperative Healthcare-Associated Infections through Use of a Novel Hand Hygiene System; A Randomized, Double-blind, Placebo-controlled Efficacy, Safety, and Tolerability Study of up to 20 mL of DFA-02 (gentamicin/vancomycin gel) in Patients Undergoing Abdominal Surgery; Comparison of two different pulse oximeters in low flow states in the operating room. In-patient research is difficult to perform because the investigator has to wait for the patient; she cannot recruit the patient as in outpatient studies. To maximize the experience of the student, we are offering exposure to 4 studies that will be up and running at the time of the elective.

Student's Role:
The student will receive background reading material before the start of the elective, participate in all four of the research protocols enumerated above (screening for patients, enrolling patients and gathering data under the supervision of the PI and his research coordinators) and learn how to write an institutional research board (IRB) application for a clinical study.

Required skills:
None

Location of research:
Memorial and University campuses OR and University ICUs

**10. Cytokine secretion from human autoreactive B cells from Type 1 diabetic subjects**

PI: Sally C. Kent, Ph.D., Diabetes Center of Excellence
368 Plantation Street, Albert Sherman Building 7-2041, Worcester, MA 01605

Recent clinical trials in T1D with rituxin (anti-CD20) highlight the importance of B cells in the autoimmune response in T1D, but we know little about how they function in the autoimmune response. The functional nature of autoreactive B cells as sources of cytokines in the autoimmune response in human Type 1 diabetes has not been addressed. We propose that autoreactive B cells from T1D subjects will have a more pro-inflammatory profile as compared to those from healthy subjects. We are developing a 2-color ELISpot for examining autoantibody secretion with concurrent cytokine secretion from single CD19+/CD20+ B cells. We will utilize cell culture techniques for examining autoreactive B cells from the peripheral blood, spleen and pancreatic draining lymph nodes from subjects with T1D with varying disease durations and from controls for cytokine effector functions after stimulation. This will entail examining methods of B cell stimulation with polyclonal stimulation and determining the frequency and functional profile of autoreactive B cells from these groups of subjects. All tissue is banked in our lab and all reagents are available.

Student's role:
The student would work directly with PI on this project and be involved in discussions of experimental design, execution and analysis.

Required skills:
This is mostly a cell culture project utilizing basic lab skills with analysis by ELISpot. Some PCR will be performed. As part of the learning process, I would instruct the medical student in these techniques. Knowledge of immunology would be extremely useful.

Location of research:
ASC7-2012

**11. Development of therapeutic strategies for childhood blindness disorders**

PI: Hemant Khanna, PhD, Department of Ophthalmology and Gene Therapy Center
 368 Plantation St., AS6-2043, Worcester, MA 01605

This project involves the development of rational treatment paradigms to treat debilitating blinding disorders. The focus of the project is to understand the pathology of photoreceptor degeneration and use of novel strategies to treat the gene defect. The challenge is that the conventional gene therapeutic approaches using AAV vectors are not feasible because the large size of the gene exceeds the limit of the DNA that can be packaged into the viral genome. Hence, novel strategies are being utilized to develop appropriate therapeutic modalities. The project involves the use of zebrafish and mouse models of the disease.

Student's role:
The student will work with a postdoc and will have the opportunity to design and implement strategies and perform experiments related to the development of novel viral vectors for gene therapy and for other approaches. All institutional approvals are in place.

Required skills:
Commitment to learn and do hard work.

Location of research: Albert Sherman Center AS6-2007

**12. Transitions, Risks and Actions in Coronary Events Center for Outcomes Research and Education (TRACE-CORE)**

PI: Catarina Kiefe, PhD, MD, Professor and Chair, Dept of Quantitative Health Sciences, UMMS, AS7-1077 (7th floor ASC)

TRACE-CORE is a longitudinal prospective observational cohort study of 2,300 patients hospitalized at one of 6 hospitals in Massachusetts or Georgia with an acute coronary syndrome. We are following the cohort for 2-years post-discharge via telephone interviews and medical record reviews.

Student's role:
The study is now in its final year and the work for a summer research fellow will be analysis and manuscript preparation.

