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2026 Combined Degree Student Research Symposium

Abstract Guide

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*Presenter at the symposium

Title: Beyond the Label: A Decision-Support Tool for Automotive Detailing Safety

Author: Antonio Astarita, B.A.

Abstract: Automotive detailing is a multibillion-dollar industry spanning both professional services and a large DIY hobbyist base, yet the long-term occupational and recreational health risks remain largely under-researched. Detailers are routinely exposed to complex chemical mixtures, often with minimal formal safety training. Current industry safety documentation is often ambiguous, contradictory, or inaccessible, creating significant barriers to informed safety choices. This project developed a prototype digital decision-support tool to guide the PPE decision-making process. We cross-referenced Safety Data Sheet information with NIOSH and OSHA regulatory standards using an AI-assisted document analysis process to generate a centralized PPE database. This evidence-based approach generated PPE recommendations tailored to work environment (e.g., indoor vs. outdoor) and exposure frequency (e.g., daily professional use vs. occasional hobbyist use). By making safety guidelines more accessible and transparent, this project aims to enhance the health literacy of the detailing community and thereby promote safety compliance. Future work will include usability testing to assess real-world adoption and impact.

Title: Stress, Time Scarcity, and Dietary Disruption During the First Semester of Medical School

Authors: Bryan Bartnick, Stephen Gauta, Zane Gabriel

Abstract:
Background: Early medical training may disrupt healthy eating, but the degree to which students attribute these changes to structural pressures such as stress and lack of time is not well described. This study assessed dietary habits, perceived stress, and self-reported weight change during the first semester of medical school.

Methods: An anonymous Qualtrics survey was administered to two first-year cohorts at Albany Medical College, the Class of 2028 in November-December 2024 and the Class of 2029 in November-December 2025. Identical survey instruments were used across both years and responses were pooled. Items assessed unintentional weight change greater than 5 pounds, perceived contributors to weight change, meal preparation, meal skipping, diet satisfaction, fruit and vegetable intake, takeout use, and self-rated stress.

Results: A total of 104 responses were analyzed. 59 respondents (56.7%) reported unintentional weight change greater than 5 pounds. Among respondents to later diet-related items, mean self-rated stress was 7.74/10, 61.8% were dissatisfied with their diet, 75.5% never or only occasionally meal prepped, 73.5% skipped meals at least weekly due to time or stress, and 52.0% reported decreased fruit and vegetable intake. Among respondents reporting weight change, the most commonly perceived contributors were lack of time (82.8%), stress (81.0%), and diet shifts such as takeout use or skipping meals (79.3%). Respondents with weight change were more likely to report diet dissatisfaction and higher stress.

Conclusions: First-semester medical students commonly reported disrupted eating behaviors and substantial stress. Students most often attributed weight change to time scarcity, stress, and altered eating patterns rather than to direct access-related barriers alone. These findings suggest that nutrition challenges in early medical training may reflect structural demands of the transition into medical school and may be amenable to institution-level supports.

Title: Patients' Desires to Receive Opioids in the Emergency Department After a Patient-Centered Discussion: A Randomized Trial With Hypothetical Vignettes.

Authors: Matthew Campo BA, Sharfaa Ahmed MBBS, Sahil Adil BS, Joseph Salcce BS, Ashar Ata MBBS, MPH PhD, Marth Kowalik RN, Andrew Chang MD, MS, Denis Pauze MD, Elena Rosenbaum MD, Julia Hastings MSW, PhD, Michael Waxman MD, MPH

Abstract: We hypothesized that emergency department (ED) patients with painful conditions may be more likely to decline opioid pain medicines when they consider the connection between receiving opioids in the ED and the subsequent risk of opioid dependence or addiction. Therefore, we assessed patients' willingness to decline opioid pain medicines after a brief patient-centered discussion.

We conducted a cross-sectional survey of randomly sampled ED patients, with embedded randomization for participants to receive a patient centered discussion (intervention) or no discussion (control). The intervention consisted of a brief (less than 2-minute) discussion on the risks/benefits of receiving opioids in the ED. The primary outcome of interest was patients' desire to receive morphine after considering a hypothetical vignette of a fractured ankle. To limit the influence of Hawthorne eJect, prior awareness of opioid risks was measured in the control group. The eJect of the intervention was described using absolute risk reduction [ARR] and relative risk (modified Poisson analysis), with 95% confidence internals.

Among the total 175 patients, mean age was 49.9 (SD=18.8), mean NRS pain scores were 6.0 (SD=2.7), with 54.9% of patients identifying as female, 60% as white, and 23.4% as black. Among the 86 patients randomized to the control group, 77.9% (n=67) believed that opioid prescriptions purchased at a drug store could lead to addiction, while 43% (n=37) believed that opioids given in the ED could lead to addiction. After all patients (n=175) received the hypothetical vignette of a fractured ankle, 20.2% (18/89) of patients in the intervention group desired morphine compared to 62.8% (54/86) in the control group [ARR 42.6% (95% CI 23.4%-61.7%)]. Modified Poisson analysis showed that patients who received the intervention were 0.32 times (95% CI 0.19-0.55) less likely to opt for morphine than those in the control.

The study findings suggest that most patients are not aware of the association between receiving opioids in the ED and the risk of dependence or addiction. The findings also suggest that a brief patient-centered discussion, focused on the risks/benefits of receiving opioids in the ED, might sway patients to decline opioids for painful ED conditions. Further research is needed to confirm these findings in real-life scenarios.

Title: A comparative study of food labels in the United States and India: Adherence to Codex Alimentarius guidelines

Author: Naavya Dangi

Abstract: This study presented a comparative analysis of the adherence to Codex Alimentarius guidelines by packaged food industries in the United States (US) and India. Nutrition labels are crucial for consumer awareness of the healthiness of these products. Acknowledging the pivotal role of packaged food labeling in enabling informed consumer choices, this research systematically scrutinized a subset of packaged food products from each country. Based on the tenets of the Codex guidelines, the primary goal of this study was to discern notable similarities and divergences in packaged food labeling practices between the two countries. We hypothesized that the US would have greater adherence to food label guidelines in comparison to India. We collected packaged food labels from the US and Indian markets and compared and tabulated the data from seven major categories of packaged foods. Notably, the investigation revealed a higher degree of compliance within the US packaged food industry with Codex Alimentarius guidelines compared to the Indian packaged food sector. This study's implications extend to raising awareness among the populace and the packaging industry about the pivotal significance of nutritional labeling on packaged food items available in the market.

