INNOVATIVE RESEARCH SYMPOSIUM

A Celebration of Student and Faculty Scholarship, Collaboration, and Innovation

Thursday, April 23, 2020

Fairfield University

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THURSDAY, APRIL 23, 2020

Online Schedule

All Day

Download the eBook and Watch Recorded Presentations from Select Students

Engage with Students on Quip

Students, faculty, staff, and community members with a Fairfield NetID are invited to engage with students via Quip, browse projects, and leave comments for students to participate in online dialogues about their research.

2:00 - 4:30 p.m.

Join Live Faculty-Moderated Zoom Sessions Featuring

Student Research Presentations from:

Sigma Xi

Egan School of Nursing and Health Studies

Undergraduate Research and Independent Projects

Students, faculty, staff, and community members with a Fairfield NetID are invited to watch students present their research and engage in faculty-moderated Q&A.

4:30 - 5:00 p.m.

Celebration of Innovation with Pilobolus Dance Company

Join us for a concluding celebration that will embody the innovation, creativity, and imagination of this year's Innovative Research Symposium with Pilobolus Dance Company.

Welcome and Appreciation

Dear Colleagues, Students, and University Guests:

Welcome to the 2020 Innovative Research Symposium at Fairfield University! Innovation is a spark of imagination igniting the pursuit of answers to questions that drive our intellectual curiosity. Fairfield students collaborate with faculty mentors to develop creative research projects that extend from the classroom to the world. Whether examining cells under a microscope or learning about girls' education in The Gambia, our student research contributes to the understanding necessary to address today's pressing societal issues.

The Innovative Research Symposium showcases the rich diversity of student research from across academic disciplines. Capstone Nursing and Health Studies projects, research by our Sigma Xi students in the natural sciences, mathematics, engineering, and psychology, and undergraduate, graduate, and independent projects are featured. We invite you to engage with the exciting scholarly endeavors of nearly 300 undergraduate and graduate students that spotlight the wide range of student-faculty research at the core of Fairfield's academic mission. Exploring these innovative projects joins us together in reaching for the *magis*, the more, to advance the common good through the pursuit of knowledge.

This year the Innovative Research Symposium moves online in response to the current global context. In doing so, we exhibit the capacity of our community to adapt quickly and creatively, turning challenges into opportunities. Our innovative use of Quip, Zoom, the eBook, and videos showcase Fairfield University's firm grounding in the online environment. Most importantly, we provide our students the opportunity to interact and engage with the Fairfield community about their research projects, many of which are years in the making. We join together at a time when the strength of our bond as a community is so important as we forge into the future.

We are grateful for the generous support of so many from our Fairfield community who contributed to making this event such a success. We offer our appreciation to the many donors whose gifts enable Fairfield University students to pursue their academic goals and take advantage of opportunities arising from collaboration with our outstanding faculty. A special note of appreciation is extended to each faculty mentor who devoted their time and energy to our students. We deeply appreciate our Zoom session faculty moderators. We especially recognize our graduating seniors at this unprecedented time that disrupted a unique moment in their lives. Special recognition also goes to Kimberly Baer, Tasha Mehne, Jay Rozgonyi, Debbie Whalley, Allison Wade, Casey Timmeny, Jill Smith-Carpenter, Kraig Steffen, Kathy Saracino, Deborah List, Melissa Quan, Dayna Cavanaugh, Kathleen Freis, David Schmidt, Pilobolus, and all those who assisted in making this event possible. Most especially, we thank the students who inspire us every day with their joy for learning.

Congratulations to our student presenters and faculty mentors! Thank you for joining us on this day of academic celebration.

Jocelyn M. Boryczka, PhD

Associate Vice Provost for Scholarly, Creative, and Community Engagement

Sigma Xi


SIGMA XI
THE SCIENTIFIC RESEARCH SOCIETY
Fairfield University

Add a Splash of Water: Antecedent Conditions are Significant Indicators of Reservoir Response to River Inflow Events

Teresa Sauer 2020

Faculty Mentor: Jen Klug

https://fairfield.quip.com/Wbu3A0W5uKyP

Abstract:

Lakes are highly valued globally for their hydroelectric potential, food and drinking water resources, and even their recreation potential. Climate change is predicted to increase the frequency of extreme weather events, which may have serious implications for lake ecosystems. River inflow into the lake is driven by precipitation in the watershed, and fluctuations in that inflow have the potential to alleviate or exacerbate water quality concerns in the lake. For example, increased river inflow increases energy input into the lake and therefore water column mixing, which may alleviate periods of hypoxia at the bottom of the lake. However, stimulated algal growth may worsen eutrophic conditions. Algal blooms may decrease in prevalence due to increased water column mixing and equal distribution of nutrients; however, algae bloom growth may also accelerate due to increased nutrient inflow and, in the case of a drought, warmer, more stable surface conditions. The impact of extreme weather events on lakes is complex and multifaceted, yet it is critically important that it is understood moving forward so that responsible management decisions can be made in regard to the lake ecosystem. The present study analyzes the impact of river inflow events on Lake Lillinonah in Newton, CT in wet and dry years to assess the potential impact of storms on lake health.

Technical Abstract:

Climate change is projected to significantly increase the frequency of extreme weather events, including drought and extreme precipitation globally. These changes have serious implications for lake hydrology. River inflow into the lake is driven by precipitation in the watershed and fluctuations in that inflow have the potential to alleviate or exacerbate water quality concerns in the lake. For example, increased river inflow increases energy input into the lake and therefore water column mixing, which may alleviate periods of hypoxia at the bottom of the lake or stimulated algal growth may worsen eutrophic conditions. Algal blooms may decrease in prevalence due to increased water column mixing and equal distribution of nutrients; however, algae bloom growth may also accelerate due to increased nutrient inflow and, in the case of a drought, warmer, more stable surface conditions. The impact of extreme weather events on lakes is complex and multifaceted, yet it is critically important that it is understood moving forward so that responsible management decisions can be made in regard to the lake ecosystem. This study analyzes the effect of pulses of inflow on indicators of water quality in Lake Lillinonah, a reservoir on the Housatonic River in CT. Our analysis is novel in that it defines pulses of inflow in terms of deviation from the baseline of a given year rather than an absolute minimum value which must be achieved. This allows us to analyze the impact pulses in inflow within a given season on indicators of water quality such as temperature, dissolved oxygen, and water column stability. We found that antecedent conditions in the lake were most significant in predicting Lillinonah's response to the discharge events.

Analysis of Electro-Scattering Off a Deuteron Target

Justin Dickovick 2020

Faculty Mentor: Angela Biselli

Supported by McGualey Family Faculty Student Research Fund

https://fairfield.quip.com/I84RAt3YToWw

Abstract:

Unlike how we learned in high school chemistry, the building blocks of matter are not protons, neutrons, and electrons. Instead, these elementary particles are made up of quarks. However, measuring quarks is not as easy as holding up a ruler to them or looking at them through a microscope. Instead, we have to measure them indirectly using the deeply virtual Compton scattering reaction. This reaction allows us to get a glimpse of how quarks are arranged in nucleons like protons and neutrons. Previous studies have been done on the quark distributions of those particles, but never before have the quark distributions of the deuteron, which is essentially a proton and a neutron fused together. In this project, I use data from Jefferson Lab's Run Group B in order to investigate the quark distributions of the deuteron and how they differ from those of the particles that make it up.

Technical Abstract:

One of the biggest questions in physics at the moment is: what is the quark structure of the nucleons that make up the matter with which we are familiar? Specifically, can we describe the measurable characteristics of nucleons in terms of their most basic building blocks? This question can be answered by measuring generalized parton distributions (GPDs), which are correlated momentum-space distributions of quarks in nucleons. GPDs can be studied by looking at the deeply virtual Compton scattering (DVCS) reaction, which consists of an electron scattering off a nucleon, resulting in the production of a photon, the scattered electron, and the scattered nucleon. Jefferson Laboratory, a medium energy particle accelerator laboratory in Newport News, VA, has a large experimental program devoted to studying DVCS on protons, neutrons, and deuterons using an electron beam up to 10.6 GeV of energy. In this poster, I present the analysis of coherent DVCS for the deuteron channel. In particular, I describe the identification of particles, steps to select the exclusive e d - e' d' y reaction, and the procedure to extract the beam spin asymmetry, which is sensitive to the DVCS process and GPDs of the deuteron.

Articulating Mount for Portable Ultrasound Probe

Amy Caplan 2020, Brian Gozzo 2020, Connor Hehn 2020, Natalia Velasquez 2020, Peter Wihbey 2020

Faculty Mentor: Susan Freudzon

Supported by Hardiman Scholars

https://fairfield.quip.com/CIKfAXT3HI8P

Abstract:

The use of portable ultrasound devices has increased recently due to its convenience and cost benefits. Portable ultrasound probes cost approximately $2,000 and fit in a pocket compared to large five-foot-tall ultrasound systems used in hospitals that cost approximately $40,000. The size and cost of portable ultrasound benefit low-income countries globally where many rural healthcare workers lack access to imaging technology. One area where portable ultrasound has the potential to help is with ultrasound-guided procedures. These are procedures in which a clinician uses ultrasound images to visually guide needle placement to specific locations. This is useful for obtaining needle biopsies, placing intravenous catheters, removing fluid from lungs, injecting joints and more. One challenge with using portable ultrasound for ultrasound-guided procedures is that two hands are required; one hand is used to hold the ultrasound probe and the other hand holds the viewing device. The goal of this project is to design an articulating mount to secure a mobile phone to the ultrasound probe. This mount will allow the user to scan with one hand and use the other hand to insert the needle and perform the procedure. The clinician typically holds the ultrasound probe in two positions oriented 90 degrees from one another. The screen must be able to rotate between these two 90-degree positions. It must be easy to rotate the phone and the phone must be held close to the probe to reduce forces that unbalance the probe.

Technical Abstract:

The Butterfly iQ Ultrasonic Probe allows for medical imaging on-the-go. Data is gathered using the ultrasound probe and an image is displayed on a connected viewing device, commonly an iPhone. The size and cost of portable ultrasound has benefited low-income countries globally where many rural healthcare workers previously had no access to imaging technology. Portable ultrasound has the potential to help with ultrasound-guided procedures in which a clinician uses ultrasound images to visually guide needle placement to specific locations. One challenge with using portable ultrasound for ultrasound-guided procedures is that two hands are required; one hand is used to hold the ultrasound probe and the

other hand holds the viewing device. The goal of this project is to design an articulating mount to secure a mobile phone to the ultrasound probe. This mount will allow the user to scan with one hand and use the other hand to insert the needle and perform the procedure. The mount will allow the screen to rotate to enhance visibility from a variety of positions. Our team currently has a working model (image below) and we plan to spend the upcoming months improving our design and transitioning into the testing phase. By April 2020, our team will have a finished mount which will allow for 90 degrees of rotation. The phone will be held close to the probe to reduce forces that unbalance the probe.