Required skills:
Quantitative data analysis skills

Location of research:
7th floor, ASC, University Campus

## 13. Community Health Statistics and Geography

PI: Wenjun Li, PhD
Associate Professor, Director of Health Statistics and Geography Lab
Division of Preventive and Behavioral Medicine, Department of Medicine
Shaw Building, SH2-230

Mentored by Dr. Wenjun Li, the student(s) will work on population-based sample surveys on health and health behaviors including MA Behavioral Risk Factors Surveillance System (BRFSS), Youth Risk Behavior Survey (YRBS), Mass in Motion/Community Transformation Grant Surveys. We will use the data to evaluate the impact of local health policies and community health promotion programs. We will develop statistical models to estimate community level prevalence of risk behaviors (e.g., tobacco use, obesogenic behaviors) and illustrate the results using thematic maps.

Student role:
Students are expected to conduct literature reviews for a chosen topic, summarize the findings, participate in statistical analysis of the data, and participate in the preparation of reports and manuscripts for publication. Based on contributions, students may serve as a co-author of the manuscript(s). At the end of the program, each student is required to submit a 12 page, double-spaced report that summarizes his/her literature review on the assigned topic, research methods learned, preliminary analysis results and interpretations. Dr. Li will provide mentoring on scientific writing.

Required skills:
Genuine interest in population/community health, Basic knowledge of biostatistics and epidemiology, Skills in searching and reviewing scientific literature, Being able to work with a large team of staff and undergraduate student interns with diverse racial, cultural and technical background, Ability to follow study protocols, Good scientific writing skills, and ability to summarize findings in writing.

Location of research:
Shaw Building, 2nd Floor; and communities in Worcester County

**14. Analysis of State Emergency Room Visits and Inpatient Hospitalization Data**

PI: Wenjun Li, PhD
Associate Professor, Director of Health Statistics and Geography Lab
Division of Preventive and Behavioral Medicine, Department of Medicine
Shaw Building, SH2-230

Mentored by Dr. Wenjun Li (Statistician and Health Geographer), the student(s) will participate in the analysis and interpretation of State Emergency Department Discharge (SEDD) and State Inpatient Discharge (SID) data. Outcomes of interest include incidence rates and fatality of pediatric and elderly fall injuries, traumatic brain injuries, coronary heart diseases, diabetes and total joint replacement surgeries. We will analyze the effects of MA Health Care reform (universal health insurance) on the utilizations and care outcomes of these injuries and medical conditions, comparing to states without a health care reform (NY and MD).

Student role:
Students are expected to conduct literature reviews for a chosen topic, summarize the findings, participate in statistical analysis of the data, and participate in the preparation of reports and manuscripts for publication. Based on contributions, students may serve as a co-author of the manuscript(s). At the end of the program, each student is required to submit a 12 page, double-spaced report that summarizes his/her literature review on the assigned topic, research methods learned, preliminary analysis results and interpretations. Dr. Li will provide mentoring on scientific writing.

Required skills:
Genuine interest in population/community health, Basic knowledge of biostatistics and epidemiology, Skills in searching and reviewing scientific literature, Being able to work with a large team of staff and undergraduate student interns with diverse racial, cultural and technical background, Ability to follow study protocols, Good scientific writing skills, and ability to summarize findings in writing.

Location of research:
Shaw Building, 2nd Floor; and communities in Worcester County

**15. Functional Effects of a MICB SNP associated with severe dengue**

PI: Daniel Libraty, M.D., Department of Medicine,
Rm S6-751, UMMS, University Campus

Dengue is the most prevalent arthropod-borne viral illness in humans with half of the world's population at risk. Genetic studies have shown that a single nucleotide polymorphism (SNP rs3132468) in the MHC class I polypeptide-related sequence B (MICB) gene is associated with the development of dengue shock syndrome in children and adults, and symptomatic dengue in infants. The specific aim of this proposal is to determine the functional effects of the MICB SNP rs3132468 in vitro compared to the MICB reference sequence. The human astrocytoma cell line Sv-FHAS will be used as it does not have surface expression of MICA or MICB. The Sv-FHAS cell line will be transfected with recombinant plasmids expressing MICB SNP rs3132468 or the MICB reference sequence. Stable transfectants will be obtained by puromycin resistance. We will next measure and compare three variables in the two stably transfected cells: i) relative expression of MICB mRNA by quantitative (q)RT-PCR; ii) surface expression levels of MICB by flow cytometry; and iii) cell culture supernatant levels of soluble (s)MICB by ELISA.

