

Abstracts

Distinction in Research

Alexa Semonche

Combination Chemotherapy Potentiates 5-Aminolevulinic Acid-mediated Photodynamic Therapy Killing of Patient-derived Glioma-like Stem Cells In Vitro

Project Mentors: Dr. Michael Ivan (University of Miami)

Dr. Simon Hanft

Dr. Peter Yurchenco

Background: In glioblastoma, glioma stem-like cells (GSC) are hypothesized to be resistant to standard therapies and give rise to tumor recurrence. 5-aminolevulinic acid photodynamic therapy (5-ALA PDT) is a promising novel therapy for glioblastoma. 5-ALA induces tumor-selective accumulation of protoporphyrin IX (PPIX). Photoactivation of this metabolite with laser light induces reactive oxygen species generation and tumor cell death. Previous studies suggest that PPIX accumulation vary among GSC, which could lead to treatment resistance. We investigated if two chemotherapeutic agents, temozolomide (TMZ) and bis-chloroethylnitrosourea (BCNU), could potentiate 5-ALA PDT killing using patient-derived GSC lines in vitro.

Methods: Patient-derived GSC lines were established from glioblastoma tumor biopsies. PPIX accumulation induced by 5-ALA was assessed with flow cytometry. mRNA expression of enzymes involved in 5-ALA metabolism were measured with qRT-PCR. For combination therapy, BCNU or TMZ was co-administered with 5-ALA prior to laser irradiation. Cell viability after treatment was measured using PrestoBlue reagent. The effect of combination therapy was evaluated using Loewe combination index analysis.

Results: Three patient-derived GSC were established and exposed to 5-ALA in vitro. Peak PPIX fluorescence levels differed significantly between two of these cell lines, which we termed “high-” and “low-fluorescing” GSC. This finding did not correspond with any differences in 5-ALA metabolism enzyme expression levels. PPIX fluorescence intensity correlated with GSC susceptibility to 5-ALA PDT. All GSC tested were highly resistant to TMZ. We found that this drug did not affect 5-ALA PDT killing efficacy. BCNU and 5-ALA PDT worked synergistically in low-, but not in high-fluorescing, GSC. In high-fluorescing GSC, BCNU upregulated expression of heme-oxygenase 1, an enzyme that promotes PPIX catabolism and may combat oxidative stress.

Conclusions: We report the first investigation into the effect of combination chemotherapy and 5-ALA PDT on glioma stem cell viability. We demonstrate the potential for BCNU and 5-ALA PDT to work synergistically. Further investigation is needed into the mechanisms underlying this synergistic effect. However, we speculate that upregulation of heme-oxygenase 1 by BCNU could mitigate this effect.

Distinction in Service to the Community

Anne Levine, Anya McDermott, Samantha Freedman, Sally Tarabey

Baby Steps: A Cuddling Program for Babies with Neonatal Abstinence Syndrome and Education Curriculum for Families with Opioid Dependence

Project Mentor: Dr. Danitza M. Velazquez

The purpose of this DISC is to implement a sustainable non-pharmacological intervention to address neonatal abstinence syndrome (NAS) and maternal opioid use disorder in the New Brunswick community. The program is two-fold: 1) a cuddling program for newborns with NAS when caregivers are not available, and 2) educational sessions that target expecting and new families affected by opioid use disorder. The community partners are the neonatal intensive care unit (NICU) in BMSCH at RWJUH, and the New Brunswick Counseling Center. The DISC program aims to minimize withdrawal symptoms associated with NAS, educate families about the signs and symptoms of NAS, provide a supportive and safe environment for open discussion about NAS, and equip new mothers and families with resources to care for both their newborns and themselves.