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https://emerginginvestigators.org/articles/24-180/pdf

Title: The Mushrooming Crisis: Computational Analysis of Sec14 and the Emergence of Antifungal Resistance

Authors: Amani Dinar; Keith Fraser, PhD

Abstract: Drug-resistant fungal infections pose an imminent global public health crisis. The rapid evolution of resistance, driven by the extensive use of a limited set of antifungal compounds in clinical and environmental settings, has rendered many existing therapeutics ineffective. Consequently, there is an urgent clinical need to expand the antifungal armamentarium by targeting novel mechanistic pathways. This study uses computational modeling to investigate how specific resistance- and sensitivity-conferring mutations in pathogenic fungal strains modulate the ability of small-molecule inhibitors to target Sec14, the primary fungal phosphatidylinositol-transfer protein mediating trans-Golgi vesicle export. To assess binding affinity complexes, we used Chai-1 to generate predicted structures of the ligand-target complexes across one model organism and five pathogenic strains. To represent the intermolecular interactions between turbinmicin, a novel broad-spectrum antifungal, and the variants, we utilized the Protein-Ligand Interaction Profiler (PLIP). To quantify interface stability, we compared average interface predicted template modeling (ipTM) and predicted template modeling (pTM) scores and characterized topological changes in the ligand-binding pockets across several fungal pathogens. Turbinmicin demonstrated high binding affinity across all six variant proteins, with Candida albicans being the most significant amongst pathogenic strains. Characterization of resistant strains revealed a consistent contraction of the **b**ligand-binding pocket as a driver of enhanced ligand inhibition. By quantifying structural changes, this study defines the structural requirements for successful Sec14 inhibition. These findings provide a template for identifying and developing broad-spectrum antifungals that maintain high binding affinity despite volumetric and spatial changes observed in resistant fungal variants.

Title: A Review of 195 Patients Successfully Supported with Impella 5.5 Device with a Low Complication Rate.

Authors: Lauren Edelstein, Joyce Wald, DO, et al.

Abstract:
Introduction: Impella 5.5 (i5.5) is an FDA-approved microaxial, continuous flow pump intended to provide left ventricular hemodynamic support for 14 days.

Methods: The outcomes of 195 patients placed on i5.5 at an academic hospital from March 2021 to July 2024 are included.

Results: 195 patients required 202 Impella 5.5 devices. Of the 195 patients, 171 patients (88%) were male, and 24 (12%) were female, with a median age of 58.4 years [22 years -84]. The majority of patients had a heart failure etiology of NICMP (99, 51%), followed by ICMP (76, 39%), post cardiotomy shock (7, 4%), planned post cardiotomy support (3, 1%), and other (9, 5%). Twenty-Four patients (12%) were SCAI C, 121 patients (62%) SCAI D, and 49 patients (25%) SCAI E. Fifty-six (29%) patients were Intermacs 1 (IMX), followed by 128 (66%) with IMX 2. The majority of Impella 5.5 devices were placed as a bridge to decision/stabilization (94 patients, 48%), followed by BTT (50 patients, 26%), BTR (30 patients, 16 %) and bridge to durable LVAD (16 patients, 8%). Pre-Impella 5.5 MCS was provided by VA-ECMO (46 patients, 24%), temporary LVAD (21, 11%), RVAD (1, .005%) and IABP (27 patients, 13.8%). 21 patients required interval escalation to concomitant VA-ECMO. With respect to serious complications, 15 patients (0.07%) suffered from strokes that occurred during or within 24 hours of i5.5 removal; 5 pts died, 3 underwent durable LVAD, 2 underwent successful heart transplant and 5 were discharged with recovery of cardiac function. Other serious complications include: 5 patients (0.02 %) had pump thrombosis, all requiring pump exchange (4) or removal (1), 2 patients (0.01 %) had pump migration out of ventricle leading to need for surgical replacement. 1 (0.005%) had brachial artery thrombosis, and 2 patients (0.01%) had axillary graft infection requiring surgical exploration and IV antibiotics. Of note, 3 patients had cardioembolic strokes and one coronary embolus during long term i5.5 support while waiting for heart transplant.

Conclusion: The Impella 5.5 device is an excellent left ventricular support device, which can provide extended periods of hemodynamic supplementation, allowing time to transition patients failing medical support to advanced therapies. Despite prolonged support times, complication rate is lo

Title: Management of Postaxial Polydactyly Type B in the Caribbean Pediatric Population of South Florida

Authors: Stephen Gauta, Bryan Bartnick, Luis Lui, F. Brett Shannon DO, Jordan Vokes MD

Abstract:
Background: Postaxial polydactyly type B is a common congenital hand difference featuring a rudimentary ulnar digit on a narrow pedicle and is frequently seen in South Florida among families of Caribbean origin, creating a practice setting where treatment choice must balance superior cosmetic outcomes with access-to-care constraints.

Objectives: To compare ligation versus excision for neonatal/infant postaxial polydactyly type B and summarize implications for care in a resource-variable community.

Methods: We searched PubMed/MEDLINE and Google Scholar from inception to November 10, 2025 using MeSH terms and keywords for postaxial/ulnar polydactyly, type B, ligation, excision, local anesthesia, and complications. We included comparative studies, cohorts, case series (≥5 patients), caregiver-perspective surveys, and technique reports with outcome data. Two reviewers extracted study characteristics and outcomes and synthesized findings qualitatively. Primary outcomes were complications, neuroma formation, infection, re-intervention, and caregiver/patient satisfaction. Secondary outcomes were anesthesia type, timing of intervention, and setting .

Results: Ligation remains common because it is quick and accessible, but it is more often followed by residual irregularities and sensitive neuromas, with some patients later requiring revision excision. Early surgical excision is often feasible in the office under local anesthesia, which is consistently described as more definitive, with fewer residual sequelae and higher cosmetic satisfaction. In the South Florida clinic experience, family preferences were shaped by prior experiences, perceived invasiveness, and financial barriers, even when caregivers were aware of possible residual cosmetic or sensitivity concerns.

Conclusions: In high-prevalence Caribbean communities, shared decision-making should explicitly address the tradeoffs between the two procedures. When feasible, primary excision under local anesthesia should be presented as the preferred first-line option to optimize long-term cosmesis and reduce re-intervention, while ligation remains a reasonable alternative when access, timing, or family circumstances exclude excision.

Title: The Prevalence of Elder Loneliness: Creative Care Intervention for Social Isolation in Nursing Homes

Author: Gia Susan John

Abstract: According to the World Health Organization, roughly 11.8% of elderly patients experience social isolation, damaging their physical and mental health. The predominance of elderly loneliness is experienced in nursing homes and healthcare facilities, where social interactions are limited. To address the rise of elder loneliness and boredom, a program was designed in collaboration with a local nursing home, Bethany Village, to bridge connections between elderly patients and high school students via creative outlets. Students engaged to create handmade care packages consisting of self-made artwork and cognitive activities such as puzzles and fidget toys. Alongside actively creating care-packages for patients, we shared research on elder loneliness and taught the importance of our mission to the students. Roughly 30 care packages were crafted and donated to Bethany Village. This program addressed the need for social connection and mental stimulation among elderly residents via personalized, engaging artwork and activities building emotional connection and cognitive engagement. The involvement of high school students aimed to foster intergenerational awareness and need, expanding community support for an overlooked population. Bethany Village staff noted patients' enjoyment and appreciation of the packages, while participating students acknowledged their prior unawareness of the prevalence of this issue. Though modest in regards to impact, the program fostered tangible emotional impacts and recognition. This program aligns with public health and psychology, specifically surrounding social isolation and its effect on mental decline. Additionally, the outcomes highlight the value of intergenerational connections, as it enhances empathy in adolescents while enhancing mood and cognitive stimulation in elders. Though this care package focused on creative methods in approaching elder loneliness, future projects could be directed to including necessities and address the long-term issue, as care packages served as temporary engagement. Furthermore, developing personalized activity packages would also benefit differences in physical and cognitive abilities amongst patients.