Student's role:
Perform qRT-PCR, flow cytometry, or ELISAs

Required skills:
Prior laboratory experience preferred

Location of research
S6-746, UMMS, University campus

## 16. Gestational Diabetes Mellitus and Adipose Tissue Function (GEDMAT)

PI: Tiffany A. Moore Simas, MD, MPH, Med, Director, Ob/Gyn Research Division
Memorial Campus – 119 Belmont Street, Jaquith Building, Floor 2, Office JB2.008

Affecting 3-8% of gravidas, Gestational Diabetes Mellitus (GDM) is one of the most common pregnancy complications. GDM is an important predictor of future health risk of mothers and their offspring. Mothers with GDM are at long term risk of T2DM (50% in 5 years), metabolic syndrome and CVD, and offspring are at risk of abnormal glucose intolerance, obesity and metabolic syndrome across the life course. Despite pregnancy being associated with weight gain and being an insulin resistant state promoted by diabetogenic placental hormone production, there are multiple other known and unknown contributors to GDM risk. Obesity is the single most powerful risk factor for GDM development; however the association between gestational weight gain (GWG) and GDM is less consistent, raising the question of what factors distinguish non-pathogenic versus pathogenic weight gain in pregnancy. It has been proposed that the expandability of SQ adipose tissue (SQAT) is a critical factor that links weight gain to T2DM risk, and that visceral AT (VAT) macrophage infiltration and inflammation are additional contributors to insulin resistance. In this research project, we will leverage novel techniques established to perform a quantitative study of SQ and VAT stromal and vascular architecture and angiogenic expandability in pregnancy. We will determine the degree of adipocyte hypertrophy, inflammatory state and angiogenic capacity, and compare these features between normal and GDM pregnancies. We hypothesize that insufficient SQAT expandability underlies GDM risk. A prospective cohort of pregnant women (GDM cases and non-diabetic controls) meeting inclusion/exclusion criteria, with plans for a scheduled Cesarean delivery for obstetric indications, will be enrolled. Biological specimens including SQAT, VAT, placenta and maternal serum will be collected at delivery. Regression models that control for potential confounders, including prepregnancy body mass index, gestational weight gain, GDM-treatment modality (i.e., diet, oral hypoglycemic agents and insulin) and pregnancy-induced hypertension, will be used to evaluate each of the study aims. This line of inquiry has the potential to become a landmark study in our understanding of the role of AT in the development of GDM, a condition that significantly increases women's and their children's risk of cardiometabolic sequelae. The mechanistic insights derived from this work will facilitate approaches for screening, monitoring, intervention and even prevention opportunities for mothers and children affected by GDM, especially in high-risk populations.

Student's Role:
Prescreen surgical/clinical schedules and charts to identify eligible candidates, Assist in contacting attending physicians and getting permission for their patients to be approached for the study, Assist in mailing letters to potentially eligible candidates and maintaining contact logs and HIPPA relevant documents, Approaching patients to explain study and consenting them into study, Administering study-specific surveys and tools, Performing study-specific physical assessments including weight measurement, skin-fold thicknesses, waist/hip/arm/thick circumferences, BP measurements, etc. Attendance at surgeries for collection of biologic specimens; transport of specimen to Lee lab (Biotech), Chart review for study-specific data, Data collection, data entry and data cleaning, Maintenance of study stipend logs, Other study-related activities

Required Skills:
Socially comfortable people-person who is at ease in a clinical environment with multi-disciplinary, inter-professional team members, Great communication skills – written and verbal, Meticulous with consistent focus regarding detail, Ability to follow protocol and navigating medical record systems, Ability to drive/access to transportation

Location:UMass Memorial Health Care – Memorial Campus

**17. Hepatic Dysfunction, Vitamin D Status, and Glycemic Control in Diabetes**

PI: Benjamin U. Nwosu, MD, Department of Pediatrics, UMMS, Room S5-838, 55 Lake Avenue N, Worcester MA 01655

This is small randomized, double-blind, placebo-controlled study to determine the role of vitamin D supplementation on glycemic control (measured by hemoglobin A1c) and severity of non-alcoholic fatty liver disease (measured by proton magnetic resonance spectroscopy) in patients with type 2 diabetes, fatty liver disease, and vitamin D deficiency.