Building an Ultrasonic Theremin Using a Raspberry Pi

Meghan Bruni 2020

Faculty Mentor: Christopher Staecker

https://fairfield.quip.com/4KmrA22N8iS6

Abstract:

Although seemingly distinct topics, coding and music both involve the same analytical processes of recognizing and manipulating patterns. I interwove coding and music and created an ultrasonic theremin using a Raspberry Pi microcomputer. When playing a theremin, the thereminist moves one hand along one antenna to control the volume, and moves another hand along the second antenna to control the pitch. I connected two ultrasonic sensors to a Raspberry Pi model 3 and created a theremin. A typical theremin has two antennas, one controls the pitch, the second controls the volume. Rather than using antennas, I used two ultrasonic distance detectors. The distance data from the two sensors on my theremin is sent to my python code. The python code then converts the distance data into two coordinates [(pitch), (volume)] sent to the Sonic Pi code. The Sonic Pi then plays the sound through a speaker. The notes on my theremin correspond to a pitch in Sonic Pi; 60 corresponds to the 4th octave C. The volume on my theremin is loudest when the object detected by the volume sensor is closest. I attached the Raspberry Pi, along with the two distance detectors, and a speaker into a 6" x 12" piece of wood. I attached two dowels perpendicularly to the base, with markings on one dowel that correspond to notes, and markings on the second dowel for volume.

Catalytic and Electrochemical Characterization of Self-Assembling Nucleopeptides

Sabrina O'Donnell 2020, Madison Gilbert 2020, Natalia Nawrocka 2020

Faculty Mentors: Amanda Harper-Leatherman, Jillian Smith-Carpenter

Supported by Hardiman Scholars

https://fairfield.quip.com/KB2bAu5ggJ0a

Abstract:

The synthetic ease and modularity of peptide synthesis has allowed for the development of peptide based materials. These materials have been applied to a wide variety of fields ranging from biomedical applications to nanoelectronic devices. Currently, there is a need to design and characterize novel modifications to self-assembling peptides in an effort to increase the diversity of supramolecular architectures available for future applications. To this end, our research laboratory has developed a self-assembling nucleopeptide. We hypothesize that these self-assembling nucleopeptides will have good catalytic and electrochemical properties.

Technical Abstract:

The synthetic ease and modularity of peptide synthesis has allowed for the development of peptide based materials. These materials have been applied to a wide variety of fields ranging from biomedical applications to nanoelectronic devices.

Currently, there is a need to design and characterize novel modifications to self-assembling peptides in an effort to increase the diversity of supramolecular architectures available for future applications. To this end, our research laboratory has developed a self-assembling nucleopeptide that combines the sheet assembly of peptides with G-quartets from guanine based nucleic acids. The nucleopeptide, gs-GKFF-OH, was synthesized using solid-phase peptide synthesis, purified by HPLC, and then assembled into nanofibers. The assemblies were structurally characterized via FTIR and TEM analyses. Additionally, the nucleopeptide was co-assembled with a hemin modified construct, hemin-(FF-OH)2, in efforts to design a supramolecular catalyst based on the G-quartet/hemin system. We hypothesize that these self-assembling nucleopeptides can take advantage of the robust sheet driven assembly process and utilize the G-quartets for emergent catalytic and electrochemical properties. The catalytic potential of the assemblies was characterized by an ABTS assay. The electrochemical properties of the assemblies were characterized through the cyclic voltammetric and chronoamperometric response of uric acid.

Childhood Trauma and Social Cognitive Deficits in Individuals with Intimate Partner Violence and Borderline Personality Disorder

Christina Maher 2020, Julia Karnes 2021, Amanda Ekkers 2021

Faculty Mentor: Margaret McClure

https://fairfield.quip.com/CQhoAKaZr0OV

Abstract:

This study investigates the relationship between childhood trauma, internal experiences, and external outcomes. Participants presenting Borderline Personality Disorder symptoms, Intimate Partner Violence victims, and healthy controls were examined. Groups completed the Childhood Trauma Questionnaire, the Reading of the Mind and the Eyes Test, and the Movie for the Assessment of Social Cognition. The results suggest a relationship between childhood maltreatment, social cognitive deficits, and presence of BPD and IPV victimization.

Technical Abstract:

The current study investigated the relationship between childhood trauma, social cognitive errors, Borderline Personality Disorder (BPD) symptoms, and Intimate Partner Violence victimization (IPV). As part of two large, ongoing studies, participants with BPD, IPV Victimization, and controls completed a battery that included the Childhood Trauma Questionnaire (CTQ), and two measures of social cognition, the Reading of the Mind and the Eyes Test (RMET), and the Movie for the Assessment of Social Cognition (MASC). Participants with BPD were recruited from an academic medical center, while IPV participants and controls were recruited from the General Psychology Participant pool at a suburban university. Overall, accuracy scores on both measures of social cognition were positively correlated with one another ($r=.38$, $p<.05$), and RMET accuracy was negatively correlated with CTQ emotional abuse ($r=-.32$, $p<.05$). BPD pathology was positively correlated with CTQ emotional abuse ($r=.18$, $p<.05$) and emotional neglect ($r=.19$, $p<.05$), while IPV was positively correlated with CTQ physical abuse ($r=.39$, $p<.05$). BPD patients reported significantly more CTQ emotional abuse ($F(2, 152)=24.8$, $p<.001$), physical abuse ($F(2, 152)=10.8$, $p<.001$), emotional neglect, ($F(2, 152)=33.8$, $p<.001$), physical neglect ($F(2, 152)=24.4$, $p<.001$), and sexual abuse ($F(2, 152)=8.4$), $p<.001$), than both controls and IPV participants ($p<.01$). Additionally, IPV participants demonstrated significantly worse accuracy on the RMET ($F(2, 32)=3.4$, $p=.04$), than both groups, although no between group differences were found for MASC performance. Overall, the results suggest a relationship between various types of childhood maltreatment, deficits in social cognition, and manifestation of BPD and IPV victimization. Implications of these findings can be used to further understand the relationships between childhood trauma, social cognition, and maladaptive behavior.

Comparing MCF7 Cell Adhesion and Viability on PLA Scaffolds Generated by Chemical Foaming vs. Microwave Foaming

Brenna McAllister 2021

Faculty Mentor: Shelley Phelan

https://fairfield.quip.com/63SkAabb6bNO

Abstract:

This study focused on growing human breast cancer cells on Polylactic Acid scaffolds (PLA) generated by chemical and microwave foaming to compare the cell attachment to the material and the viability of the cells while attached. The breast cancer cell line are adherent cells, meaning they must attach to a surface for growth. The foaming process of the PLA material results in a more porous surface, allowing for better cell attachment on the scaffold. Chemical and microwave foaming results in PLA scaffolds with different porous surfaces, which could affect the cell attachment. This research focused on determining the optimum foaming process that results in the highest cell adhesion and cell viability. This optimum foaming process would then be utilized in future studies to observe cell growth in a more realistic 3D environment and to incorporate oleuropein treatments to the human breast cancer cells while attached to the material. This could have useful applications for targeted drug treatments and tissue engineering.

Consumption of Different Egg-Based Diets Impacts Body Composition in Young Healthy Adults

Julia Greco 2021, Dominika Mis 2022, Courtney Campbell 2020, Allison Sloan 2019

Faculty Mentor: Catherine Andersen

https://fairfield.quip.com/gabsA4HczCuE

Abstract:

The different nutrient components contained in whole egg and egg-whites are associated with satiety and post-exercise skeletal muscle synthesis. Therefore, our research study has been investigating the effects of different egg-based diets, whole egg vs. egg-free vs. egg whites, on different clinical body markers. In order to conduct this study, a total of 26 young healthy adults were recruited for the randomized study. The participants were required to be egg-free before each 4-week egg period, followed by a 4-week period of ingesting 3 whole eggs or egg-whites, and another 4-week period consisting of the other egg option. Additionally, subjects recorded their food intake and physical activity for a 5-day period. Afterwards, fasting serum lipids were collected to measure cholesterol, glucose, and different protein markers. As a result of this study, we found several indictors that different egg-based diets are associated markers of diet quality and body composition. For instance, whole egg diets were accompanied by a greater intake of cholesterol and total, saturated, and monosaturated fats. In addition, compared to the egg-white diet, the whole egg diet was associated with greater vitamin D intake and a greater body fat mass (+3.5%). Conversely, greater increases in body weight (+1%) and body mass index (+1%) were observed during the egg white period as compared to the whole egg and egg-free diet period. No changes in skeletal muscle mass of protein markers in blood were affected. Overall, our findings indicate that different egg-based diets are associated with changes in body composition in young healthy adults.

Determining the Importance of Exosites in Insulin-Degrading Enzyme

Kierstin Jones 2021

Faculty Mentor: Jillian Smith-Carpenter

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/i7A4A2MAlzzV

Abstract:

Insulin-degrading enzyme (IDE) is a zinc metalloprotease that occurs naturally in the human body. While its main function is to degrade insulin by cleaving the peptide at specific residues, IDE has also shown an inclination to cleave glucagon, amylin, and the amyloid-beta (AB) peptide. Previous research shows that IDE is selective when it comes to the rates of proteolysis among its substrates. This may be due to the position of exosites, or secondary binding sites, near IDE's active site. The amino acids positioned near these exosites are key to the function of this enzyme. We used the inhibitor 6bk and short chains of known IDE substrates insulin and (AB) to establish a reliable method for determining the kinetics of these proteolyses in the presence and the absence of the inhibitor.

Developing a Heat Transfer Experiment for Integration into the BSME

Justin Chi 2020, Lorenzo Giordani 2020, Nicholas Junquet 2020, Quinn Rozanitis 2020

Faculty Mentor: Shahrokh Etemad

Supported by Hardiman Scholars

https://fairfield.quip.com/Te4bApaR0Vt3

Abstract:

Existing educational commercial experiments are rather expensive. We developed an educational convective heat transfer laboratory experiment to educate undergraduate mechanical engineering students the concept of convective heat transfer. The experiment consists of a Stainless-Steel 304 electrically heated rod within a wind tunnel. This experiment involves the study of forced convective heat transfer through a heated stainless steel rod, which enables students to gain a clear understanding of the flow over a cylindrical surface from an internal electric source. The experiment demonstrates the importance of several key concepts including one-dimensional and steady-state heat transfer. In the beginning phases of our project design, extensive research regarding the heating cartridge was conducted. The cartridge consists of the appropriate size, threading, and maximum temperature compatible with the wind tunnel and safe operation in the laboratory room. To gain a better understanding of the design, concept drawings were first implemented. Following the drawings, a SolidWorks assembly was created that illustrated our idea into a 3D model with accurate detail. The heating mechanism was ensured to be uniformly heated to a specific temperature. For this reason, thermocouples were assembled and attached to the heating cartridge at various locations. A professional computer numerical control, CNC, machine was used to design and construct a plate to hold the heating cylinder within the wind tunnel. In addition, a thermocouple readout, ammeter, voltmeter, and power supply were installed to measure the temperature and power into the cylinder. The amount of voltage inputted into the power supply was limited to allow for a safe maximum heating cartridge temperature. Complete operation of the experiment was conducted to ensure all the components were compatible and functioned properly. We had to reassure that this experiment can be carried out successfully with minimal errors for the most optimal results. Along with the lab experiment, additionally a lab manual was created to ensure that the experiment is executed safely and successfully. The lab manual and necessary equipment were reviewed by a group of mechanical engineering students to ensure that others could perform the experiment successfully. The lab manual includes procedures, diagrams, expected results, and an error analysis that will ensure the validity of the experiment.