Title: Definitive Radiotherapy for Locally Advanced Unresectable Pancreatic Cancer: Historical Review, Current State, and Future Directions

Authors: Anjalika R. Kumar, Nina N. Sanford

Abstract:
Background: Standard dose conventional chemoradiation does not appear to improve survival in patients with locally advanced pancreatic cancer (LAPC), and thus chemotherapy remains the only standard of care therapy. However, prognosis remains poor, and there remains some promise about the effects of radiotherapy in a subset of patients with LAPC.

Objectives: This work reviews existing data on definitive radiotherapy for LAPC, identifies key considerations for these trials, and analyzes single arm studies on dose-escalated radiotherapy in LAPC.

Methods: A patient case is reviewed. Current randomized trials assessing radiotherapy in LAPC are analyzed, and then key considerations for radiotherapy in LAPC are discussed.
These include clinical trial endpoints, optimizing patient selection, role for dose escalation, and need for standardization of radiotherapy target volumes.

Results: Standardized endpoints for randomized trials in oncology are overall survival and quality of life. In LAPC, overall survival is the preferred endpoint as prognosis is less than 1.5 years from diagnosis, but quality of life has demonstrated importance to patients. Additional markers in the selection of patients participating in trials were important in order to derive benefits from additive radiotherapy. Furthermore, dose escalated radiotherapy is proven to be safe and effective for LAPC from trials. Target volumes for radiotherapies should be standardized to prevent differences in coverage and potential “marginal misses.” Future studies now have a focus on improving quality of life as an optimal endpoint through standardized and comfort care that prioritizes the patient’s wishes.

Conclusion: Standard low-doses of chemoradiation does not add any benefit to existing LAPC treatments. However, there exists strategies for better quality and survival outcomes associated with dose-escalated radiotherapy. Developments of Phase III randomized trials show promising data that can soon support and suggest a safe escalated dose of radiotherapy so patients can make better informed decisions.

Publication Link: https://doi.org/10.1016/j.semradonc.2025.07.002

Title: A qualitative exploration of AYA cancer survivors' stressors, stress management, and mindfulness experiences

Authors: Aleena Kuriakose, Shannon Cheung, MSW**,** Gary Kwok, PhD

Abstract: Adolescent and young adult (AYA) survivors (ages 15-39) are typically siloed into a binary age classification system: "pediatric" (under 18 years old) and "adult" (over 18 years old). This obfuscates the unique needs that are tied to emerging adulthood, a developmental stage marked by changes in major life domains (e.g., forming romantic relationships, starting a career, becoming financially independent). Despite AYA survivors' increased risk of poor mental health outcomes, there are few age-specific resources to support them with navigating survivorship while attending to the normative developmental tasks of emerging adulthood. The use of digital health interventions (DHIs) to improve AYA survivors' mental health has great promise, given that DHIs can increase accessibility to care and align with AYA patterns of technology use. The positive effects of such interventions, however, are moderated by engagement and adherence, which vary widely.

This study aimed to answer three research questions: (1) How do AYA cancer survivors manage stress in their lives?; (2) what are their experiences with mindfulness and meditation?; and (3) what features would facilitate AYA survivors' engagement with and adherence to a mindfulness-based DHI that utilizes peer coaching?

U.S.-based cancer survivors (ages 18-39) were recruited via Hackensack Meridian Health's Cure and Beyond survivorship clinic and a national AYA advocacy non-profit. After screening for eligibility, 19 semi-structured Zoom interviews were conducted, each lasting approximately 1 hour. Transcribed interview data were analyzed using deductive thematic coding. The authors developed a list of codes based on concepts from the supportive accountability model. The data was analyzed using this codebook. The authors then independently reviewed and grouped the codes and met to generate initial themes. These initial themes were refined, then reviewed for coherence, distinction, and representation.

Preliminary findings, conclusions, and implications will be presented.

Title: Designing a Clinical Trial for HHT Epistaxis: Incorporating Patient-Reported Outcomes in a Novel Topical Sirolimus Therapy

Authors: Monica Louka, Thomas Scharfenberger, Michelle Kwon, David Gudis, Jonathan Overdevest MD, PhD

Abstract: Hereditary Hemorrhagic Telangiectasia (HHT) is a rare disorder characterized by telangiectasias and visceral arteriovenous malformations (AVMs). The manifestations of this disorder can vary in both presentation and severity. However, it is most common for patients to experience bleeding from mucosal sites, particularly the nasal cavity and gastrointestinal tract. Patients consistently describe recurrent spontaneous epistaxis as the most burdensome aspect of their disease. By age 20, more than 75% of patients are affected, and lifetime prevalence exceeds 90%. These nosebleeds frequently occur daily or weekly, leading to chronic iron deficiency anemia, transfusion dependence, and diminished quality of life. Beyond physical morbidity, patients report that epistaxis causes significant anxiety, social withdrawal, and interruptions to work, school, and family, making it the most disruptive symptom of their condition.

Current management includes endoscopic cauterization, systemic agents such as bevacizumab and pomalidomide, and supportive nasal therapies. However, no standard of care exists, as each approach carries unique limitations, and both systemic therapy and recurrent surgery can independently worsen quality of life.

Sirolimus, an mTOR inhibitor with anti-angiogenic and immunomodulatory properties, has demonstrated activity in vascular anomalies, including venous malformations, hemangiomas, and angiofibromas; however, its efficacy in HHT-associated epistaxis has not been studied. To address this gap, we developed a clinical trial protocol for a topical sirolimus ointment. The proposed Phase I dose-finding study will enroll adults with HHT following a baseline observation period, with twice-daily treatment at escalating concentrations. Primary outcomes include safety, tolerability, and dose-limiting toxicities, while secondary outcomes include systemic exposure, epistaxis severity scores, hematologic parameters, and endoscopic findings. To capture the broader functional burden of nosebleeds, participants will complete validated quality of life measures, including a modified Clinical Global Impression Scale, NOSE HHT, HHT-Specific QoL questionnaire, a modified QoL-HHT instrument, NIH PROMIS® short forms (Fatigue, Depression, Satisfaction with Social Roles), and the EuroQol Visual Analogue Scale. These tools will be administered at baseline, throughout active treatment, and at follow-up to evaluate longitudinal impact.

By focusing on the symptom patients identify as most disruptive, this work seeks to reduce daily disease burden, improve psychosocial well-being, and establish the foundation for future Phase II evaluation in this underserved community.