Student's role:
Student will learn the processes involved in all aspects of the study from consenting, screening, data collection and storage, magnetic resonance spectroscopy, data analysis and manuscript development and publication.

Required skills:
None, just a strong interest in clinical research

Location of research
ACC Building, University Campus

**18. Immunotherapeutic human monoclonal antibody for prevention of EBV-PTLD**

PI: Javier G. Ogembo, Ph.D. Dept. of Medicine, 364 Plantation St. LRB RM 211, Worcester MA 01605

Blood cancers remain a major cause of morbidity and mortality after organ transplants in young children. Infection with a virus widely known for its cause of "mono" in adolescents has been identified as the primary cause of about 20% of blood cancers in immunosuppressed transplant children. Through a collaborative effort between researchers at academic institutions and industry our goal is to develop a panel of human monoclonal antibodies that can be administered to prevent or decrease the risk of blood cancers in children. Epstein-Barr virus (EBV)-associated post-transplant lymphoproliferative disorder (PTLD) remains a major cause of morbidity and mortality after hematopoietic stem cell or solid organ transplants in EBV seronegative children. EBV primary infection and high levels of viral load in the blood have been reported to significantly increase the risk of developing PTLD in multicenter clinical studies of pediatric heart transplant recipients. Thus, strategies targeting prevention of EBV infection are necessary to protect transplant patients from PTLD. The role of gp350/220 envelope glycoprotein in the EBV infection process has been well documented. Strong gp350/220 specific humoral and even cellular responses have been shown in EBV infections both *in vitro* and in animal models. Despite several attempts to generate an EBV vaccine based on gp350/220 as an immunogen, an effective vaccine capable of blunting EBV infection *in vivo* is lacking. In collaboration with MassBiologics of UMMS, we have generated, isolated, and characterized a panel of neutralizing antibodies against EBV-gp350/220 upon immunization of wild type BALB/c mice with UV-inactivated EBV. Our overall goal is to develop a panel of human monoclonal antibodies directed against EBV-gp350/220 as a prophylactic or therapeutic treatment of PTLD in children.

Student Role:
Identify donors with high titers of broadly neutralizing anti-gp350/220 Abs as sources of B-cells. Single cell sorting of gp350/220 antibody secreting cells (ASCs) or memory B-cells using a panel of specific Abs (CD19, CD20, CD3, CD27 and CD38), RT-PCR mRNA amplification of gp350/220 ASCs or memory B-cells heavy and light chain variable regions for transfection to generate hybridoma cell lines. Test the ability of individual humAbs to neutralize EBV infection and mediate ADCC lysis of B95-8 gp350/220$^+$ cells *in vitro*. Immunize transgenic mice with UV-inactivated EBV to stimulate specific Ab responses. Test the ability of serum obtained from immunized mice to neutralize EBV infection *in vitro*. Fusion of plasmablast with P3X63-AG8.653 mouse myeloma cells to generate hybridoma cells. Test the ability of individual humAbs generated in humanized mice to neutralize EBV infection and mediate ADCC lysis of B95-8 gp350/220$^+$ cells *in vitro*.

Required skills:
Cell culture, ELISA, PCR, DNA purification

Location of Research:
UMMS, Lazare Research Bldg

**19. Assessment of the utility of Longitudinal Sleeve Gastrectomy vs Roux en Y Gastric Bypass in the treatment of severely obese diabetic patients**

PI: Richard Perugini MD, General and Minimally Invasive Surgery, Bariatric Surgery, Room H1-758, 55 Lake Avenue North, Worcester, MA