Technical Abstract:

Existing educational commercial experiments are rather expensive. We developed an educational convective heat transfer laboratory experiment to educate undergraduate mechanical engineering students about the concept of convective heat transfer. The experiment consists of a Stainless-Steel 304 electrically heated rod within a wind tunnel. This experiment involves the study of forced convective heat transfer through a heated stainless steel rod, which enables students to gain a clear understanding of the flow over a cylindrical surface from an internal electric source. The experiment demonstrates the importance of several key concepts including one-dimensional and steady-state heat transfer. In the beginning phases of our project design, extensive research regarding the heating cartridge was conducted. The cartridge consists of the appropriate size, threading, and maximum temperature compatible with the wind tunnel and safe operation in the laboratory room. To gain a better understanding of the design, concept drawings were first implemented. Following the drawings, a SolidWorks assembly was created that illustrated our idea into a 3D model with accurate detail. The heating mechanism was ensured to be uniformly heated to a specific temperature. For this reason, thermocouples were assembled and attached to the heating cartridge at various locations. A professional computer numerical control, CNC, machine was used to design and construct a plate to hold the heating cylinder within the wind tunnel. In addition, a thermocouple readout, ammeter, voltmeter, and power supply were installed to measure the temperature and power into the cylinder. The amount of voltage inputted into the power supply was limited to allow for a safe maximum heating cartridge temperature. Complete operation of the experiment was conducted to ensure all the components were compatible and functioned properly. We had to reassure that this experiment can be carried out successfully with minimal errors for the most optimal results. Along with the lab experiment, additionally a lab manual was created to ensure that the experiment is executed safely and successfully. The lab manual and necessary equipment were reviewed by a group of mechanical engineering students to ensure that others could perform the experiment successfully. The lab manual includes procedures, diagrams, expected results, and an error analysis that will ensure the validity of the experiment.

Development of Polarized Quadrature Tomographic Microscope

Barak Davidi 2020

Faculty Mentor: Jonathan Stott

https://fairfield.quip.com/vWeVAU0TOlbm

Abstract:

Currently, there are limitations in the field of microscopy in imaging transparent samples. The traditional quadrature tomographic microscope (QTM) combines conventional microscopy with wave interference to measure both the amplitude and phase of an electric field simultaneously. There are critical applications for these measurements in imaging nearly transparent samples because changes in the phase of an electric field show things we cannot see with conventional microscopy, and changes in the amplitude of the electric field provide structural and spatial information. This study expands the measurement capabilities of traditional QTM by adding an element to the apparatus and enabling measurements of the direction of the electric field. Where the traditional QTM obtained measurements of the magnitude of the electric field, Polarized QTM would obtain measurements of the magnitude and direction of the electric field. Thus, properties of samples inaccessible in prior microscopic techniques would be made visible and quantifiable in this expanded setup. The Polarized QTM could be utilized to image biological samples such as collagen fibers found in cartilage and corneas.

Technical Abstract:

Currently, there are limitations in the field in microscopy in imaging transparent samples. The traditional quadrature tomographic microscope (QTM) combines conventional microscopy with interferometry to measure both the amplitude and phase of an electric field simultaneously. QTM is based on a modified Mach-Zehnder interferometer layout. There are critical applications for these measurements in imaging nearly transparent samples because phase shifts are indicative of changes in the sample's index of refraction, and amplitudes provide structural and spatial information. This study expands the measurement capabilities of traditional QTM by adding a quarter wave plate in the sample beam and enabling polarization measurements. Where the traditional QTM obtained measurements of the scalar electric field, Polarized QTM would obtains measurements of the vector electric field. Thus, properties of that sample inaccessible in prior microscopic techniques would be made visible and quantifiable in this expanded setup. The Polarized QTM could be utilized to quantity the birefringence of samples, where the material's index of refraction has a polarization dependence. Optically anisotropic

biological materials, such as collagen fibers found in cartilage and corneas, are of particular interest for polarization measurement.

Does Therapy Dog Intervention Affect Stress Levels of Fairfield University Nursing Students?

Ryan Brennan 2020

Faculty Mentor: Brian Walker

https://fairfield.quip.com/aiRtA2RBkd58

Abstract:

This project will observe the effects of therapy animal interaction on Fairfield University Nursing students. Sample collection was completed on days when students had tests, had interactions with the therapy dog, or a normal control. We can use the saliva of the students in an experimental method called an ELISA to compute absorbance values which correlate to the amount of stress hormone, cortisol, which is circulating in the students. In addition to the "biochemical" measurements, surveys were also conducted to provide a psychological basis of the study. Results showed that students had higher amounts of cortisol on test days, and the lowest amounts of cortisol on days when they saw the dog. Additionally, survey data reported similar results, as students' cortisol levels were inversely related with relaxation levels, showing that students can sense accurately how stressed they are on a given day.

Technical Abstract:

The benefits of therapy animals have been well studied in populations with emotional difficulties, but few studies have examined benefits of therapy animals on "stable" populations. We investigated if there was a benefit of a therapy dog for college students (i.e. "stable" population) by measuring cortisol levels (a stress hormone) and surveying personal feelings. Nursing students were tested for their cortisol levels on separate days under various conditions: before and after animal assisted therapy, directly prior to an exam, two hours before an exam, and a day with no animal intervention or exams. We predicted that interaction with the therapy dog should result in students feeling calmer, having lower cortisol levels than the sessions without the therapy dog. Additionally, it was predicted that the samples collected on the day with the exam directly after the session would be under the most distress. Data analysis revealed a higher baseline cortisol amount in students on days of which they had exams, while the day which the students saw the dog displayed lower levels of cortisol. Additionally, an inverse relationship was observed when analyzing cortisol levels and relaxation levels from the survey. These findings did support our hypothesis, but could be additionally bolstered by a large sample size or stricter adhesion to experimental guidelines, such as fluid intake during sessions.

Eddy Current Passive Damping Utilizing a Travel Multiplier

Emmett Godfrey 2020, Robert Gonfiantini 2020, John Callanan 2020, Turutana Tekaata 2020

Faculty Mentor: Andrew Judge

Supported by Hardiman Scholars

https://fairfield.quip.com/8ZpUAoeW90bf

Abstract:

Whether from the hum of a machine or the effect of a passing car, vibrations are abundantly present in everyday life. While vibrations, especially those that may have smaller amplitude, may seem minuscule or negligible in the big picture, even the smallest of vibrations can have drastic repercussions on any system if they are disregarded by designers. Two main ways to effectively damp - or reduce - these vibrations are Active and Passive Damping Systems. Active damping requires

continual power input and feedback loops which can be very complex. Passive Damping mechanisms, on the other hand, require little-to-no input energy and are able to oppose and damp a comparable range of unwanted movement. Eddy Current passive damping is one such damping strategy which can be highly beneficial in counteracting these vibrations. This is a process by which energy of motion is transformed into electrical currents and then to harmless heat that can be easily dissipated. The Eddy Currents work practically to slow down objects, which can be useful when trying to counteract unwanted motion such as vibrations. Another component of our project that allows for increased effectiveness is our combination of Eddy Current damping with a travel multiplier. Typically, the small distances inherent for vibration restricts the effectiveness of Eddy Currents. The addition of a lever into the system allows for distance to be increased, and therefore increases effectiveness. The lever works across a magnetic array to increase use in systems otherwise too small for a single magnet setup. This would make Eddy Current damping feasible in more precise applications.

Technical Abstract:

Two main ways to effectively damp - or reduce the amplitude of - these vibrations are Active and Passive Damping. Active damping requires continual power input which can be very complex. Passive Damping mechanisms, as opposed to more expensive Active Damping systems, require little-to-no input energy and are able to oppose and damp a wide range of unwanted movement. Eddy Current passive damping is one such passive damping strategy which can be highly beneficial in counteracting these vibrations. This is a process by which kinetic energy is transformed into electrical currents and then to heat to help dissipate energy within a system. As a non-magnetic conductor moves through a magnetic field, the magnetic field induces a current in the conductor. This current, called an Eddy Current, gets its energy directly from the kinetic energy of the movement, thereby lowering the relative velocity. The result of the magnetic field interacting with the conductor creates a resistive force that directly opposes any relative motion in the system. Due to the resistance inherent in the structure of the conductive material, the current quickly dies out and the Eddy Currents are dissipated into heat. Another component of the project that allows for its increased effectiveness as a damping system is the combination of Eddy Current damping with a travel multiplier in the form of a lever. Typically, while using Eddy Current damping to decrease vibrations, there is a limit of how much energy can be extracted due to the displacement in question. As the energy that Eddy Currents remove is a function of the distance traveled by the conductor across the magnet, the small distances inherent for vibration at a diminutive scale hampers the effectiveness of a passive damping system. The lever allows greater magnetic frequencies and enables a magnetic array to be used in systems otherwise too small for a single magnet. This would make Eddy Current damping feasible in more applications. While Eddy Current damping has been used in the past to damp unwanted motion, the combination of a travel multiplier to increase the displacement of vibration allows for Passive Damping to be tested in this specific application.

Effect of Oleuropein on K562 Cells

Chaza Khatib 2020, Sara Wells 2021

Faculty Mentor: Shelley Phelan

https://fairfield.quip.com/1GjPAwSbqeNL

Abstract:

This research project investigated the effect of an antioxidant called Oleuropein on K562 cells. Oleuropein is a type of phenolic bitter compound that can be obtained from green olive skin, seeds, leaves, and oil. The K562 cell line is a leukemia cell line derived from a 53-year old female chronic myelogenous leukemia patient. These cells cause blood-forming organs (like the bone marrow) to produce increased numbers of immature leukocytes. Based on previous research that proved that Oleuropein inhibits the density and viability of the K562 cells, this project investigated the specific cellular pathways impacted by this substance. This was done by treating K562 cells with Oleuropein for 4, 8, and 24 hours and identifying the presence of specific proteins of interest in those treated groups in addition to a group of cells that lacked the Oleuropein treatment. The proteins of interest were Nrf2 and NF-kB, and they were detected using specific antibodies. The results confirmed the success of detecting these proteins in K562 cells and the potential effect of Oleuropein on these proteins in the cells. Further research is needed to confirm whether or not Oleuropein affects the levels of these proteins in K562 cells and if that is contributing to the inhibition of K562 cell density and viability in response to the Oleuropein treatment.

Technical Abstract:

Oleuropein is a type of phenolic bitter compound that can be obtained from green olive skin, seeds, leaves and oil. Previous studies have shown that Oleuropein reduces the growth and viability of K562 cells. In our lab, we showed that 200uM Oleuropein treatment of K562 cells results in a significant inhibition of growth and viability, and a toxicity due to apoptosis. Based on such results, our research investigated the cellular pathways affected by oleuropein and the effect this substance may have on Nrf2 and NF-kB, two transcription factors important in cellular response to oxidative stress. To test this, an experiment was set up to measure the density and viability of K562 cells 4 hours, 8 hours, and 24 hours after treatment with 200uM oleuropein, as compared to an untreated control group. The control and treated groups were then used to extract proteins, generate blots, and run western blots to detect the levels of the proteins of interest in the different experimental groups. Since both transcription factors translocate to the nucleus when activated, we also extracted protein from nuclear extracts to analyze by western blot. Our results confirmed a decrease in both cell proliferation and percent viability of K562 cells treated with Oleuropein. The western blots generated demonstrated that we were able to detect both target proteins in K562 cells successfully using specific antibodies. Future research will include measuring the nuclear expression of Nrf2 and NF-kB in Oleuropein-treated cells, and possibly investigate other proteins that may be induced in response to this treatment.