Distinction in Medical Education

Morgan Dunn

Inspiring Rural High School Students to Pursue a Career in Medicine

Project Mentor: Dr. Norma Saks

The US is experiencing a physician shortage, with rural areas especially impacted. Medical students who grow up in rural areas are more likely to practice medicine in rural communities. Programs exist to encourage medical students and physicians to work in rural areas. While high school STEM and “pipeline” programs also exist, they are not always accessible in rural areas. The motivation for this project emanated from personal experience growing up in rural New Hampshire and receiving limited guidance toward my dream of becoming a doctor. The purpose of my project was to develop and implement a workshop to educate rural high school students about preparing for medical and health professions careers. The workshop (an interactive lecture, a peer-to-peer exercise to develop personal goals, and a small group activity), was presented to 50 students at the rural high school I attended. Student evaluations were positive and indicated increased knowledge and interest in health professions careers. Evaluations indicated that students valued hearing from a current medical student and graduate of their school. Limitations were the one-time presentation and the inability to study the lasting effects of this project. Suggested changes for future workshops include adding specific content requested by the students and altering the format to broaden access. It is exciting to think that even a brief educational program has the potential to increase interest of rural high school students to pursue health professions careers, and perhaps someday help increase the number of physicians practicing in rural areas.

Distinction in Medical Education

Megan Ruben

Reducing Implicit Bias in First Year Medical Students: A Longitudinal, Multidisciplinary Training Program

Project Mentor: Norma S. Saks

Background: Studies have shown that implicit bias among healthcare providers (the unconscious and unintended biases that influence medical decision making) contributes to health disparities. However, medical schools do not routinely measure implicit bias in students, and curricula lack specific programming for reducing implicit bias.

Design and Methods: Thirty-nine first year medical students (experimental group n=18; control group n=21) participated in a 3-part implicit bias training program. Students in the experimental group attended three art museum visits where an art educator discussed works of art to address themes related to implicit bias, a medical anthropology lecture, and a discussion about implicit bias in medical research. All participated in pre- and post-test activities: (1) the Harvard Implicit Association Test for Skin Tone (IAT) and (2) a questionnaire to measure awareness of implicit bias, which included writing narrative responses to open-ended questions.

Results: Analysis of IAT results indicated all participants had bias towards light skin tone ($p=.025$), and all were aware that implicit biases affect the provision of healthcare. Change in IAT scores for the experimental group did not reach significance but trended towards a decrease in bias.

Conclusions: A training program to reduce implicit bias can lead to deeper reflection on personal biases. Increased awareness and acknowledgement of personal biases may positively influence healthcare and impact healthcare disparities. Although this study involved only a small sample of first year students from one medical school, it is our intention to promote curricular focus on this important topic.

Distinction in Medical Innovation and Entrepreneurship (DIMIE)

Benjamin Lichtbroun

Mobile EMR: Progressing into the Modern Era

Dr. Tomer Davidov and Dr. Frank Sonnenberg

We get notifications when our favorite clothing stores are having sales, but we are often left in the dark when our patient's labs, imaging, or pathology reports come back. From a technological perspective, the rest of the world is progressing at an alarming rate, yet when we enter a hospital or clinic we often feel like we've entered a time machine and went back twenty years. To solve this problem, our team pitched to a grant foundation and was awarded a grant to create a mobile version of the Centricity outpatient EMR and eventually study the impact of its use. We created an IRB approved survey to send to the physicians of the medical group to understand what aspects of a mobile EMR they valued. Once we had this information, we hired a team of developers through Rutgers University as well as interface experts to help design and create the mobile app. While we are currently still in the development stages, we were able to create a prototype of the app with much of the functionality one would want.

Julia Tartaglia and Eve Rosenheck

HappyMed - A Digital Solution to Medical Student Burnout

HappyMed is a cognitive behavioral therapy (CBT) app that combats depression and anxiety and promotes wellness among medical students and residents.

Mission

To develop a wellness app tailored to the needs of medical students that addresses their unique barriers to mental health resources through self-guided e-CBT modules, educational resources, and self-help strategies.