Roux en Y gastric bypass (RYGB) has long been the most widely accepted and utilized operation for weight loss. However, over the last several years, there has been a shift towards the longitudinal (sleeve) gastrectomy (LSG). This procedure has several presumed benefits over RYGB. It is conceptually an easier procedure to perform, requiring only resection of the greater curvature of the stomach, as compared to intestinal reconstruction. This should lead to lower time in the operating room and lower number of staple cartridges used per case. Patients may recover more quickly from this procedure, with a result of lower postoperative length of stay. In long term follow up, LSG results in no increased risk of anastomotic ulcer disease or vitamin deficiencies. The impact of LSG on weight loss and on remission of type 2 diabetes mellitus is impressive, appearing to follow the same time course as RYGB. At UMass Memorial Health Care, LSG has become the bariatric procedure most commonly performed; for the last four months, 99 LSG were carried out compared to 45 RYGB. LSG as a procedure was first performed only a decade ago; this is in contrast to the RYGB, which was first performed in 1967. Long term, and even short term data comparing these two procedures with regards to complication rate, cost, and remission of diseases associated with severe obesity are lacking. Some series in the literature document a serious complication rate and a mortality rate at least as great as RYGB. It is our goal to review the inception series of LSG performed at UMass Memorial, as compared to RYGB performed during the same time period. We specifically plan to look at operative time, complication rate, cost of initial hospitalization and subsequent hospitalizations up to one year post operative, weight loss, and remission of type 2 diabetes mellitus. We will utilize databases that are already constructed for bariatric operations performed at UMass Memorial. This effort will require abstraction of further information from charts to be performed by the summer student. Once the databases are completed, we will proceed with statistical analyses. The student should be able to complete the statistical analysis prior to the end of the summer. The goal is to publish this data.

Student's role:
The student is expected to carry out abstraction of information in medical records to complete databases already constructed. Once completed, the student is expected to take part in statistical analyses of the data.

Required skills:
Some experience or knowledge of management of databases, and the utilization of statistical methods to analyze data

Location of research:
UMass Medical Center. Can use computers present in H1-758 and H1760.

**20. Key features of immunity to *Bordetella pertussis* for improving vaccine design**

PI: Keith A. Reimann, DVM, Department of Medicine, MassBiologics
460 Walk Hill Street, Boston, MA  02126

The incidence of infection with *Bordetella pertussis,* the highly contagious etiologic agent for whooping cough, fell dramatically upon introduction of a whole-cell pertussis vaccine in 1940s.  However, clinical pertussis infection has gradually increased in incidence in the US since the 1980s and has included recent epidemics.  While the reason for the reemergence of this once well-contained infection is unclear, a change in vaccine formulation in the 1990s from a cellular to an acellular form has been implicated. New immunization strategies are clearly needed to again control this vaccine-preventable infection. A nonhuman primate model of *Bordetella pertussis* infection was recently described in which vaccination of baboons (*P. anubis*) with acellular vaccine was shown to prevent clinical illness despite transient colonization of airways with pertussis.  In contrast, naïve baboons infected with virulent pertussis became immune to disease AND airway colonization after recovery.  Thus, understanding the immune response that occurs following infection of naïve baboons may elucidate key elements of the sterilizing immune response. We will utilize the baboon model of *B. pertussis* infection to define the components of the immune response to infection that impart sterilizing immunity.  In concert with novel deep sequencing of the baboon immunome, we will identify antibodies that emerge following experimental infection and characterize their specificity.  We will: 1) Determine the role of passively transferred IgG from pertussis convalescent (protected) baboons in preventing disease and airway colonization following challenge. 2) Utilize a novel deep sequencing strategy to analyze and compare the B and T cell response from baboons following experimental infection that produces sterilizing immunity versus baboons following vaccination that become colonized.

Student's role:
Student will participate in next-gen sequencing and bioinformatics definition of the antibody responses to pertussis infection using a novel animal model.  They will be directly responsible for expressing and purifying antibodies from DNA sequences using molecular biology and protein expression techniques, and then characterizing these antibodies to determine pertussis antigen specificity.  During the fellowship, they will also have exposure to all aspects of vaccine and drug development from R&D through regulatory affairs and clinical trials at MassBiologics.