Effects of Temperature on the Feeding Patterns of Tautog

Caitlin Oberempt 2020, Sidney Sarfo 2020, Kamryn Jebb 2020

Faculty Mentor: Shannon Gerry

https://fairfield.quip.com/vbUBA4iPUh6q

Abstract:

Understanding the impacts of temperature on feeding patterns is important to appreciate the thermal effects on whole organism performance. In the present study, we determine if variation in water temperature changed the feeding mechanisms of fish. Our study species was the Tautog (Tautoga onitis), which can be found along the eastern coast of North America in waters that range from 5C to 20C. To examine feeding, fish were acclimated at either 10C, 25C, and 28C for four weeks. After the acclimation period, high-speed video was used to record feeding events. Tautog were fed crabs and sand worms, their typical prey in the wild. Videos were analyzed to see if temperature affected prey capture. This data has important implications for species management because the warming of Long Island Sound will impact the seasonal distribution and activity of these fish.

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Empathy and Burnout

Danielle Minieri 2021, Megan Quirk 2020, John Dolan 2020

Faculty Mentor: Michael Andreychik

https://fairfield.quip.com/AJJXAJWrN9YW

Abstract:

Those in helping occupations, such as nursing or therapists, are especially likely to experience job-related burnout. This may be due, in part, to the fact that these helpers regularly empathize with the negative emotions of those they care for, a process termed negative empathy. But, recent correlational research suggests that when caregivers also make an effort to empathize with their clients' positive emotions--a process termed positive empathy--they show lower levels of burnout. Our study aims to provide experimental evidence regarding the potential for positive empathy to decrease burnout. Participants watched a video interview ostensibly of a first year college student (actually an actor) discussing her difficulties adjusting to college. Before watching the interview, participants were told to focus on the girl's positive emotions only, negative emotions only, both her negative and positive emotions, or to remain objective. After watching the interview, participants reported their emotions and were given the opportunity to write some advice to help the girl. We predicted that although participants who were instructed to empathize either with the student's negative emotions only or with both her negative and positive emotions would show high levels of helping, students who empathized only with the student's negative emotions would show the most burnout-related emotions.

Technical Abstract:

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Event Memory and Social Cognition: Cognitive Psychology in an Asch Paradigm

Katherine Trykowski 2020

Faculty Mentor: Jessica Karanian

https://fairfield.quip.com/5MYnArbojOUF

Abstract:

This research project aims to narrow the gap between social psychology and cognitive psychology, specifically focusing on how certain, pressured social situations can impact memory both immediately and over time. The cornerstone of this experiment, the original Asch situation, is a landmark case that brought to light the possible impacts of social conformity and "groupthink" on how people interpret and process information. Asch determined that if you are exposed to others with differing opinions or insights to yours, you will adjust your own personal answers to match the majority. This is a landmark finding, but Asch never tested if the participants remembered the situation with the answers of their own personal experience, or the majority's answers. There are few published experiments directly researching social memory in this paradigm. In this experiment, we expose a participant to a short movie clip. Then, immediately after watching the video, the participant is led into a room with recordings of others' responses. After listening to alternative responses, they verbally state answers to various questions about the clip they just watched. Our key manipulation is to vary the confederates'

responses to match a state of high, low, or no coherence. These confederates will either all be saying the incorrect answer, some incorrect or correct answers, or all different answers. Two days later, the participant is asked to complete a survey about what they remember from their in-lab visit. In a broader scope, this research has applications in crime-scene research and eyewitness studies.

Technical Abstract:

This experiment acts as a socio-cognitive bridge study exploring the connection between the classic Asch situation and event memory. The original Asch paradigm concluded that when exposed to other, differing opinions in an arbitrary task, one will change their opinions to match the majority (Asch, 1951). In this study, participants were exposed to a video clip, and then asked to answer questions based on the clip's content in the presence of "alternative answers" provided by recordings of confederates. To ensure maximum exposure to social stimuli, participants provided their answers after hearing all alternative responses. Recordings were varied by coherence levels, with confederates providing similar, different, or mixed answers in their responses. Two days post-lab exposure, participants were to complete a survey answering the same questions presented in the lab. We hypothesize that participants exposed to highly coherent confederate answers will remember the recorded responses rather than the actual facts presented in the video, compared to the different or mixed conditions. Further implications for this research includes eyewitness and event memory studies.

Exploring Dynamic Covalent Chemistry on Supramolecular Structures

Daniel Swanson 2020, Katherine Eighmy 2023, Ramiz Haddad 2020, Grace Dibileo 2022

Faculty Mentor: Jillian Smith-Carpenter

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/TgEvAOYmYoqI

Abstract:

Amyloid peptides are biological molecules which can self-assemble into a variety of supramolecular structures. Changing the pH of the assembly or mutating one amino acid in the peptide sequence can result in the assembly of either fibers or nanotubes. While the procedures to assemble these peptides are well-documented, there is currently little research on the reactivity of the supramolecular surfaces. To explore the surface reactivity, we are strategically incorporating functional groups with dynamic covalent chemistry to determine how the surfaces react with the surrounding environment. One such example of dynamic covalent chemistry coupled to self-assembly involves monitoring a thiol-thioester exchange reaction on peptide nanofiber surfaces. Additionally, we explored the conditions necessary to react C-terminal hydrazides with benzaldehyde to characterize a hydrazone dynamic covalent reaction on the surface of the peptide nanotubes. We further plan to study the ability of peptide nanofibers to facilitate dithioester exchange reaction on the supramolecular surface for biomedical applications in the future. The peptide will be tested for its ability to deliver molecules intracellularly. Together, these nanofiber platforms will extend current biomaterial applications for self-assembling peptides.

Fabrication of a Sublimation Chamber

Ashley Halmans 2020, Kylie Duncan 2020, Dean Martel 2020, Kyle Klaschka 2020, Yen Linh Le 2020

Faculty Mentors: Issac Macwan, Jillian Smith-Carpenter

Supported by Hardiman Scholars

https://fairfield.quip.com/1kxQAvSs7lpp

Abstract:

A Matrix Assisted Laser Desorption Ionization (MALDI) is an instrument that ionizes a biological sample with a laser in order to collect information regarding the mass to charge ratio of the sample. This process takes place in the presence of a chemical matrix that aids the laser in ionizing the sample. Without an even layer of this matrix, ionization will not occur uniformly throughout the entire sample. This causes problems with the quality of images then produced by the MALDI, and therefore decreases the quality of the results. It is difficult for scientists to evenly lay down the matrix onto the sample. Pipetting is often used for simple MALDI techniques but is considered effective with complex imaging. In the literature, it has been shown that sublimation of the matrix onto the sample is an effective solution. We plan to sublimate the matrix onto a microscope slide along with making a 3D computer model. The computer model will allow us to model to simulate the matrix's thickness, evenness, and smoothness applied to the microscope slide as it relates to different pressure, temperature, and amount of matrix within the chamber for improved MALDI mass imaging.

Technical Abstract:

The Matrix Assisted Laser Desorption Ionization instrument (MALDI) uses a chemical matrix in order to better capture a mass to signal ratio from samples. The purpose of the matrix surrounding the sample is to aid in the ionization of the sample. It is important that the layer is even to ensure ionization occurs homogeneously throughout the sample to improve mass spectral imaging (MSI) quality. In the literature, possible solutions improve MS image resolution in comparison to manual pipetting were electrospray, airbrush, and sublimation chamber. Airbrush in an inefficient method due to heterogeneous crystal formation; electrospray and sublimation has experimentally been proven to form homogeneous crystalline layers. We determined that sublimation is the best method for solving this problem due to it being an inexpensive, consistent, and easy to manufacture solution. We plan to create a sublimation chamber in which we can place the microscope slide in order to sublimate an even layer of matrix up onto the slide before placing it into the instrument. We expect that with proper planning and design techniques, we will be able to efficiently create a sublimation chamber that will allow researchers to utilize MALDI to its full capabilities.

Factors to Consider when Assessing Commercial Whale Watching and the Physiological Effects in Humpback Whales (*Megaptera novaeangliae*) in the Gulf of Maine

Nicholas Ryan 2020

Faculty Mentor: Brian Walker

https://fairfield.quip.com/DVPTA8jpsxO8

Abstract:

During Summer 2019, I participated in an internship with the Center for Coastal Studies (CCS) and the Dolphin Fleet Watching Company (DF). This internship bolstered my passion for marine education, conservation, and research. While onboard the DF boats, I educated the public on issues surrounding the ecosystem of the Stellwagon National Marine Sanctuary and the animals inhabiting this body of water. In addition, I recorded data on types of marine mammals (seals and whales), certain fish species (sharks and ocean sunfish (a.k.a. Mola mola), and pelagic birds (gulls, terns, shearwaters, etc). The data collected was transferred to an online database and utilized to design a future study regarding the effect of vessel traffic on the population of whales in the Gulf of Maine. Cetaceans have demonstrated that the presence of heavy vessel traffic may invoke behavioral responses representing both short- and long-term effects. For the purposes of this study, only commercial whale watching vessels will be accounted for, recognizing that other recreational whale watching boats, fishing vessels, and pleasure craft are present most of the time as well. For this initial study analyzing the effects of vessel traffic on humpback whale populations in the Gulf of Maine, the first steps include generating the metrics and obtaining the necessary legal documentation required for gathering data.

Finding Elliptic Islands in Angled Mushroom Billiards

Daniel Swanson 2020, Emily Schofield 2020

Faculty Mentor: Mark Demers

https://fairfield.quip.com/awi3AjiNliJT

Abstract:

Mathematical billiards are important models of dynamical systems from statistical mechanics in which point particles collide elastically with fixed boundaries. This project concerns the class of positively angled mushroom billiards which exhibit a wide range of behavior due to the coexistence of focusing and defocusing effects. To study these billiards, we varied two parameters, the angle of inclination, alpha and the stem width, w, and searched the resulting two-dimensional phase space for periodic orbits surrounded by elliptic islands. Each periodic orbit we found is stable for some range of alpha, 0 < alpha < pi/2, and some stem width, 0 < w < 2. Therefore, each periodic orbit covers some area of the parameter space, and the goal of this research was to find elliptic periodic orbits to fill the entire parameter space. During our research, we characterized periodic orbits of period two, six, ten, twelve, fourteen, and sixteen, and a family of an infinite number of orbits with periods greater than or equal to six. This research was conducted during the summer of 2019 with support from the National Science Foundation.

Technical Abstract:

Mathematical billiards are important models of dynamical systems from statistical mechanics in which point particles collide elastically with fixed boundaries. This project concerns the class of positively angled mushroom billiards which exhibit a wide range of behavior due to the coexistence of focusing and defocusing effects. To study these systems, we used a billiards simulation program in MATLAB to model the billiard dynamics in mushroom-shaped tables. In our studies, we varied two parameters, the angle of inclination, alpha and the stem width, w, and searched the resulting two-dimensional phase space for periodic orbits surrounded by elliptic islands. Once candidate orbits were found numerically, we proved the existence and stability of each orbit analytically. Each periodic orbit we found is stable for some range of alpha, 0 < alpha < pi/2, and some stem width, 0 < w < 2, when the absolute value of the trace of the derivative matrix of the orbit was less than two. Using computational programs such as Excel and Wolfram Alpha, we determined ranges of alpha and w in which the orbits were stable and existed geometrically. Using these ranges, we covered areas of the parameter space in which stable periodic orbits existed for the positively angled mushroom billiard. During our research, we characterized periodic orbits of period two, six, ten, twelve, fourteen, and sixteen, and a family of an infinite number of orbits with periods greater than or equal to six. This research was conducted during the summer of 2019 with support from the National Science Foundation.