Distinction in Global Health

Zachary Berlant

Social and Economic Determinants Affecting Surgical and Obstetric Care at Hospital San Vicente de Paul in Medellín, Colombia

Project Mentors: Dr. Javier Escobar & Dr. Gregory Peck

The importance to access timely and affordable surgical care has been gaining increasing recognition after the 2015 World Health Assembly added essential surgical to its definition of Universal Health Coverage. Methodology and quality improvement for acquiring data in low- and middle-income countries is limited. This study shows that it is feasible, reasonable, and sustainable to acquire well defined surgical indicators related to accessibility and affordability of surgical care at a large public hospital in Medellín, Colombia. The findings support ways to improve methodology for future national surgical planning.

Kalyani Dhar

A Comparative Study Between HIPAA Practices in America and India

Advisors: Ms. Christina Rozario and Dr. Javier Escobar, RWJMS

This is a three part paper focusing on the HIPAA practices in America and India. The first part of the paper explores the different experiences in a hospital in West Bengal, India and the HIPAA practices that were observed at the time. The second part of the paper is an analysis of surveys that was distributed among interns and residents in either West Bengal or South India. The third part of the paper is a discussion on the HIPAA practices that were observed, formulated via the surveys, and based on research online. I spent the summer of my first year of medical school in a hospital in West Bengal, India where I had observed three patients with their families being seen at once, by different residents, in one room, which made me question the HIPAA practices in India. A survey was sent to interns and residents in West Bengal and South India. Unfortunately, due to the current circumstances surrounding COVID-19 only ten surveys were obtained. The survey asked about one's knowledge of HIPAA, their HIPAA practices in medical school and at their workplace, and why they think that their institution follows or does not follow HIPAA. The answers varied depending on where the resident went to medical school and where they are currently practicing. One can conclude from the surveys that HIPAA practices are not uniform in India. Based upon research, there is no similar act like HIPAA in India, however, there are attempts to establish something similar to HIPAA.

Distinction in Global Health

Fernando Ferrera

The Global Surgery Research Unit (GSRU): A model for Dissemination and Implementation of Surgical World Development Indicator 1 data collection, analysis, and interpretation in Cali, Colombia

Gregory Peck DO, FACS (Principal investigator-NA)

Carlos Ordoñez MD, FACS (Principal investigator-LA)

Joseph Hanna, MD, Phd., Javier Escobar MD, John Dutton MD, Michael Scott MD, Rachel Nemoyer MD, Alejandra Londoño MS4, Juan Yucuma MS4

OBJECTIVE: The Lancet Commission on Global Surgery (LCoGS) has identified six core surgical indicators, which are now within the World Development Indicator (WDI)* dataset. The indicators assess surgical preparedness, delivery, and affordability in capacity-limited settings. Indicator 1, a component of surgical system preparedness, has been defined as a 2-hour geographic access to essential surgical care. Although previously reported through computational geo-spatial models, no consensus exists for on-the-ground prospective collection of this data. We introduce a Pre-Hospital Run Sheet (PHRS) as a process tool that conceptualizes LCoGS indicator 1 research within a GSRU. Our project utilizes the Consolidated Framework for Implementation Science (CFIR) model to systematically evaluate our efforts.

METHODS: In May 2017, a GSRU was established in Cali, Colombia. It consisted of a 1:1 North American: Latin American research fellow team within Fundacion Valle Del Lili Hospital (FVL) to champion a data collection process. The GSRU itself piloted tasks related to processes in the Emergency department (ED) to evaluate quantitative data collection. The CFIR conceptualized a qualitative evaluation of processes used to collect indicator 1 data. The PHRS was iteratively improved using the CFIR model.