Required skills:
Experience in routine molecular biology and protein chemistry techniques is helpful, or should have a willingness to learn these laboratory techniques

Location of research:
MassBiologics, 460 Walk Hill Street, Boston (Mattapan), MA  02126

**21. PCP Hospitalist Communication Survey**

PI: Patricia Seymour, MS MD, Hospitalist Education Director Dept of FMCH, UMMS, 119 Belmont St. Worcester, MA 01605

Project Description: Forthcoming

Student's role:  This project is newly approved by the IRB.  The student would actively participate in revision of the instrument based on small sample completion, PCP contact, survey distribution, collection of results, analysis of results and early draft writing regarding findings.  There will likely be opportunity for work beyond the summer, if interested, and for publication.   We are currently searching for funding sources but currently the project isn't funded.

Required skills (if needed):  Understanding of statistics would be helpful but not required.  Strong communication skills to work with PCPs, Hospitalists and administrative staff.  Desire to learn about transitions of care and clinician to clinician communication practices and preferences.

Location of research:  Based out of Memorial hospital FM Hospitalist's office Jaquith ground floor

**22. Evaluating the Impact of Reflective Writing on Medical Providers**

PI: Hugh Silk, MD, MPH, Department of Family Medicine and Community Health, UMMS, 27 Ann Lee Road, Harvard, MA 01451

Over the last 6 years we have been posting clinical and educational success stories from the department of Family Medicine and Community Health on a weekly list serve. These reflections serve many roles for the writers and the readers. Physicians have noted that such avenues for reflection have allowed them a way to pause to reflect upon their care, deepen the connection they have with patients, and share these ideas with colleagues in a non-threatening environment. The focus on protocols, quality improvement, and EHR check lists is leading to the loss of "the story" we cherish in primary care. This was best expressed recently in a NEJM commentary:
*...reflection that is integrated with clinical experience, not separate from it, is critical to students' professional and emotional growth. The creation of a "safe space" for reflection and discussion can disempower the hidden curriculum by exposing it, allowing both positive and negative experiences to be used to reinforce values and behaviors conducive to the development of compassionate, emotionally engaged physicians.*
For students, the reflections might play a role in helping them to better understand the hidden aspects of family medicine. The essays may play a role in the specialty they choose or in how they understand where patients are coming from. The goal of this project is to build on the current evidence that exists which uses reflective writing to promote primary care, improve job satisfaction in primary care and promote strategies to improve patient outcomes (e.g. teamwork, cultural sensitivity). The student will help our team create a survey for faculty, community doctors, residents and medical students on the list serve to ascertain what impact the reflective writing pieces has on them as readers and writers. We plan to do literature searches and write a manuscript for a peer reviewed journal.

Student's role:
Help design study with faculty team; Help design survey for faculty, residents, medical students, and others, Help prepare IRB proposal, Help conduct the survey, Help perform literature search, Help with data analysis with analysis specialist, Help write up and edit study

Required skills:
Enthusiasm, self-motivation, interest in reflective writing and medical humanities would be helpful but no specific background or expertise in this field is required

Location of research:
On campus- mostly computer based and meetings

**23. Assessment of Medical Students' Knowledge, Attitudes and Training in Treatment of Persons with Behavioral Health Addictions, Substance Use Disorders in Massachusetts**

PI: David A. Smelson MD, Department of Psychiatry, 55 Lake Avenue North, Worcester, MA 01655-0002

The legalization of casino gambling in Massachusetts raises the concern regarding the increased prevalence of gambling disorders and co-occurring conditions. Health providers may lack the knowledge, skills, and will to diagnose and treat persons with mental health disorders and co-occurring conditions. Gambling disorders often co-occur with mental health disorders, adverse medical conditions and substance use disorders. Gambling disorders, serious mental health conditions and substance use disorders are prevalent among homeless persons (Folsom et al., 2005; Shaffer et al., 2002). Most importantly, gambling is one of the major contributory factors to homelessness (Shelton et al., 2009; Crane et al., 2005). Persons with co-occurring conditions do not receive adequate care for their conditions; most mental health services overlook or ignore co-morbid conditions. Research shows that medical school curricular often does not provide adequate training in the management of persons with co-morbid conditions and negative attitudes towards persons with mental health and behavioral disorders is prevalent among mental health treatment providers and medical students (Renner, 2004). This project consists of 1) an assessment of medical students' curriculum on problem gambling treatment training; 2) an overview of screening, diagnostic and treatment practices for gambling disorders and its co-morbidities; and 3) a preliminary assessment of fourth year medical students knowledge, personal believes and attitudes towards individuals in general and homeless in particular, with gambling disorders and associated co-occurring conditions. Students will be invited to participate in an educational module and in a brief survey. A pre- and post- survey will be conducted to assess effectiveness of the educational materials. The survey will assess participants' knowledge of gambling disorders and co-occurring conditions, the recognition symptoms, screening and diagnostic practices for individuals with co-occurring conditions. Participants' attitudes towards homeless persons and persons with behavioral health addictions and mental health disorders will be the primary study outcome.