Fluctuations in Salivary Cortisol are Associated with Body Mass Index and Diet Quality

Thomas Karanian 2021, Courtney Campbell 2020

Faculty Mentor: Catherine Andersen

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/g27gAR9ve8gQ

Abstract:

Individuals exposed to chronic stress are at an increased risk for chronic disease such as diabetes and heart disease. Our objective was to define a holistic set of measures to manage chronic stress in human subjects, which can aid as a tool for understanding the effects of stress on inflammation, human health, and lifestyle habits. Our method involved adult men and women (18-70y, n = 17) participated in a baseline health assessment to measure body composition (weight, % body fat), and blood pressure. Dietary records and saliva samples were obtained from each participant over the study duration. Saliva samples were collected three times per day (morning, afternoon, evening) and used to quantify the concentrations of cortisol, a marker of stress. Subjects with greater fluctuations in salivary cortisol had higher cortisol levels on average,

indicative of increased stress. Greater fluctuations in cortisol were additionally associated with a higher body mass index and metabolic age, which are associated with increased risk of chronic diseases. Greater changes in salivary cortisol was also associated with consumption of less healthy foods and beverages. Our initial findings demonstrate that greater fluctuations in stress biomarkers (cortisol) are associated with elevated morning stress hormone levels, body mass index, and less favorable dietary patterns.

Technical Abstract:

Objectives: Stress can negatively impact lifestyle practices and metabolic health, thereby increasing an individual's risk for chronic disease. We investigated whether fluctuations in salivary cortisol were associated with body composition, blood pressure, and diet quality. Methods: In this ongoing study, adult men and women (18-70y,n=17) participated in a fasted baseline health assessment to measure body composition and resting blood pressure. Dietary intake was assessed over a 5-day period, where saliva samples were collected in the morning, afternoon, and evening to measure cortisol fluctuations. Degree of cortisol variability over the 5-day period (highest cortisol measure - lowest cortisol measure) was used to classify subjects into high (n=9) and low (n=8) cortisol fluctuation groups. Results: Subjects with greater fluctuations in salivary cortisol had higher cortisol levels on average across all timepoints, in addition to greater concentrations and variability in cortisol levels in the morning. Greater fluctuations in cortisol were additionally associated with a higher body mass index and metabolic age, but were not associated with fat or fat-free mass, waist circumference, or blood pressure. Subjects with lower fluctuations in cortisol reported greater dietary intake of linoleic acid, manganese, and a trend toward greater intake of vitamin D. Greater fluctuations in salivary cortisol positively correlated with the percent of dietary calories coming from fat, fructose, serine, fried potatoes, dairy-based desserts, sweetened coffee, and beer. Conclusions: Our preliminary findings demonstrate that greater fluctuations in salivary cortisol are associated with elevated morning stress hormone levels, body mass index, and less favorable dietary patterns.

Impacts of Mixing in Submarine Canyons

Christian Burns 2020

Faculty Mentor: Robert Nazarian

Supported by McGualey Family Faculty Student Research Fund

https://fairfield.quip.com/JFfLATCvDUMj

Abstract:

The breaking of tidally-generated internal waves is a significant driver of ocean mixing, and observations show that a non-negligible amount of this internal tide-driven mixing occurs in submarine canyons. While previous studies have used single observations of canyon mixing to estimate the global magnitude of internal tide-driven mixing within canyons, there is still significant uncertainty in these estimates. We constructed an algorithm based on the modeled energy loss in Nazarian & Legg 2017b to calculate the magnitude of mixing in each submarine canyon and to determine the percentage of the global internal tide energy budget dissipated in canyons. The algorithm utilizes the Harris et al. 2014 analysis of the SRTM30_PLUS global bathymetry map to provide the geometrical properties of each canyon (i.e. height, length, width), the bias-corrected WAGHC to determine the local stratification, and a high-resolution, tidally-forced HYCOM simulation to determine the internal tide energy field. Preliminary calculations show that the canyon's geometrical properties and local hydrographic properties have significant effects on the magnitude of mixing. Specifically, the calculations of canyon-induced mixing show that canyons that are tall relative to the depth of the water column and long relative to the incoming internal tide's wavelength dissipate approximately 100% of the incoming wave's energy. Our calculations have also shown that, regardless of the bathymetry, submarine canyons can dissipate a significant fraction of the incident internal wave energy, which is consistent with previous findings.

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Improving Soccer Analytics with Athlete Academy

Alexandru Rusu-Sprincenatu 2020

Faculty Mentors: Haishuai Wang, Radu Jianu

Supported by Hardiman Scholars

https://fairfield.quip.com/cZUSAuzgOkwC

Abstract:

Data analytics and information visualization are growing research fields that have many real world applications such as sports analytics. With the increasing popularity of youth sports, it can be difficult for coaches to manage drills and exercises for players in an individual manner. As a result, many training exercises are team-oriented. In this environment, team growth can still occur, but individual player growth can stagnate. In order to solve this problem, an individualized approach can be more beneficial to the players' growth and performance by allowing each player to improve in specific categories. A software system that can target individual areas for growth will allow for greater training efficiency on both the individual and team level. Athlete Academy is proposed as a software application that enables youth soccer players to improve their athletic skill level through a customized training system and where parents can also contribute by generating drills based on their rating of the child's performance. Athlete Academy is also aiding coaches in decision making such as comparing players, customizing lineups, and drill selection, which will improve player retention and relations. The research aspects of this project include developing and finding performance rating metrics used to evaluate players and a mining engine that allows appropriate drill selection for each player based on individual performance and optimized based on their weaknesses. Alternative visual representations of the data were researched to make it easier and more useful to the coaches.

Technical Abstract:

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attract customers, and metrics refinement.

Investigating How Self-Assembling Peptide Structure Affects Electrochemical Sensing

Vasiliki Bayiokos 2021

Faculty Mentor: Amanda Harper-Leatherman

https://fairfield.quip.com/rK0GAGSFJDDA

Abstract:

Electrochemical methods were used to investigate electrochemical properties of two self-assembling peptides called KLVWWAE and KLVFFAE when sensing for uric acid, potassium ferricyanide, and hexaammineruthenium (III) chloride. Comparison of the results of the two self-assembling peptides showed that changing the peptide sequence to include more pi bonds led to an increase in signal. The increased delocalization within tryptophan, which was found in the KLVWWAE peptide, compared to phenylalanine, which was found in the KLVFFAE peptide, may lead to the electrochemical result and to new design considerations in the area of self-assembling peptides.

Technical Abstract:

Electrochemical methods were used to investigate electrochemical properties of two self-assembling peptides when sensing for uric acid, potassium ferricyanide, and hexaammineruthenium (III) chloride. Comparison of the results of the two self-assembling peptides showed that changing the peptide sequence to include tryptophan instead of phenylalanine led to increased signal when sensing for uric acid and hexaammineruthenium (III) chloride. The self-assembled structures for the two self-assembled peptides varied as shown in transmission electron microscopy. The increased delocalization within tryptophan compared to phenylalanine may lead to the electrochemical result and to new design considerations in the area of self-assembling peptides.

MALDI-TOF Analysis of a Human Egg Dietary Intervention Study

Justin Mercado 2020

Faculty Mentor: Aaron Van Dyke

Supported by Hardiman Scholars

https://fairfield.quip.com/zCjoAwa10hEE

Abstract:

Mass spectrometry is a chemical technique that fragments molecules into small pieces, so its original chemical structure can be identified. One could picture the laser as the Death Star, and the molecule as the planet, where the multiple fragments of the explosion are detected to give us the original mass of the molecule. Matrix Assisted Laser Desorption/ Ionization Time-Of-Flight (MALDI-TOF) is a specific type of mass spectrometry often used for characterizing biomolecules. While routinely used to study bacteria, it has rarely been used to analyze human cells. Just as human fingerprints are unique to each individual, our goal is to use the MALDI-TOF to acquire a spectral "fingerprint" of human blood cell and how it changes with your diet. We identified the optimal preparation method for this analysis to obtain a high-quality fingerprint. We are excited to apply these discoveries to the study of samples from a dietary intervention study, examining the link between egg consumption and inflammation.

Technical Abstract:

Matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) mass spectrometry is commonly used to study biomolecules. MALDI-TOF was used to collect and analyze the profiles of peripheral blood mononuclear cells (PBMC), which serve an important role in the human immune system. PBMCs were isolated from participants in a dietary intervention study. Subjects in the study were segregated into three groups, corresponding to the egg components supplementing their diet: whole eggs, egg whites, or no eggs. Previous research has suggested that changes in egg diet can affect cellular markers of inflammation. We report on the use of MALDI-TOF mass spectrometry to collect a cellular phenotype of PBMC cells and to discern similarities and differences between dietary intervention groups.

Measuring Glutamic Acid Decarboxylase (GAD) Isoforms as Biomarkers of Anxiety

Matthew Little 2022, Nicholas Colorito 2021, Claire Monahan 2020, Claire Mulligan 2020

Faculty Mentors: Aaron Van Dyke, Shannon Harding

Supported by Hardiman Scholars

https://fairfield.quip.com/cbtHAqfuybtU

Abstract:

Glutamic acid decarboxylase (GAD) 65 and 67 are enzymes that catalyze the synthesis of GABA, a neurotransmitter that regulates cognition, behavior, and physiological responses to stress. Behavioral tests, such as the elevated plus maze and open field test, were used to detect anxiety in rats. Further work remains to connect these tests with biomarkers for anxiety in the brain. Rats, raised in group-housed or socially isolated conditions, underwent behavioral testing for anxiety. The level of GAD in the prefrontal cortex of each group was then measured to determine if an association was present between GAD levels and type of housing.

Technical Abstract:

Glutamic acid decarboxylase (GAD) 65 and 67 catalyzes the decarboxylation of glutamate to GABA, a potent neurotransmitter. GABA regulates cognition, behavior, and physiological responses to stress. Behavioral tests are routinely used to detect and measure anxiety. These tests included an elevated plus maze and open field. However, work remains to connect behavioral tests of anxiety with specific biomarkers for the condition in the brain. A Long-Evans rat model of anxiety was used, raising the animals in group-housed conditions or in social isolation from weaning to adulthood. The level of GAD in the prefrontal cortex of each rat population was determined by western blotting and will be presented.

Measuring Solar Flares

Edward Wenzel 2020

Faculty Mentor: Jonathan Stott

https://fairfield.quip.com/dzV9A7lZ3HeJ

Abstract:

The purpose of our project is to measure solar flare activity in the upper atmosphere by monitoring radio frequencies. When solar flares contact the atmosphere, they disturb these radio waves and this interaction can be measured. To accomplish our goal of measuring this interaction, we planned a receiver circuit that will collect samples of these designated frequencies. The circuit's purpose is to receive these radio frequencies and shift them to an appropriate value for our software to process the data. The data samples are processed through a series of code and then plotted for observation.