Abstract: Coffee for a Cause: A Sustainable Student-Led Model for Advancing Community Health

Authors: Francesca L. Muzio, B.A., Antonio J. Astarita, B.A., Annie Rutter, M.D., M.S., FAAFP

Abstract: Coffee for a Cause (CFAC) is a student-led pop-up café at Albany Medical College (AMC) and Albany Medical Center Hospital (AMCH). CFAC raises awareness about community health needs and addresses social determinants of health through sustainable financial support for community partners and AMC student initiatives. CFAC has raised more than $80,000 since 2022 and achieved a 95% donation-to-revenue ratio across 93 events, made possible by in-kind supply donations. These funds have been distributed to more than 50 distinct organizations, supporting initiatives ranging from local food security programs to international disaster relief. From 2022 to 2025, the mean amount donated per event increased more than two-fold ($p < 0.001$), with Direct Community Services events raising 1.5-fold more per event than Institutional Sustainability events ($p < 0.001$). CFAC represents a scalable co-curricular model that equips future physicians with core skills—such as leadership, advocacy, and collaboration—increasingly recognized as essential in primary care specialties. Given the success of CFAC at AMC, other institutions seeking to strengthen community ties through experiential learning should consider supporting similar student-led initiatives.

Title: Early Service Learning in Shaping Compassionate Future Physicians

Author: Prathyankara Premkumar

Abstract:
Background/Need
Effective healthcare encompasses knowledge, empathy, humanity, and the ability to understand your patients as a whole. Along with listening to patients' stories, empathy is often seen as an ideal for physicians to achieve rather than a clinically meaningful skill. However, empathy has been shown to decline during medical training due to stress, workload, and increasing emphasis on data rather than patient connection, highlighting the need for early interventions that preserve and strengthen this skill.

Intervention methods
Participating in various medical service projects impacting diverse communities.

How it meets needs
Service learning provides early exposure to patient-centered care, encouraging students to develop empathy through active engagement rather than passive learning. By being exposed to community involvement, students learn to listen to patients first, respect values, and understand healthcare beyond the traditional clinical practices.

Reflections
A pivotal movement occurred during a busy clinic day, when a patient sat down with anxious feelings and quietly said “I feel dizzy.” It was a simple complaint, one that could mean anything. Dr. R, paused for a moment and knelt down next to the patient and spoke in a calm, reassuring voice. He asked her several questions about her lifestyle and daily routines. He allowed space for the patient to feel heard and understood, and by the end the patient felt comfortable in expressing her concerns, and I saw an honest trust and bond being built. That moment shifted my perspective and I began to understand how vital it is to practice empathy and humanity to create a connection where the patient feels trusted and comfortable. Additionally, observing Dr. R hold the patient's hand and say a prayer for her deepened my view of what compassion can look like in medicine.

Future directions
To alleviate the issue of decline in empathy in medical training, service learning could be intentionally integrated into the curriculum of pre-medical and medical students. Expanding programs that promote this experience can help students develop skills that are fundamental to medicine, and enforce empathy as a habitual clinical practice, ensuring physicians stay grounded in humanity focused care.

Title: PGAM5 Dephosphorylates p53 at Serine 392 Residue to Regulate p53 Mitochondrial Localization and Apoptosis

Authors: Akash Raman, Yi Tang

Abstract: In response to DNA damage, p53 is known to induce apoptosis through transcription-dependent mechanisms and also through a transcription-independent mitochondrial pathway. In its transcription independent pathway, when p53 is phosphorylated at serine 392 (S392), it promotes p53 tetramer stability and p53 mitochondrial localization. While multiple kinases have been shown to phosphorylate p53 at S392, no phosphatase has been reportedly identified with sharing this function. Previous studies from our lab have identified a phosphatase called PGAM5, which was not only able to phosphorylate p53 at S392, but also directly bind p53. Using isogenic HCT116 wild-type, knockout, and phosphatase-dead mutants, treated with camptothecin (CPT) to induce DNA damage, we performed mitochondrial fractionation and Western blotting to assess p53 S392 phosphorylation and mitochondrial localization. Although total p53 enrichment due to CPT was demonstrated in mitochondria, p53 S392 was not yet clearly detected, suggesting that it is below the detection threshold under current conditions. Together, these results implicate PGAM5 as a regulator of mitochondrial p53 localization and highlight the need for improved approaches in detecting phosphorylation events critical for subsequent apoptosis.

Title: Examining Antidepressant Discontinuation Syndrome Among Hospice Patients in the Last Week of Life

Authors: Mridula Shanker, Jasmine Choi, Carol Weisse, PhD

Abstract:
Background: Terminal symptoms at the end-of-life (EOL) can be distressing to hospice patients and to caregivers who often manage symptoms in a home setting. Identifying potential contributors of these symptoms is key to quality patient- and family-centered care. Disruptions in antidepressants can lead to antidepressant discontinuation syndrome (ADS), a condition characterized by unpleasant symptoms such as agitation, restlessness, nausea, and insomnia.

Objectives: Using a retrospective review of hospice patients' medication records, this study examined whether patients experiencing disruptions in their antidepressant regimen needed additional comfort medication to manage terminal symptoms consistent with ADS.

Methods: An existing data registry of 356 home hospice patients was queried to identify patients who were administered antidepressants whose regimens were disrupted in the last week of life. Patterns of comfort medication administration in these patients were compared to comfort medication usage in patients whose antidepressant regimens were not disrupted and to patients who were not prescribed antidepressants. Symptoms of ADS were assessed by comparing doses of liquid morphine, lorazepam, and haloperidol pre- and post-discontinuation of an antidepressant.

Results: Analyses revealed significant increases in liquid morphine and lorazepam administration among patients who experienced disruptions to their antidepressant regimen, and that the increased overall utilization of these comfort medications was higher than that of control patients whose antidepressants were not disrupted or of those who were not prescribed antidepressants at all. These results warrant further exploration to determine whether distressing EOL symptoms may be indicative of ADS.

Title: Tunable Bacterial Cellulose Nanofiber Platforms for Accelerated Tissue Repair

Authors: Anika Sharma, Zane Salmar, Preksha Jerajani, Efthymia Iliana Matthaiou

Abstract:
Background: Chronic wounds affect 1–2% of the population in developed countries and impose a substantial economic burden, costing healthcare systems billions of dollars annually. These wounds are associated with high morbidity, mortality, and diminished quality of life. Current wound dressings often fail to provide adequate structural support, moisture balance, and infection control, necessitating frequent changes that increase pain and risk of complications.

Hypothesis: We hypothesize that bacterial cellulose (BC) nanofiber membranes can serve as multifunctional scaffolds that enhance wound healing by providing structural integrity, maintaining optimal hydration, and supporting cellular regeneration.

Methods: BC membranes were fabricated and characterized for mechanical strength and moisture retention. In vitro assays using human keratinocytes (HaCaT) and fibroblasts (NHDF) assessed proliferation via XTT assay at 24–72 h, and migration over time using a scratch assay to evaluate re-epithelialization.