Student's Role:
The student will be expected to participate in the design, execution, analysis and evaluation of project. Responsibilities will include: collect various forms of data pertaining to the research project; conduct research and review available literature; revise curriculum on problem gambling treatment training; assist in the design and maintenance of educational materials; collect and analyze project data; prepare report and manuscript on study findings.

Required Skills:
Strong existing computer skills with Microsoft Office; some experience with any statistical software; general Internet and electronic communications. Strong oral and written communication skills. Strong interpersonal skills

Location of Research:
University of Massachusetts Medical School (UMMS), Worcester

## 24. The Character of Rural Medical Practice

PI: Stefan Topolski MD, Department of Family and Community Medicine, UMMS,
Fitchburg FP Residency, 5th Fl, 275 Nichols Rd, Fitchburg, MA  01420

There is an acute shortage of traditional family physicians in rural western Massachusetts and more acutely in New England in general.  Family medicine and primary care are lauded as historical cornerstones of community health as well as the future of improved public health and general welfare in our communities, but whether traditional general practice is sustainable and has a future remains uncertain.  Much has been written about changes in the culture, values, style and independence of physician practice in general, but unverified assumptions about past physician practice may cloud the degree, direction, and future of currently postulated changes in medical practice.  The Shelburne Falls region of western Franklin County contains written and human record of continual physician presence and practice for over 110 continuous years. Quantitative historical records including appointment logs and qualitative data from family and patients of past physicians may help to better understand the degree of objectively real or subjectively perceived change in rural primary care practice over the past century.
 Franklin county governments are actively planning for a future with less primary care physicians.  The historical trends within untapped local data may prove valuable in better determining whether rural primary health care remains sustainable and what form it may best assume to remain present to support the health of poor and rapidly aging rural communities.

Student's role:
Any and all aspects of historical review, data collection from historical physician office records and other sources, interaction with local interest groups and historical societies and retired physicians and family of physicians deceased, collation and presentation of data with qualitative and complex systems methodologies if applicable.  Students are also welcome to develop programs of their own for IRB approval and completion in future years.

Required skills:
Enthusiasm, honesty, hard work

Location of research:
Shelburne Falls and surrounding communities

Celeste Lemay for
Patricia D. Franklin MD MBA MPH
Professor and Director
Clinical and Outcomes Research
Department of Orthopedics and Physical Rehabilitation University of Massachusetts
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**Description: PROJECT 25 -** The overarching goals of FORCE-TJR are:
> To build a comprehensive database
> To develop new and transformative comparative effectiveness tools &
> conduct research useful to both clinical practice & healthcare policy

We would like to better understand how and why patients with rheumatoid arthritis (RA) experience lower patient reported functional outcomes and higher rates of adverse events after total joint replacement surgery, specifically total hip replacement (THR) and total knee replacement (TKR). Abstracting data from TJR patients' clinical notes and clinical visits would help to better understand issues involved, which could inform interventions to mitigate or reduce these factors

**Students' Role:**
The student will assist in this Agency for Healthcare research and Quality funded national research study designed to (1) measure physical activity and function in adults with knee arthritis who have total knee replacement surgery using patient reported outcome (PRO) measures. Daily work will include: participation in a clinical research team comprised of rheumatologists, surgeons, nurses, and research professionals; understanding the emerging importance of collecting PROs; training in appropriate data collection and: and abstraction of clinical notes from FORCE-TJR registry participants at the UMass Medical School Total Joint Center. Students will also be exposed to ambulatory and surgical patient care in the course of the research.