Technical Abstract:

The purpose of our project is to measure solar flare activity in the ionosphere by monitoring Very Low Frequency [VLF] radio frequencies. The propagation of these VLF frequencies are disturbed by solar activity and the goal of the project is to map these disturbances and record instances of solar flares. To accomplish this goal, we designed a receiver circuit involving a loop antenna, an amplifier, and a mixer with a Software Defined Radio (SDR) to collect VLF samples. The loop antenna receives radio signal from the necessary 20-200 kHz frequencies and the circuit shifts these frequencies to approximately 50 MHz. At this frequency, the SDR can collect data samples and monitor the entire VLF band. The data samples that the SDR receives is then processed through C code. The process involves reading the data array using the (SDR) library commands and separating the values between their real and complex values. A Fourier Transform is taken of these data samples and then plotted for observation.

MEL-28 and Dynactin Impact Male Fertility in the Nematode Worm C. elegans

Kaitlin Levangie 2022

Faculty Mentor: Anita Fernandez

https://fairfield.quip.com/usEbAYiu8And

Abstract:

C. elegans is an ideal model organism for studying gene function because of its fast life cycle, high reproduction rate, and tractability for gene manipulation. To study the roles of dynactin and the MEL-28 protein in C. elegans fertility, animals with mutations in those genes were studied. The dnc-1 gene encodes a part of the dynactin protein, which helps with the transport of substances to different ends of a cell. The mel-28 gene encodes a protein which helps reform access channels in the nucleus of a cell after cell division occurs. The dnc-1 mutation typically manifests as a decreased number of eggs being laid and an increase in the percentage of unfertilized eggs being laid. To test the hypothesis that dnc-1 mutants have sperm defects, we set up sperm competition tests that found significant differences in sperm functionality between dnc-1 mutant males and normal males. When an animal has both the dnc-1 and mel-28 mutations, both brood size and fertilization efficiency is restored to normal. Our current goal is to further study how the sperm is impacted by the dnc-1 mutation and why defects to the mel-28 gene help lessen their impact. Dynactin and MEL-28 are important in all animal cells, so studying nematode fertility will eventually lead to a better understanding of how human cells work too.

MEL-28-Mediated Regulation of Microtubule Motors Affects Fertility in the Nematode Worm Caenorhabditis Elegans

Giulia Crosio 2020

Faculty Mentor: Anita Fernandez

Supported by Femia Science Endowment

https://fairfield.quip.com/aaJmAIaoxZhJ

Abstract:

A gene is a sequence of DNA that serves as a set of instructions for the cell to manufacture a particular component. We have been using the genetic model animal C. elegans to study the roles of different genes and how they collaborate to promote fertility. We discovered that the regulation of microtubule motors, which are essential transporters of cargoes within cells, is important for fertility. In addition, we discovered that mel-28, a nuclear envelope protein not previously associated with intracellular transport, plays important roles in microtubule motor function. Specifically, simultaneous disruption of mel-28 and the microtubule motor dynein negatively impacts fertility in C. elegans. This suggests that dynein and mel-28 coordinately contribute to processes essential for fertility. To identify other genes involved in dhc-1;mel-28

infertility, we disrupted multiple candidate genes and assayed their effects on fertility in dhc-1;mel-28 double mutant animals. We discovered that when klc-2 is disrupted, the fertility issues in the mel-28;dhc-1 mutant are rescued. klc-2 encodes part of a larger protein complex called kinesin-1. Kinesin-1 and dynein both interact with the protein UNC-83 to regulate nuclear migration. Our experiments suggest that UNC-83 is required for a temperature-sensitive process involving inputs from mel-28, kinesin, and dynein that impacts fertility in C. elegans.

Technical Abstract:

Microtubule motors are multi-molecular machines that ferry cargoes from one location to the other within a cell. We have been studying mel-28, a conserved and essential protein important for chromosome segregation and the post-mitotic rebuilding of the nuclear pore. Previous work showed that mel-28 and the minus-end directed microtubule motor dynein work in parallel to support fertility in C. elegans. Simultaneous disruption of mel-28 and dhc-1 (which encodes the large subunit of dynein) causes low brood size and disorganization of the oogenic germline. Our main goal has been to understand why dhc-1;mel-28 double mutants have reduced fertility. Using markers that identify oocyte stage, we observed that dhc-1;mel-28 double mutants have oocyte maturity defects. To find cellular components that regulate mel-28 and dynein-related cellular processes, we did a candidate RNAi screen searching for genes that when disrupted rescue the brood size of dhc-1;mel-28 double mutants. We found that disrupting klc-2, which encodes the light chain of the plus end directed microtubule motor kinesin-1, drastically improves the brood size of dhc-1;mel-28 double mutants. Previous studies found that both kinesin-1 and dynein directly interact with unc-83 to regulate nuclear migration. In addition, it is known that dynein interacts with unc-83 through two dynein regulators: Bicaudal-D homolog (BICD-1) and NudE homolog (NUD-2). To determine if unc-83-mediated dynein connections are required for fertility in mel-28 mutants, we are currently investigating the fertility of mel-28; bicd-1; nud-2 mutants, as well as mel-28; unc-83 mutants. Preliminary data suggests that unc-83 is involved in a temperature sensitive process that promotes fertility while interacting with dynein and mel-28. All of the genes we are studying are conserved and essential in all animals. What we learn by studying genetic networks regulating fertility in C. elegans could be valuable for understanding regulation of intracellular trafficking in other animals, including humans.

Metabolism Methods for Detecting Temperature-induced Stress in *Limulus polyphemus*

Julia Frees 2020

Faculty Mentors: Shannon Gerry, David Hudson

https://fairfield.quip.com/aJrmAkOZARlY

Abstract:

Temperature is one of many factors that could potentially cause stress to horseshoe crabs. This project studies how stress caused by exposure to different temperatures affects the metabolism and behavior of the Atlantic horseshoe crab (Limulus polyphemus). We hypothesize that the metabolic rate (amount of energy used in a certain amount of time) and/or behaviors of horseshoe crabs including movement, activity level, and behaviors corresponding to the tides, could be altered upon the introduction of stress. Respirometry techniques that measure dissolved oxygen and observational videos are used to study the metabolic rate and behavior, respectively, of the young-of-the-year horseshoe crabs at the Maritime Aquarium in Norwalk, Connecticut in response to stress caused by exposure to different temperatures. We expect that our results will provide insight as to the metabolic and behavioral response of L. polyphemus to temperature-induced stress and possible thresholds - all of which could be helpful information to guide animal care in captivity or conservation in the wild.

Technical Abstract:

Potential stressors of Limulus polyphemus, commonly known as the Atlantic Horseshoe Crab, include temperature, salinity, dissolved oxygen, air exposure, and handling. The purpose of this project is to study how stress caused by exposure to different temperatures affects the metabolism and behavior of L. polyphemus. We hypothesize that the metabolic rate and/or behaviors such as locomotion, activity level, and circatidal behavioral rhythms of L. polyphemus could be altered upon introduction of stress. Our prediction is that if temperature is a stressor of L. polyphemus, then metabolic rate and/or

behavior will change when the animal is subjected to temperatures outside of its normal range. In order to test this, the Q-Box AQUA Aquatic Respirometry Package from Qubit Systems is used to study the young-of-the-year L. polyphemus housed on the research rack in the horseshoe crab room at The Maritime Aquarium in Norwalk, Connecticut. Data is being collected on the amount of dissolved oxygen remaining in a certain volume of initially oxygenated water after one hour based on the manipulation of temperature in order to induce stress. Metabolic rate in response to this stress can then be calculated using the dissolved oxygen data and measurements of the animal's mass and volume. Observational video data will also be recorded and analyzed to determine whether there are any correlations between metabolic rate and behavior. These methods could be used to test the response to other stressors such as salinity or nitrate-level. We expect that our results will provide insight as to the metabolic and behavioral response of L. polyphemus to temperature-induced stress and possible thresholds. These results have the potential to help guide animal husbandry practices in aquariums and zoos or conservation efforts in natural habitats.

Monitoring Cellular Metabolic Activity by Non-invasive Endogenous Fluorescence Imaging

Isabelle Seppa 2020, Maggie Xie 2020

Faculty Mentors: Shelley Phelan, Min Xu

Supported by McGuinness Mentorship Program

https://fairfield.quip.com/1oFlAeMVF7qr

Abstract:

Standard histopathology is complex and time consuming. In contrast, label-free computational staining of tissue uses chemometric fluorescence to quantify native chromophores such as FAD, which can also correlate with biochemical alternations in cancer. In this study funded by an NSF grant, we investigate whether native fluorescence can measure cellular metabolism in MCF-10A cells. Our experimental design involves parallel experiments using either molecular assays or endogenous fluorescence. MCF-10A breast epithelial cells were grown under three conditions: growth medium, serum-deprived, and serum-deprived followed by serum stimulation. For native fluorescence measurements, treated MCF-10A cells were imaged with epi-fluorescence and DIC microscopy. A significant difference in cellular FAD was observed between re-stimulated and either growth medium or serum deprived conditions. No significant difference was observed between growth medium and serum deprived conditions. The molecular assay run in parallel is a glucose uptake assay. Our results show a reduction in cellular glucose uptake in serum-deprived cells, as compared to the serum-stimulated condition. We also found a significant reduction in glucose uptake and cellular metabolism in the serum-deprived condition compared to the re-stimulated condition. While the glucose uptake assay and endogenous fluorescence imaging can both measure cellular metabolism, endogenous fluorescence imaging is noninvasive and could potentially be used to provide new approach for a non-invasive cancer cell characterization.

Technical Abstract:

Standard histopathology is complex and time consuming. In contrast, label-free computational staining of tissue uses chemometric fluorescence to quantify native chromophores such as FAD, NADH, tryptophan, and elastin who can also correlate with biochemical alternations in cancer. In this study funded by an NSF interdisciplinary grant, we investigate whether endogenous fluorescence can measure cellular metabolism in MCF-10A cells. Our experimental design involves parallel experiments using either molecular assays or endogenous fluorescence. MCF-10A breast epithelial cells were cultured under three conditions: growth medium, serum-deprived, and serum-deprived followed by serum stimulation. For endogenous fluorescence measurements, treated MCF-10A cells were imaged with epi-fluorescence and DIC microscopy. Each cell was first delineated with its DIC image, and it is endogenous fluorescence intensities obtained from the corresponding fluorescence images using ImageJ. The fluorescence intensity at the green channel excited under blue light serves as the proxy for the concentration of FAD, a marker for cellular metabolism. A significant difference in cellular FAD was observed between re-stimulated and either growth medium or serum deprived conditions. No significant difference was observed between growth medium and serum deprived conditions. The end-point molecular assay run in parallel is a glucose uptake assay. Our results demonstrate a reduction in cellular glucose uptake in serum-deprived cells, as compared to the serum-stimulated condition. We also found a significant reduction in glucose uptake and cellular metabolism in the

serum-deprived condition compared to the re-stimulated condition. While the glucose uptake assay and endogenous fluorescence imaging can both measure cellular metabolism, endogenous fluorescence imaging is noninvasive and further reveals significant heterogeneity in the shape and metabolic rate of cells under each individual growth conditions and could potentially be used to provide new approach for a non-invasive cancer cell characterization. Additional experiments are currently underway to verify the accuracy of this methodology, and its application in distinguishing cancerous from non-cancerous cells.