Results: Preliminary findings indicate that BC membranes support cell adhesion and migration, maintain hydration for extended periods, and mimic extracellular matrix architecture. Membrane density and hydration significantly influenced keratinocyte and fibroblast behavior, suggesting tunable properties for optimized healing.

Discussion: BC membranes integrate structural and biological functions, addressing limitations of conventional dressings. Future work will focus on optimizing composition, incorporating antimicrobial agents, and validating efficacy in preclinical wound models. This platform represents a sustainable and scalable strategy to accelerate tissue regeneration and improve outcomes in chronic wound care. Ultimately, these findings highlight the potential of BC-based scaffolds to transform chronic wound management and advance next-generation bioactive dressings.

Title: Time-dependent endogenous Angptl-7 expression in a 4T1 TNBC model

Authors: Helen Shen, Alex Reers, Branden Eggan, PhD, and Kevin Cheung, MD

Abstract: Breast cancer is one of the most frequently diagnosed cancers among women in the United States, with nearly 275,000 new cases each year. Although triple-negative breast cancer (TNBC) accounts for only 10-15% of those diagnoses, it is an aggressive subtype characterized by rapid metastasis and increased necrosis within the primary tumor core. Previous studies found angiopoietin-like protein 7 (A7) to be highly enriched in the tumor core compared to the viable rim in a TNBC mouse model, suggesting that A7 may play a role in driving necrotic activity and metastasis in TNBC. How A7 concentrations fluctuate with time-dependent stress and affect cell death and necrotic activity is unclear. In this study, we show that in 4T1 mouse mammary carcinoma cell lines with varying levels of endogenous A7 expression, A7 over-expressing cells exhibit a marked increase in cell death around hour 100 in culture and greater cell death overall. By performing western blotting and ELISA testing on cell lysates and culture media, we determined that extracellular human A7 secretion increases logarithmically over time, while intracellular A7 levels remain relatively stable. Taken together, these findings indicate that A7 may promote cell death and necrosis in TNBC only after being secreted into the primary tumor core.

Title: Enhancing Dermatology Education and AI Fairness: Leveraging Generative Models to Expand Skin Tone Diversity in Melanoma and Nevi Datasets

Authors: Rajveer Singh, Luis Pablo Luy, Naik Saini, Angadh Singh, Mannut Singh, Adrian Joseph, Richa Nathan, Dr. K. Neena Chima

Abstract: Convolutional neural network (CNN) models for skin cancer classification rely on publicly available datasets, such as the Kaggle Skin Cancer MNIST dataset, that substantially underrepresent darker skin tones. This imbalance limits model generalizability and contributes to diagnostic disparities for patients of color, as standard preprocessing techniques of resizing, normalization, and geometric augmentation fail to address the lack of melanin-driven variation in training data. To address this gap, this study aims to develop a reproducible pipeline for generating diverse, high-quality synthetic dermatology images across Fitzpatrick skin types I–IV, supplement existing CNN training datasets with realistic synthetic images to improve classification equity, and incorporate expert dermatologist validation to ensure generated images preserve diagnostically relevant lesion morphology. We reviewed existing CNN-based approaches to the Kaggle skin cancer classification task, evaluating preprocessing, augmentation, and classification pipelines, and extended this baseline by fine-tuning a Stable Diffusion model to generate synthetic melanoma and nevi images across Fitzpatrick types I–IV. The generative pipeline preserves lesion morphology while systematically varying skin tone to reflect clinically realistic presentations, and generated images undergo dermatologist review to assess diagnostic fidelity prior to integration into CNN training data. We anticipate the pipeline will produce synthetic images rated as diagnostically faithful by expert reviewers and that CNN models retrained on the augmented dataset will demonstrate improved classification across underrepresented skin tones compared to models trained on original data alone. Generative AI offers a scalable approach to bridging diversity gaps in dermatology datasets without requiring large-scale collection of new patient data.
While synthetic images are not substitutes for real clinical data, they can improve equity in AI training and expand clinician exposure to diverse presentations. This framework of combining generative augmentation with expert validation has implications for AI fairness in dermatologic diagnosis and medical education.

Title: Quantification and Modeling of Capsid Electrostatics for DNA Packaging

Authors: Ahdaf Zaman, Ann Zhang, and Cecilia Bores, PhD

Abstract: The three-dimensional structure of DNA packed within the capsid of bacteriophages is determined by the physical chemistry of DNA folding, certain features of the packaging process, and the characteristics of the capsid. In most cases, experiments only show averaged images of the DNA within the capsid, obscuring some details of the actual encapsidated DNA conformation. In this work, we have quantified the electrostatic character of the inner surface of the capsid for two phages, phi29 and lambda, finding different values of the superficial net charge. In the case of phage phi29, we found that the innermost capsid wall has an attractive character toward the confined nucleic acid, and we devised a capsid model capturing these features. We used this model to run molecular dynamics simulations aimed at unveiling how the interactions between the DNA and the capsid wall could affect the distribution and conformation of the packed genome. We found that DNA tends to be closer to the capsid wall, specially at early stages of the packaging process, as indicated by a more pronounced peak near the wall in the two dimensional radial density profile. On the other hand, we quantified the orientation of the DNA strand across the capsid and finding that our attractive model for the capsid doesn't trigger a different conformation of the packed genome compared with the non-attractive capsid wall.

Title: The Mechanisms of Endothelial Priming Using a “Two-Hit Model” of Infection” for Severe Sepsis

Author: Amrin Chowdhury, Ramon Bossardi Ramos Ph.D.

Abstract: Sepsis is a leading cause of death worldwide, with survivors facing persistent immune and endothelial dysfunction that predispose them to chronic organ injury. The endothelium plays a central role in acute sepsis and in long term, yet the mechanisms underlying endothelial “priming” are not fully understood. This study used a two-hit mouse model, combining cecal ligation and puncture (CLP) with subsequent Streptococcus pneumoniae infection, to investigate organ-specific endothelial responses. The renal cortex, renal medulla, and lung tissues were analyzed using immunofluorescence for Ki67 (proliferation marker) and methyl histone H3 (epigenetic remodeling marker). Quantitative comparisons were made between Sham, CLP, CLP + Saline, and CLP + SP groups. Results revealed distinct patterns of endothelial priming. In the lung, CLP induced an increase in Ki67 expression but declined after secondary infection despite elevated methyl histone H3 expression, suggesting proliferative exhaustion in epigenetically primed endothelial cells. In contrast, the renal cortex and medulla displayed increases in both Ki67 and methyl histone H3 expression across the septic groups, consistent with sustained proliferative activation and potential maladaptive remodeling. These findings highlight organ-specific trajectories. Together, these results support the concept that sepsis induces long-lasting endothelial priming, mediated in part through epigenetic remodeling, which contributes to organ vulnerability during secondary insults. Targeting endothelial memory through epigenetic or regenerative therapies may lead to promising therapeutic strategies to mitigate long-term complications in sepsis survivors.