RESULTS: The GSRU was successfully implemented in a cost-effective manner that affects structure and processes for a 90-day collection of Indicator 1 data. A total of 141 PHRSs were completed in the ED, that led to a quantitative indicator 1 data mean of 72.39 minutes. The CFIR provided a dynamic framework that qualitatively conceptualized and intervened upon the process of data collection. Using the specific CFIR domains i.e., Inner setting (Education), Outer setting (Incentives), and Implementation process (adaptability), we framed important qualitative factors for iterative process development in data collection.

CONCLUSION: This study proves a feasibility of the PHRS as a process improvement tool within the GSRU model. The CFIR Domains establish an organization that engages pre-hospital, hospital, and medical school personnel in our framework. The CFIR provides iterative theorization to address barriers to data collection (i.e., improve data sources, centralize implementation of PHRS data management, and promote annual wide GSRU action). The longitudinal value of the GSRU, PHRS and the CFIR will be evaluated to achieve optimal WDI data collection.

(*Indicators 2-6: surgeon, anesthesiologist, OBGYN (SAO) density; 30 day post-operative mortality; total surgical procedures; and patient impoverishing/catastrophic expenditure associated with surgical care)

Distinction in Global Health

Elizabeth Ginalis

The Global Surgery Research Unit of the Latin American Indicator Research Collaboratory: An Action Model for Lancet Commission on Global Surgery Indicator Collection and Systems Research Implementation in Colombia

Project Mentors: Dr. Gregory Peck, D.O.; Dr. Joseph Hanna, M.D. Ph.D.; Dr. Javier Escobar, M.D.

Background: The Lancet Commission on Global Surgery (LCoGS) recommends collection of six surgical indicators to inform surgical systems strengthening in an effort to improve a population's access to surgical care. However, no standard practice currently exists to guide nations in this endeavor.

Methods: A partnership between the University of Antioquia and Rutgers University became the first Global Surgery Research Unit (GSRU) and was implemented at Hospital Universitario de San Vicente Fundacion (HUSVF) in Medellin, Colombia. LCoGS indicator data were collected over a three-month period via hospital medical records, administrative surveys, and patient interviews. Evaluation of implementation outcomes enabled retrospective evaluation of the intervention.

Results: In regard to timely access to surgery, 84.5% of general and trauma surgery patients and 73.2% of OBGYN patients reported traveling less than two hours to reach HUSVF. The workforce at HUSVF includes 15 general surgeons, 34 anesthesiologists, and 9 OBGYNs. Surgical volume was 15,180 surgeries per year. Postoperative mortality rate was 1.8%. Impoverishing and catastrophic expenditures from surgical care were unable to be collected. Evaluation of implementation outcomes revealed an adaptable intervention that required significant workforce and time commitment to achieve feasibility and sustainability.

Conclusion: The GSRU model introduces a cost-effective and reproducible intervention for LCoGS indicators 1-4 collection at an individual hospital via a grassroots approach. Data were unavailable to assess LCoGS indicators 5-6. Grassroots collection of surgical indicators can inform health systems improvement in individual hospitals and national surgical planning in Colombia. The GSRU intervention and its methodological process require continued evaluation.

Ankita Gore

The Scope and Role of Inaccurately Reported Race and Ethnicity in Trauma Research

Project Mentor: Gregory Peck DO FACS

Background: Race and ethnicity are two commonly cited causes of disparate trauma outcomes. This study seeks to characterize accuracy of recorded race and ethnicity at an urban Level 1 Trauma center and identify factors associated with misclassification.

Materials and Methods: A prospective study was conducted over a six-month period to compare documented and self-identified race and ethnicity among trauma patients at a level one trauma center. Self-identified race and ethnicity were obtained through in-person patient interviews prior to discharge and then compared to data recorded through the hospital trauma registry. Logistic regression was used to compare rates of race and ethnicity misclassification and identify factors independently associated with

(continued – Ankita Gore, Global Health)

increased odds of misclassification including age, gender, primary language, Glasgow Coma Scale (GCS) score, insurance status, and Injury Severity Score (ISS).