**Required Skill:**
CITI certified, detail oriented, with the ability to work well with research leadership and staff, clinicians and patients. Able to review medical records, specifically operative notes and enter data into a database (Access or similar database).

 **Location of Research:**
Department of Orthopedics and Physical Rehabilitation at the University of Massachusetts Medical School
Total Joint Center at the Memorial Campus

 **Status of IRB:**
This study has been approved by the Umass IRB, Docket number H-13910.
Students would need to be CITI certified and will be added to the IRB.

**Interview is required**

Celeste Lemay for
Patricia D. Franklin MD MBA MPH
Professor and Director
Clinical and Outcomes Research
Department of Orthopedics and Physical Rehabilitation University of Massachusetts
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55 Lake Ave North
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**Description: PROJECT 26 -** The overarching goals of FORCE-TJR are:

To build a comprehensive database
To develop new and transformative comparative effectiveness tools &
conduct research useful to both clinical practice & healthcare policy

We would like to better understand how and why patients with rheumatoid arthritis (RA) experience lower patient reported functional outcomes and higher rates of adverse events after total joint replacement surgery, specifically  total hip replacement (THR) and total knee replacement (TKR). Abstracting data from TJR patients' clinical notes and clinical visits would help to better understand issues involved, which could inform interventions to mitigate or reduce these factors

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The student will assist in this Agency for Healthcare research and Quality funded national   research study designed to (1) measure physical activity and function in adults with knee arthritis who have total knee replacement surgery using patient reported outcome (PRO) measures. Daily work will include: participation in a clinical research team comprised of rheumatologists, surgeons, nurses, and research professionals; understanding the emerging importance of collecting PROs; training in appropriate data collection and:  and abstraction of clinical notes from FORCE-TJR registry participants at the UMass Medical School Total Joint Center. Students will also be exposed to ambulatory and surgical patient care in the course of the research.

**Required Skill:**

CITI certified, detail oriented, with the ability to work well with research leadership and staff, clinicians and patients. Able to review medical records, specifically operative notes and enter data into a database (Access or similar database).

**Location of Research:**

Department of Orthopedics and Physical Rehabilitation at the University of Massachusetts Medical School
Total Joint Center at the Memorial Campus

**Status of IRB:**

This study has been approved by the Umass IRB, Docket number H-13910.
Students would need to be CITI certified and will be added to the IRB.

**Interview is required**

Celeste Lemay for
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**Description: PROJECT 27 -** The overarching goals of FORCE-TJR are:
>    To build a comprehensive database
>    To develop new and transformative comparative effectiveness tools &
>    conduct research useful to both clinical practice & healthcare policy

We would like to better understand how and why patients with rheumatoid arthritis (RA) experience lower patient reported functional outcomes and higher rates of adverse events after total joint replacement surgery, specifically  total hip replacement (THR) and total knee replacement (TKR). Abstracting data from TJR patients' clinical notes and clinical visits would help to better understand issues involved, which could inform interventions to mitigate or reduce these factors

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The student will assist in this Agency for Healthcare research and Quality funded national   research study designed to (1) measure physical activity and function in adults with knee arthritis who have total knee replacement surgery using patient reported outcome (PRO) measures. Daily work will include: participation in a clinical research team comprised of rheumatologists, surgeons, nurses, and research professionals; understanding the emerging importance of collecting PROs; training in appropriate data collection and:  and abstraction of clinical notes from FORCE-TJR registry participants at the UMass Medical School Total Joint Center. Students will also be exposed to ambulatory and surgical patient care in the course of the research.

**Required Skill:**
CITI certified, detail oriented, with the ability to work well with research leadership and staff, clinicians and patients. Able to review medical records, specifically operative notes and enter data into a database (Access or similar database).

 **Location of Research:**
Department of Orthopedics and Physical Rehabilitation at the University of Massachusetts Medical School
Total Joint Center at the Memorial Campus

 **Status of IRB:**
This study has been approved by the Umass IRB, Docket number H-13910.
Students would need to be CITI certified and will be added to the IRB.

**Interview is required**