Title: Drug Repurposing for TAZ-CAMTA1 Fusion Driven Epithelioid Hemangioendothelioma (EHE): A Mechanistic study of Bazedoxifene Acetate

Authors: Roselyn Dai, Sarah McMullan, Ryan Kanai, John Lamar

Abstract: Epithelioid Hemangioendothelioma (EHE) is a rare and aggressive vascular sarcoma with a five-year survival rate of only 55.6%. It is known that the WWTR1(TAZ)-CAMTA1 gene fusion, caused by a chromosomal translocation, is present in more than 90% of cases and is sufficient to drive EHE tumorigenesis. While surgical resection is the gold standard treatment, the metastatic nature of the disease renders most patients in-operable. Aggressive EHE is largely refractory to conventional soft tissue sarcoma chemotherapies, and thus, there exists a dire need for more effective treatment options. The rarity of the disease makes development of a new drug specifically for EHE unlikely. Here, we utilize drug repurposing – a strategy that investigates new uses for already approved drugs outside of their original medical intention – for identification of new therapeutic agents against EHE. From a screen of 190 FDA-approved pharmacologically active compounds, four drugs were found to be promising for their ability to suppress EHE cell viability. Bazedoxifene acetate, a selective estrogen receptor modulator (SERM), is particularly interesting due to its known anticancer potential and the female predominance of EHE. Here, we aim to elucidate bazedoxifene's mechanism of action in EHE cells to offer pre-clinical evidence for its use in EHE patients. Results suggest that bazedoxifene does not suppress TAZ-CAMTA1-TEAD dependent transcriptional activity or target gene expression in EHE cells. Other SERMS, unlike bazedoxifene, do not affect cell viability, suggesting that bazedoxifene does not function like a conventional SERM in EHE cells. Estrogen receptor activation suppressed EHE viability at high dose, suggesting that estrogen signaling has a role on EHE growth and survival. Furthers studies are needed to understand bazedoxifene's mechanism in estrogen mediated EHE growth suppression as bazedoxifene remains a promising therapeutic target.

Title: Insights into Quality of Life for Pediatric Asthma Patients

Authors: Olivia Gargiulo, Siena College-AMC Science, Humanities and Medicine

Abstract: Asthma is one of the most common chronic conditions of childhood, affecting approximately 8.9% of children in the United States. Research has documented the physical discomfort associated with asthma, and pediatricians are skilled in alleviating wheezing and dyspnea through pharmacologic interventions. However, far less is understood about the broader impact of asthma on children's lives, including its influence on participation in physical activities, emotional well-being, relationships, and academic performance. This study seeks to address these knowledge gaps by exploring the lived experiences of children with asthma to enable pediatricians to provide more humanistic, patient-centered care.

Interviews were conducted at Riverside Pediatrics, an outpatient clinic located in Yonkers, NY, serving a predominantly African American, Hispanic, and minority urban community. Children (ages 5–17 years) with a clinical diagnosis of asthma was recruited during routine office visits (n=10). Each participant completed a 61 item-questionnaire, organized into four domains related to the child's physical activity, emotional well-being, relationships, and academic performance. Responses were collected using a 3-point Likert-derived scale. Qualitative follow-up prompts were incorporated. All interviews were conducted by the same investigator, with both the child and parent present.

Asthma influenced children's self-perception and academic experiences. Half of participants reported difficulty running, and nearly one-third needed to rest during gym, reflecting limits on physical activity. Emotionally, feelings of frustration (50%), isolation (40%), and self-consciousness (40%) were common, indicating that symptoms frequently shaped how children perceived themselves and asthma. At school, many reported challenges with coursework, including missing lessons for treatment (60%) and having additional homework (50%), while 40% struggled with focusing on class during symptom exacerbation. Despite these challenges, support from nurses and families was universally reported (100%), highlighting the critical role of caregivers in mitigating the impact of asthma on daily life.

To provide patient-oriented care, physicians must account for how asthma shapes a child's daily life beyond its physical manifestations. Understanding these elements potentially allows clinicians to tailor treatment more holistically, outside of just symptom management, ensuring care that reflects what matters most to the patient and supports their overall development.

Title: A Systematic Review of Racial Drivers of Mortality Disparities in Acral Lentiginous Melanoma

Authors: Bao Vy Phan, Riya Karne

Abstract: Acral lentiginous melanoma (ALM) is a rare, aggressive melanoma subtype that primarily affects extremities covered from the sun, occurring on the palms, soles, and nail beds. While cutaneous melanoma is predominantly associated with ultraviolet (UV) radiation amongst fair skin types, acral lentiginous melanoma is the most common form of melanoma in individuals with darker skin, such as those in Black, Asian, and Hispanic populations. While not UV-linked, acral lentiginous melanoma disproportionately affects people of color as it presents with significantly higher mortality rates. These disparities are largely driven by systemic barriers to dermatologic care, socioeconomic factors, and a critical under-recognition of ALM in darker skin types, which often results in delayed or incorrect initial diagnoses. To better understand these inequities, a comprehensive systematic review of the literature was conducted to evaluate drivers of mortality disparities in ALM, evaluating clinical, socioeconomic, and biological variables that can contribute to disparities in patient outcomes. Broad outcomes show a pattern of disparity that can be traced back to factors related to race. Later diagnosis timing, increased tumor size and thickness, as well as reduced access to care related to dermatology and oncology all play roles in this disparity of care.

Title: Diagnostic and Clinical Outcomes of Guideline-Based Inpatient Transthoracic Echocardiography

Authors: Taniya Thomas BS, Eeshan Kumar BS MBA, Omar Daghstani MD, Erica Jensen DO, Patrick Spiddle DO, John Chin MD, Shi Sewell BS, Saikalyan Thimirisetty BS, Mikhail Torosoff MD PhD

Abstract:
Background/Project Intent: Transthoracic echocardiography (TTE) is a non-invasive diagnostic tool whose use has been increasing in clinical practice due to its versatility, cost-effectiveness, and low risk profile. The American College of Cardiology and American Society of Echocardiography developed Appropriate Use Criteria (AUC) to reduce unnecessary TTEs and improve patient outcomes. However, the impact of adherence to Appropriate Use Criteria on meaningful clinical outcomes remains to be explored. This single center study aims to examine trends in TTE utilization in non-critical hospitalized patients.

Methodology: This quality improvement project analyzed 740 unique non-critical care inpatient transthoracic echocardiograms performed at a single tertiary care hospital between January 2025 and June 2025. TTEs were evaluated for critical (aortic aneurysm or dissection, tamponade, new significant LV dysfunction or valvular disease, and endocarditis) and actionable findings (any echocardiographic finding which prompted a change in management). Additional resource utilization, including cardiology consultation and post-discharge cardiology follow-up, was also noted.