Results: A total of 444 patients were recruited. 98 (22%) self-identified as Hispanic/Latino. 45 of these patients self-identifying as Hispanic (45.9%) had their true ethnicity inaccurately recorded in the hospital trauma registry. An adjusted logistic regression model demonstrated increased odds of ethnicity misclassification among younger patients (OR 0.97, $P < 0.01$) and Spanish-only speakers (OR 11.80, $P < 0.001$), decreased odds with male gender (OR 0.43, $P < 0.05$) but no correlation with clinical status. No factors were identified by logistic regression to increase odds of racial misclassification, but being a dual English/Spanish speaker (OR 0.05, $P < 0.01$) was found to decrease odds. A new preference for racial self-identification was observed with 75% of patients who self-identified ethnically as Hispanic also self-identifying racially as Hispanic.

Conclusions: Hispanic patients are at high risk for racial and ethnic misclassifications regardless of clinical status. These results indicate that potential nuances exist in racial and ethnic identification that may not be sufficiently captured by current standardized questionnaires.

Nupur Gulati

Latent Tuberculosis Infection Beliefs and Testing and Treatment Health Behaviors Amongst Non-US-Born South Asians in New Jersey: Patient and Physician Practices

Project Mentors: Dr. Sunanda Gaur, Dr. Sabah Kalyoussef, and Dr. Karen Lin

Latent tuberculosis infection (LTBI) remains a problem in the United States as reactivation leads to active TB disease particularly in persons with risk factors. The objective of this study is to assess the knowledge, attitudes and health behaviors related to testing and treatment of LTBI among non-US-born South Asians (SA) in New Jersey (NJ). A cross-sectional, community-based survey was the primary tool for gathering data. Eligibility criteria included being at least 18 years of age, self-identifying as SA, verbal consent for participation, and birth in a high TB endemic country. A hardcopy survey was distributed at local South Asian health fairs. The survey included questions about demographics, knowledge, beliefs on TB, and health behaviors (testing and treatment). Descriptive statistics were performed for all survey responses. Logistic regression models were constructed to assess the association of characteristics/beliefs and study outcomes. The survey sample size included 387 respondents. A total of 197 (54%) of respondents reported ever been tested for TB. Those who were tested for TB were generally younger, had higher educational levels, higher household incomes, and were more likely to have health insurance than those not ever tested for TB. Significantly more respondents who self-reported ever been tested for TB believed that TB was very or extremely serious (71.1% vs. 56.2%, $p = 0.004$). Also, significantly more respondents who self-reported ever been tested for TB believed that it was important to get tested (91.2% vs. 63.3%, $p < 0.001$). The survey analysis concluded that high-risk SA residents in NJ demonstrated a low rate of testing for TB.

Girija Hariharan

Colombia vs. the United States: Healthcare Reform Over the Last Three Decades

Over the last several decades, numerous strides have been made in international healthcare systems to address the growing problem of socioeconomic inequality. It is especially important with regards to its impact on high quality health care, outcomes and adequate coverage. Two of the countries that have adapted accordingly are the United States and Colombia. While approaching the situation from remarkably different backgrounds, they have both confronted it in a swinging pendulum between public and privatized medicine- most clearly shown with the passing of Colombia's neoliberal reforms in 1993 and the U.S.'s Affordable Care Act of 2010. These required privatized insurance companies to subsidize premiums for lower income families, while those with higher salaries faced higher out of pocket and premium charges. In both countries this was met with strong support from lower income classes, happy to exercise a new right, while higher income classes rebelled, disheartened by a new group of uninsured working-class citizens unable to afford the higher costs. While both countries now boast higher numbers of insured citizens, many still avoid treatment for several reasons such as high cost, lack of transportation and administrative barriers, creating a rift between the ability to pay for healthcare and the accessibility to actually receive it. In this paper, I hope to use my research and personal experiences to illustrate their similarities and differences while using patient stories to shed light on the human and cultural aspects of medicine.