Needle Protection Device

Jennifer McCann 2020, Samantha Fortune 2020, Sarah Bowman 2020, Jimmy Diaz 2020

Faculty Mentor: Mehdi Safari

Supported by Hardiman Scholars

https://fairfield.quip.com/nUSYASVdyr2f

Abstract:

Safety is an important concern for dentists using needles in their practice. A needle protection device will provide a safe and effective way to remove dental hypodermic needles from the syringe assembly. Dentists often have trouble avoiding poking themselves once the hypodermic needle has been exposed, which is described as a "needlestick injury." This common accident occurs when in use, disassemble, or disposal of needles. We prototyped and manufactured a device that allows the needle to be removed from the dental aspirating syringe and safely disposed of without requiring dangerous contact with the contaminated needle. We improved upon an existing patent by engineering a way to successfully unscrew the needle and cap from a syringe while maintaining sterility and safety. We developed a way to clamp onto the hub of the syringe while applying enough pressure to disassemble the parts and subsequently dispose of contaminated sharps, in a disposable sharps container located within the assembly. A case for the device has been designed and 3D printed to encase the device and make it more user-friendy. The mechanical and electrical components of this device have been designed and tested so that the final needle protection device is functional and reliable. The completion of this project produces a device that enhances safety in dentistry by reducing the risk associated with handling needles and accidental needle sticks.

Nuclear Pore Complex Components and Dynein Collaborate to Promote Fertility in the Nematode Worm C. elegans

Hannah Cullagh 2021

Faculty Mentor: Anita Fernandez

https://fairfield.quip.com/qa3aAeQzaFAF

Abstract:

Most cellular processes require the coordinated activities of multiple gene products. In order to study genes that function together, we have used C. elegan nematodes, an exceptional model organism for genetics because of their short life span, large brood size, and tractability for disrupting gene function. The mel-28 gene encodes a protein located within the nuclear pore complex that is required for nuclear envelope function and chromosome segregation. dhc-1 encodes the largest protein component of the microtubule motor dynein. Dynein traffics cargo along microtubule tracks and is essential for chromosome segregation, vesicle trafficking, and nuclear positioning. mel-28 mutants and dhc-1 each produce a normal brood size. Simultaneous disruption of mel-28 and dhc-1 causes a much smaller brood size. We asked if other disruptions to the nuclear pore complex would also cause low fertility in the dhc-1 mutants. To test this, we used RNA interference (RNAi) to disrupt the expression of the npp-20 gene, which encodes the Sec13 of the nuclear pore subcomplex also occupied by the mel-28 gene product. We found that disruption of npp-20 does indeed cause reduced

brood size in dhc-1 mutants. We are currently generating double mutant animals that are homozygous for the dhc-1 mutant and for a defect in npp-14 which encodes a component of the cytoplasmic ring of the nuclear pore. This experiment will reveal whether defects in the nuclear pore generally cause fertility problems in the dhc-1 mutant. If this is tried, this would indicate a stable nuclear pore is required for fertility in mutants with compromised dynein. The importance of studying these genes is that they are known to be conserved within the human genome. By studying them in C. elegans we could further develop our understanding of human biology.

Oxytocin Effects on Anxiety and Social Behaviors in a PTSD Animal Model

Hannah Lawlor 2021, Jaime Jubb 2020, Matthew Biasetti 2020

Faculty Mentors: Shannon Harding, Aaron Van Dyke

Supported by Hardiman Scholars

https://fairfield.quip.com/uuPfAbRI7HhB

Abstract:

This study examined intranasal oxytocin as a possible treatment for anxiety and social behaviors in a rodent model for post-traumatic stress disorder (PTSD). Male Long Evans rats were reared in socially isolated or group housed conditions for 6 weeks after weaning. All groups were subsequently tested for anxiety and social behaviors immediately after receiving intranasal saline or oxytocin. Preliminary findings suggest that socially isolated rats showed increased anxiety, and that oxytocin modestly improved anxious behavior. No effects of housing or treatment were seen on social behaviors. These data have important implications in the use of intranasal oxytocin as a treatment for PTSD.

Technical Abstract:

Post-traumatic stress disorder (PTSD) is an anxiety disorder characterized by intrusive memories, flashbacks, night terrors, avoidance behaviors to places and events related to the trauma, and an increased startle response. This study was conducted to examine whether the neuropeptide hormone oxytocin (OT) is a viable treatment option for anxiety using an animal model for PTSD. Male rat pups were raised in social groups of 2-4 animals per cage (Group housed, n=8) or alone (Socially Isolated, n=16) for 5 weeks beginning on postnatal day 28. Rats were then assigned to three treatment groups: Group housed receiving saline (GH-saline, n=8), socially isolated receiving saline (SI-Saline, n=8), or socially isolated receiving OT (SI-OT, n=8). Saline or OT (0.08IU/kg) was administered intranasally 30-60 minutes before behavioral tests. Rats were tested for anxiety using an elevated plus maze and an open field test, and for social behaviors using a sociability test and a test for prosocial behavior. We found that the SI-Saline group showed increased anxiety compared to GH-Saline animals, and that OT moderately improved anxiety. No other significant group differences in behavior were observed. After the completion of the behavioral work, the Department of Chemistry and Biochemistry received tissue from the prefrontal cortex to measure levels of GAD-67, a critical enzyme involved in anxiety. This work has important implications for understanding brain mechanisms and potential treatment of PTSD.

Pellicle Uniformity Corrector

Thomas Botelho 2020, Han Bin Yoo 2020, Konstantinos Geogiradis 2020, Carlos Murcia 2020

Faculty Mentor: Andrew Judge

Supported by Hardiman Scholars

https://fairfield.quip.com/dKWHAfLUhlLQ

Abstract:

Photolithography is the process of transferring geometric shapes on a mask to the surface of a silicon wafer. ASML measures the surface cleanliness of reticles coming into the lithography system with particle inspection systems. These systems must measure particles on both the flat surface of the backside of the reticle and the front side of the pellicle, a thin sheet used to protect the reticle frontside from contamination, trapping particles outside of the focal plane. These pellicles are thin, and sag due to gravity beyond the focus depth of the inspection systems, requiring expensive and time-consuming metrology systems and mechatronic compensators to fully inspect the pellicle. The goal of our project is to develop a gravity compensation through wind flow concept.

Technical Abstract:

Photolithography plays an important role in the production of semiconductors. These semiconductors can be seen in most, if not all, everyday electronic devices from cellular phones to laptop computers. Many of the processes are done by transferring an image from a master copy or reticle onto a silicon wafer by the use of Deep Ultraviolet (DUV) or Extreme Ultraviolet (EUV) light. This image transferring process is by far the most important step and requires the highest performance in image and contamination control. One of the drawbacks to the systems operation is contamination of the reticle. This is where particles can be found on the reticle surface ultimately compromising final image quality. A defense mechanism in the photolithography process is done through the use of a pellicle. A pellicle is a small, thin membrane used to protect the optics and ensure quality imagery transmission. This component shields the reticle from harmful particles and transmits light to enable the photolithography process. A metrology system measures the surface cleanliness of reticles coming into the lithography system through particle inspection. This system must measure particles on both the flat surface of the backside of the reticle and the front side of the pellicle. Since the pellicles are thin, and sag due to gravity beyond the focus depth of the inspection systems, it requires expensive and time-consuming metrology systems and mechatronic compensators to fully inspect the pellicle. When the pellicle sags due to gravity, particles may be present and the metrology system will not be able to notice these particles because they are not in the system's focal plane. If particles are not picked up by the metrology system, the machine will copy the particle onto the wafer, resulting in faulty semiconductors. The solution to this problem starts with researching pellicle materials and thicknesses, as well as optical inspection systems for particle inspection at the micron to nanometer level, particularly depth of focus. After more information is known, the next step is to brainstorm new concepts and mechanical architectures for sag reduction. Then, after selecting a concept, developing "first order" equations, analyzing predicted behavior, including computational fluid dynamics and finite element analysis. Next, build a proof of concept and a prototype system. Lastly, perform tests on the system, documenting results as the project progresses.

Plastic Bottle Converter

Tristin O'Connor 2020, Keith McHugh 2020, Eric Jiang 2020, Shawn Hall 2020

Faculty Mentor: Sriharsha Srinivas Sundarram

https://fairfield.quip.com/2x8QAmeS8d9H

Abstract:

The use and disposal of plastic everyday damages the environment, as only 9% of plastic used in the last fifty years has been recycled. The goal of this project is to design and build a desktop machine that will allow a plastic bottle to be remanufactured and used for other applications like household objects and personal projects. The device is capable of taking in standard plastic bottles and turning them into long bands of plastic that can be used for other applications.

Technical Abstract:

The current use and disposal of plastic damages the environment as only nine percent of plastic was recycled between 1950 and 2015. The goal of this project is to design and fabricate a device that will allow a plastic bottle to be remanufactured and used for other applications like household objects and personal projects. The device is capable of taking in plastic bottles of varying sizes and turning them into long bands of plastic by utilizing precise blades. Once cut, the plastic from each bottle will be heated and molded together, resulting in a long spool of thinly cut plastic. Essentially, the result of the device will be a long roll of thin plastic filament made from multiple plastic bottles. Ideally, this remanufactured plastic can then be used for other applications, specifically household material. This device is vital in making the consumption and use of plastic more efficient, as it would transform the disposal of plastic bottles into a simple direct return process, utilizing nearly one hundred percent of the recycled products.

Preparation and Characterization of Cobalt (II) SNS Pincer Model Complexes for Liver Alcohol Dehydrogenase

Emma Mircovich 2022, Samantha Zygmont 2020, Allison Smolinsky 2021

Faculty Mentor: John Miecznikowski

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/ObcPAtxWHfjo

Abstract:

Enzymes are proteins that accelerate reactions in nature. Synthesizing enzymes in the laboratory is a difficult process, so model complexes can be made to represent the active site of an enzyme. The specific focus of the laboratory was the syntheses of liver alcohol dehydrogenase (LADH) model complexes. The goal of preparing these model complexes was to learn about the reactions the model complexes and the enzyme accelerates. A typical LADH enzyme contains amino acids coordinated to a zinc(II) ion in the active site. In the LADH model complexes, pincer ligand precursors have been prepared. These ligand precursors contain sulfur and nitrogen donor atoms that can coordinate in the same fashion to a zinc(II) metal ion as amino acids. The purpose was to compare the structure and bonding of the cobalt(II) model complexes to the cobalt(II) version of the LADH enzyme. Cobalt(II) complexes are more desirable than zinc(II) complexes because cobalt produces a colored product while zinc harvests a white product. This cobalt compound allows further spectroscopic studies on the model complex such as measuring the ultra-violet visible spectrum of the cobalt(II) model complex and the cobalt(II) version of the enzyme.

Technical Abstract:

Recently, we developed and synthesized a series of tridentate pincer ligands, each possessing two sulfur- and one nitrogen-donor functionalities (SNS), based on bis-imidazole or bis-triazole precursors. The tridentate SNS ligands incorporate thione-substituted imidazole or triazole functionalities. We prepared somewhat rigid ligand systems through the use of 2,6-dibromopyridine as a ligand precursor. In addition, we prepared more flexible ligand systems by employing the starting material 2,6-(dibromomethyl) pyridine to introduce a methylene linker into the pincer ligand. We metallated these ligand precursors to form zinc(II) complexes containing these tridentate ligands. We are preparing cobalt(II) complexes that contain these ligand precursors. The cobalt(II) complexes are cobalt model complexes for liver alcohol dehydrogenase. A detailed description of the syntheses, and characterization (NMR Spectroscopy, ESI-Mass Spectrometry, electrochemistry, UV-Visible, EPR spectroscopy, and single crystal structures) of the SNS cobalt(II) complexes and ligand precursors will be presented.