Results: The study cohort included 44% females, average age 68+/- 16.7, 3.1% with known severe LV dysfunction, and 7.8% with known severe valvular disease. While indications generally met appropriateness use criteria (735/740, 99.3%), only a minority of patients manifested critical (88/740, 11.9%) or actionable findings (77/740, 10.4%, $p<0.001$). Despite that, cardiology consultation was requested in 46.3% (343/740) and outpatient follow-up in 33.2% (246/740, $p<0.001$) of the cases. Length of stay was not significantly affected by critical (11.9+/-11.5 vs. 10.3+/-10.6 days in the rest of the cohort, $p=0.171$) or actionable findings (12.7+/-12.3 vs. 10.2+/-10.5 days in the rest of the cohort, $p=0.055$).

Conclusions: Despite adherence to AUC, our findings show that most inpatient TTEs did not yield critical or actionable findings. Appropriateness alone does not ensure high-value care. By aligning imaging utilization with actionable clinical impact, cost containment, and care efficiency, improved patient outcomes are expected.

Title: More Than an Interruption: Stigma, Support, and Success After Academic Leaves of Absence in Medical Training

Authors: Jamie LeMire, MBA, Elizabeth Bennette, Branden Eggan Ph.D., Hyacinth Mason Ph.D.

Abstract:
Purpose: Medical students take unplanned leaves of absence (LOAs) for many reasons1, and doing so can increase risks of delayed graduation, attrition, and residency challenges. Despite these implications, research on trainees' LOA experiences remains limited. This study explored medical students' experiences before, during, and after LOA to inform support mechanisms that strengthen retention and workforce readiness.

Approach/Methods: Medical trainees who had taken an LOA within the previous five years completed an anonymous survey (Aug–Dec 2025), recruited via national listservs and social media. The survey assessed experiences before, during, and after LOA using Likert-type items and free-text responses. Percentages were calculated for Likert items, chi-squared tests assessed differences, and free-text responses underwent content analysis.

Results/Outcomes:
74 trainees (58 students, 12 residents, 4 other) participated. Overall, 84.6% reported ≥1 significant LOA-related challenge: social reintegration (61%), academic adjustment (47.2%), administrative hurdles (36.1%), financial strain (31.9%), and mental health concerns (30.5%). Stigma was prevalent: 81.3% perceived at least some stigma, and 60.3% reported decreased belonging after return. Among those reporting high stigma, 13.5% received some pre-leave guidance and 33.8% none. Receiving guidance was associated with greater likelihood of reporting LOA as beneficial ($p = 0.013$). Lower confidence in returning was also linked to higher stigma. Themes included a culture of silence and limited transparency surrounding LOAs, contributing stigma. Participants described unclear processes ("LOAs are a black box") and limited faculty engagement, which hindered communication and help-seeking.

Discussion/Interpretation: Trainees described academic, social, and emotional challenges across all LOA stages. High stigma, unclear processes, and reduced confidence suggest current institutional practices inadequately support LOAs. Limitations include modest sample size, self-reporting, and potential selection bias. Significance: Unplanned LOAs introduce interconnected challenges extending beyond the leave itself. Findings highlight gaps in communication and support, suggesting the need for clearer reintegration pathways and proactive outreach that normalizes LOAs. Addressing these gaps is critical to supporting trainee well-being, academic continuity, and a workforce already facing projected physician shortages.

Title: Therapeutic Potential of Low-Intensity Ultrasound in Diabetic Peripheral Neuropathy

Authors: Hasitha Nimmagadda, Jenica Acheta, Amanda Mondschein, Sophie Belin, Yannick Poitelon

Abstract:

Introduction

Diabetic peripheral neuropathy (DPN) is a common complication of diabetes, affecting up to half of patients and leading to progressive sensory loss, neuropathic pain, and increased risk of lower-limb injury. Current treatments provide only symptomatic relief and do not restore sensory innervation. Our lab uses a high-fat diet (HFD) mouse model of metabolic syndrome–associated neuropathy to study sensory fiber degeneration. We hypothesized that low-intensity ultrasound (LIU), a non-invasive and non-thermal modality, could restore intraepidermal nerve fiber density (IENFD) in DPN.

Methods

Female C57BL/6J mice were fed a 60% HFD for 26 weeks. LIU treatment (1 MHz, 0.3 W/cm², 20% duty cycle, 5 min/day) was applied daily to the hind paws for three weeks. Footpad skin samples were collected, cryosectioned, and immunostained with PGP9.5 and DAPI to quantify IENFD. Images were analyzed by blinded counting in ImageJ, and statistical comparisons were performed using an unpaired t-test.

Results

HFD mice displayed reduced IENFD, consistent with small fiber degeneration. LIU-treated mice showed a significant increase in IENFD compared to untreated HFD controls ($p = 0.0026$), suggesting partial restoration of sensory innervation.

Conclusion

These preliminary findings demonstrate that LIU can promote sensory fiber regeneration in a metabolic model of DPN. My current work is focused on expanding this analysis, and future studies will test LIU in a sciatic nerve injury model to determine whether ultrasound can be applied across different peripheral neuropathy models.

Title: Solutions to Kidney Shortages in America: Economic and Ethical Implications

Authors: Mayur Pabba and Sutirth Mannikeri

Abstract: The persistent shortage of transplantable kidneys in the United States represents a critical public health and economic challenge. Over 90,000 patients remain on the transplant waiting list, with thousands dying annually due to insufficient organ supply. This study evaluates the economic and ethical implications of potential solutions to kidney scarcity, with a primary focus on the legalization of kidney sales alongside alternative policy approaches. Using a narrative review of existing literature, we analyze cost-effectiveness data, supply-demand theory, and real-world outcomes from both regulated and unregulated organ markets. Legalizing kidney sales has the potential to substantially increase organ supply by introducing financial incentives, thereby reducing waitlist mortality and generating significant healthcare savings through decreased reliance on dialysis. However, this approach raises ethical concerns, including the exploitation of vulnerable populations and the potential erosion of altruistic donation. Evidence from countries such as Iran and India highlights both the effectiveness of regulated markets in eliminating waitlists and the risks of adverse donor outcomes. In contrast, alternative strategies, including kidney exchange programs, reciprocity-based allocation systems, and presumed consent policies, offer more ethically acceptable frameworks but may be limited in scalability or effectiveness. Kidney exchanges improve matching efficiency but remain fragmented, while reciprocity and presumed consent systems primarily increase cadaveric donations without fully addressing demand. Overall, while a regulated kidney market appears to offer the most comprehensive solution to organ shortages, it requires extensive safeguards to mitigate ethical risks. Policymakers must balance efficiency and ethical considerations when designing interventions to reduce kidney transplant shortages and improve patient outcomes.

Title: The Role of VDAC-1 in Mitochondrial Calcium Homeostasis and Neuronal Function in a C. elegans Model

Authors: Maanasa Pulavarty, Jocelyn T. Laboy, and Kenneth R. Norman

Abstract: Neurodegenerative disorders affect over 7 million Americans. With no cure available, it is essential to understand the underlying pathological mechanisms that promote these diseases. Disrupted mitochondrial function and dysregulated Ca^{2+} signaling are central features of several neurodegenerative diseases, including familial Alzheimer's disease (fAD). In C. elegans, mutations in the presenilin ortholog sel-12 result in mitochondrial Ca^{2+} overload and progressive neurodegeneration. These phenotypes were found to be suppressed by limiting mitochondrial Ca^{2+} uptake. While Ca^{2+} transport across the inner mitochondrial membrane is well characterized, the mechanisms governing Ca^{2+} flux across the outer mitochondrial membrane remain poorly understood.

Voltage-Dependent Anion Channel 1 (VDAC-1) localizes to endoplasmic reticulum–mitochondrial contact sites and mitochondrial junctions, positioning it as a potential regulator of mitochondrial Ca^{2+} entry. To investigate this role, we generated vdac-1 null mutants and assessed mitochondrial structure, metabolic activity, development, fertility, and neuromuscular function. The loss of vdac-1 resulted in fragmented mitochondria, reduced oxygen consumption, delayed development, decreased brood size, and impaired locomotion and mechanosensory responses, indicating a critical role for VDAC-1 in maintaining mitochondrial integrity and organismal fitness. We also examined whether vdac-1 suppression could mitigate neurodegeneration in an fAD model. In vdac-1; sel-12 double mutants, mechanosensory function was significantly restored despite persistent mitochondrial fragmentation in touch neurons. This dissociation between mitochondrial structure and neuronal function expands potential therapeutic avenues by indicating that normalization of Ca^{2+} handling and metabolic signaling may be sufficient to preserve neuronal function in fAD.

This study identifies VDAC-1 as a key regulator of mitochondrial function and neuronal health and demonstrates that the modulation of Ca^{2+} flux can suppress neurodegenerative phenotypes independently of mitochondrial structural restoration. These findings highlight mitochondrial Ca^{2+} dysregulation and metabolic imbalance, rather than amyloid-β accumulation alone, as central contributors to fAD-associated neurodegeneration and support further investigation of Ca^{2+} signaling pathways as therapeutic targets.

Title: Development and assessment of simulation approaches for streaming readout positron emission tomography detectors

Author: Jaideep Saran, Cameron Clarke, PhD

Abstract: Positron emission tomography (PET) is a medical imaging modality that utilizes injected radioactive tracers that lead to back-to-back gamma rays being emitted, which can be used to construct three-dimensional (3D) images. To detect both gamma rays as a coincidence, modern PET systems use front-end coincidence detectors, but due to their high costs and increased dead times, the Biomedical Research and Innovation Center (BRIC) at Thomas Jefferson National Accelerator Facility (TJNAF) is developing an alternate streaming readout (SRO) method. This replaces the front-end coincidence detector with a computer that can analyze data independently from the detector. A simulation was required to optimize the detector's material composition and geometry, as well as to calibrate the detector. Simulations were built separately on the C++-based Monte Carlo physics simulation toolkits GEometry ANd Tracking (Geant4) and Geant4 Application for Tomographic Emission (GATE), with GATE being built upon Geant4 specifically for medical imaging systems. For optical physics simulations, Geant4 is better equipped, whereas GATE is more effective for complete imaging systems with approximated optical processes. The Geant4 simulation will facilitate efficient calibration of the detector, reduce calibration time, and enable rapid testing of design modifications. The GATE simulation, while currently ineffective for optical processes, can be useful when modeling the full multidetector PET system after the detector module construction has been optimized. Additionally, GATE's source code can be edited to restore optical physics functionality. Lastly, the TOol for Particle Analysis and Simulation (TOPAS) is another Geant4-based simulation tool, built specifically for modeling radiotherapy systems. While PET is not a radiotherapy system, TOPAS can still prove useful in modeling the physics processes common to both, such as radioactive decay, as well as the added ease of use to detector construction and user interface that TOPAS adds.

Title: Investigating MRTFA and CaMKIIδ2 Dynamics in Saphenous Vein Smooth Muscle Cells

Authors: Lakshmi Surada, Diane Singer, Liyan Sun, Harold Singer, Roman Ginnan

Abstract: Arteriovenous fistulas (AVFs) are essential for hemodialysis access, yet nearly 60% fail to mature due to maladaptive venous remodeling. A key contributor to this process is the phenotypic switching of vascular smooth muscle cells (vSMCs) from a contractile state to a matrix-remodeling state. Myocardin-related transcription factor A (MRTFA) and CaMKIIδ2 are both known to play roles in cellular stress responses, but their interaction has not been directly visualized in human vein cells. This study aimed to determine whether MRTFA and CaMKIIδ2 interact in vSMCs under AVF-like stress conditions and to characterize their subcellular dynamics. Primary human saphenous vein smooth muscle cells were cultured and exposed to serum starvation, serum re-stimulation, and TGF-β stimulation. A proximity ligation assay (PLA) using MRTFg8 and C26 antibodies, along with appropriate controls, was employed to detect MRTFA–CaMKIIδ2 interactions. Western blotting was used to assess protein localization over time and changes in expression under stress conditions. The results demonstrated stress-dependent increases in MRTFA–CaMKIIδ2 proximity, as observed through PLA and immunoprecipitation, compared to controls, while Western blotting confirmed antibody specificity.

Title: Investigating Spatial and Temporal Activation of α3β1in Tumor and Wound Microenvironments

Authors: Lakshmi Yannam, Giesse Albeche Duarte, Whitney M. Longmate, C. Michael DiPersio

Abstract: Chronic wounds remain a significant clinical burden, affecting over 6.5 million people in the United States and leading to prolonged tissue damage, infection risk, and high healthcare costs. Effective repair requires tightly regulated keratinocyte migration and extracellular matrix (ECM) remodeling, processes mediated in part by the integrin α3β1. Prior studies from our group have shown that α3β1 regulates matrix metalloproteinase-9 (MMP-9), a protease essential for ECM degradation and wound closure. However, the spatial and temporal regulation of α3β1 activation in healing wounds has not been defined, largely due to a lack of reagents that distinguish active from total integrin populations in vivo. In an attempt to overcome this limitation, our collaborators developed Ab74A100g (or A100), a novel monoclonal antibody that appeared to recognize the activated form of α3β1. We hypothesize that α3β1, which is expressed constitutively in resting skin, is activated in healing wounds, and that the activated form of the integrin co-localizes with MMP-9 during early healing. We further hypothesize that α3β1 activation is spatially restricted within the wound epidermis and exhibits dynamic, phase-specific regulation. Using a mouse model of inducible epidermis-specific α3 knockout (α3eKO), we will combine RNAscope in situ hybridization with A100-based immunofluorescence (IF) to (1) determine whether active α3β1 co-localizes with MMP-9 in cutaneous wounds, (2) define temporal changes in α3β1 activation across the inflammatory, proliferative, and remodeling stages of repair, and (3) compare α3β1 activation in wounds and skin tumors. This work will provide the first spatial and temporal map of α3β1 activation during wound healing, which may inform therapeutic strategies to enhance wound healing or treat chronic wounds.

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