Pro-Black Bias in Criminal Sentencing: Application of the Judgement Bias Task

Emma Antoine-Portinari 2020

Faculty Mentor: Michael Andreychik

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/Ej2BACkttusN

Abstract:

While the majority of evidence in psychological literature suggests that people show bias against Blacks and in favor of Whites, more recent research has challenged this notion, finding the presence of bias against Whites and in favor of Blacks

within the context of honor society selection (Axt, Ebersole & Nosek, 2016). However, this "pro-Black bias" has only been shown to operate within an academic context, suggesting the need for research to determine if the bias is limited to this domain. My study sought to investigate if the pro-Black bias would also operate in a criminal sentencing domain. Using an adapted version of Axt and colleagues' Judgement Bias Task (JBT), a measure of social judgement bias, participants were tasked with assigning long and short sentences to Black and White offender profiles. I predicted that if participants showed the pro-Black bias, then they would sentence fewer Black offenders to long criminal sentences than White offenders for crimes of the same severity. Results showed no overall presence of a pro-Black bias in this domain, suggesting that the pro-Black bias observed by Axt et al. in the academic domain may not extend to other contexts. These results highlight the need for a more nuanced approach to understanding the specific conditions under which bias in favor of and against minority groups will occur.

Technical Abstract:

This project was designed to further investigate the phenomenon of the "pro-Black bias," in which people demonstrate bias favoring Blacks over Whites in social judgement tasks. While the majority of psychological literature suggests that people show bias against Blacks and in favor of Whites, research by Axt, Ebersole, and Nosek (2016) observed a pro-Black bias favoring Blacks over Whites for admission into an academic honor society. However, thus far the pro-Black bias has only been shown to operate in the domain of honor society selection, which left us wondering if the bias was limited to this domain. I sought to investigate if the pro-Black bias would be seen in the domain of criminal sentencing of Black and White offenders. Using an adapted version of Axt and colleagues' Judgment Bias Task (JBT), a measure of social judgement bias, participants were tasked with assigning long and short sentences to offender profiles. I manipulated the race of each offender profile by assigning photos of Black people to half the profiles and photos of White people to the other half. I also manipulated the sentence each offender profile should be subject to by building half of the profiles to represent more severe offenses and the other half to represent less severe offenses. I predicted that if participants showed the pro-Black bias, then they would sentence fewer Black offenders to long criminal sentences than White offenders for crimes of the same severity. Results showed no overall presence of a pro-Black bias in this domain, suggesting that the pro-Black bias observed by Axt et al. in the academic domain may not extend to other contexts. These results highlight the need for a more nuanced approach to understanding the specific conditions under which bias in favor of and against minority groups will occur.

Progress Toward Preparing and Characterizing a Series of Substituted Nickel(II) Ethylenediamine Complexes to Demonstrate Vivid Color Changes in the Spectrochemical Series

Nicole Flaherty 2020

Faculty Mentor: John Miecznikowski

https://fairfield.quip.com/aB5oAbWEtjRs

Abstract:

The drastic color changes that take place as a result of choosing ligands at different positions in the spectrochemical series are examined through n-substituted nickel (II) ethylenediamine complexes. The spectrochemical series lists ligands in order of strength. Progress was made to synthesize complexes with N-methylethylenediamine, N,N’-dimethylethylenediamine, N,N,-dimethylethylenediamine, and N,N,N’-trimethyethylenediamine ligands, or molecules that form coordinate bonds to the metal. The crystals formed were purple (N), light blue (N,N’), and aqua (N,N,N’). Crystal structures and mass spectrometry data were obtained, revealing that the complexes had not been synthesized as desired. Future experiments should be performed with a larger excess of ligand as a reactant.

Technical Abstract:

The aim of the project was to enhance a lecture demonstration that Professor Miecznikowski developed for Advanced Inorganic Chemistry. The lecture demonstration focused on studying a series of substituted ethylenediamine nickel(II) complexes that varied in the ligand that coordinated to the metal center. We noticed that introducing small changes in the ligand caused vivid differences in color of the nickel(II) complexes. We are hypothesizing that the differences in color of the metal complexes are due to the fact that the ligands are in different locations in the spectrochemical series, which is a list of ligands ordered on ligand strength. The observed colors seen in transition metal complexes depend on the difference in energy of the orbitals which is influenced by the choice of ligand. We set forth to prepare tris-ethylenediammine substituted nickel(II) complexes with the following ligands: N-Methylethylenediamine, N,N'-dimethylethylenediamine, N,N,-dimethylethylenediamine, and N,N,N'-trimethyethylenediamine. The syntheses, single crystal structures of two complexes, electrospray mass spectrometry data of the complexes, and future directions will be presented.

Projected Climate of the Northeast United States

Rian Boutin 2022

Faculty Mentors: Robert Nazarian, Jeffrey Strong

https://fairfield.quip.com/nyrPAA5ACZXj

Abstract:

In this project, we consider projections of New England's climate to 2100. We use three specific high-resolution climate models (GFDL, HAD, and MPI) and force them with RCP 8.5 (i.e. business as usual emission scenario) to simulate future climate. Analysis of the completed model simulations shows a continued shift to higher temperature and more variability in temperature. Additionally, simulations suggest that there will be a change in precipitation, with precipitation occurring over fewer days out of the year. Analysis shows that the amount of precipitation will remain constant, indicating that, for days in which there is precipitation, it will be more intense. Our analysis of temperature and precipitation for New England is consistent with concurrent analysis of future climate in other regions of North America. Our results are particularly noteworthy in that they suggest there may be a higher probability of flooding in the New England region through the end of the 21st century, based on the rise in sea level due to the increasing temperatures, and the increased frequency of large precipitation events.

Technical Abstract:

In this project, we consider projections of New England's climate to 2100. We use three specific high-resolution climate models (GFDL, HAD, and MPI) and force them with RCP 8.5 (i.e. business as usual emission scenario) to simulate future climate. Analysis of the completed model simulations shows a continued shift to higher temperature and more variability in temperature. Additionally, simulations suggest that there will be a change in precipitation, with precipitation occurring over fewer days out of the year. Analysis shows that the amount of precipitation will remain constant, indicating that, for days in which there is precipitation, it will be more intense. Our analysis of temperature and precipitation for New England is consistent with concurrent analysis of future climate in other regions of North America. Our results are particularly noteworthy in that they suggest there may be a higher probability of flooding in the New England region through the end of the 21st century, based on the rise in sea level due to the increasing temperatures, and the increased frequency of large precipitation events.

Proprietary Time-Shift Genetic Algorithm Framework Replacement

Mitchell Owen 2020, Andrew Jobson 2020, Prathna Pel 2020, Alexandru Rusu 2020

Faculty Mentor: Adrian Rusu

https://fairfield.quip.com/6wpeAb3ECcSL

Abstract:

Every day, more than 44,000 flights and 2.7 million airline passengers travel across over 29 million square miles of airspace. The major issue with the abundance of concurrent flights is that it is very difficult to monitor all the flights and ensure the safety of every passenger. To address this issue, conflict probes predict the trajectory of all aircraft and detect collisions or scenarios where safe separation distances are violated. As with any major software package, testing is required to ensure the reliability of conflict probes and any proposed changes to the system. This vastly increases the complexity of an already complex issue. Since violations of safe separation distances are exceptionally rare, raw recorded flight data can not be used for this testing. Instead, by shifting the timetable of recorded flight data with its natural errors, conflicts can be created and used as appropriate testing tools for ensuring the safety and efficiency of the conflict probes. The process is currently completed using a proprietary time-shift software called JavaCat. JavaCat utilizes a custom genetic algorithm to produce the time-shifted data. The proprietary nature of this algorithm, however, severely limits future modification and other means of producing conflicts. This project aids in the process of simulating conflicts with recorded flight data by addressing the lack of support for modification and addition of features in the current implementation of JavaCat. By replacing portions of the proprietary genetic algorithm with Jenetics, an open source Java-based genetic algorithm framework, we can allow support for other means of forcing conflict events through manipulating flight data (in addition to time-shifting.) This change creates the potential for more extensive testing of the conflict probes and simplifies the future maintenance of JavaCat by outsourcing the maintenance of large portions of the genetic algorithm. The changes will allow for greater trust by air traffic controllers in the conflict probe and an increase in the safety of air travel around the world.

Technical Abstract:

Every day, more than 44,000 flights and 2.7 million airline passengers travel across over 29 million square miles of airspace. The major issue with the abundance of concurrent flights is that it is very difficult to monitor all the flights and ensure the safety of every passenger. To address this issue, conflict probes are used to predict the trajectory of all aircraft and detect collisions or scenarios where safe separation distances are violated. As with any major software package, testing is required to ensure the reliability of the conflict probes and any proposed changes to the system. This vastly increases the complexity of an already complex issue. Since violations of safe separation distances are exceptionally rare, raw recorded flight data can not be used for this testing. Instead, by shifting the timetable of recorded flight data with its natural errors, conflicts can be created and used as appropriate testing tools for ensuring the safety and efficiency of the conflict probes.The process is currently completed using a proprietary time-shift software called JavaCat. JavaCat utilizes a custom genetic algorithm to produce the time-shifted data. The proprietary nature of this algorithm, however, severely limits future modification and other means of producing conflicts.This project is intended to aid in the process of simulating conflicts with recorded flight data by addressing the lack of support for modification and addition of features in the current implementation of JavaCat. By replacing portions of the proprietary genetic algorithm with Jenetics, an open source Java-based genetic algorithm framework, we can allow support for other means of forcing conflict events through manipulating flight data (in addition to time-shifting.) This change creates the potential for more extensive testing of the conflict probes and simplifies the future maintenance of JavaCat by outsourcing the maintenance of large portions of the genetic algorithm. The changes will allow for greater trust by air traffic controllers in the conflict probe and an increase in the safety of air travel around the world.

Reticle Handler Simulation Package

Daniel Valli 2020, Spencer Letizia 2020, Alexander Freedman 2020, Matthew Flores 2020

Faculty Mentor: Adrian Rusu

https://fairfield.quip.com/t32hA7bHDCnd

Abstract:

Students will research and develop a software system which models the process of manufacturing photolithography systems for the semiconductor industry. The industry behind any product you use that requires any sort of computing power, relies heavily on these machines and their manufacturing process. Lithography, the process of using light to print tiny patterns on silicon, is a fundamental step in the mass production of computer chips. Part of the manufacturing process involves the movement of a silicon disk, called a reticle, through stages of a UV exposure process. It is impossible to see inside the machine while the reticle moves along its stages, but it is necessary for engineers to diagnose positional errors

when they occur in the process. It can be very costly for companies to manually identify and repair errors in this stage of the manufacturing process. Students will attempt to solve this problem by creating a software system that simulates the movement of the reticle visually. Industry engineers will use the developed system's graphical user interface, GUI, to see the movement of an individual reticle as it progresses through the machine's stages. The GUI will also allow industry engineers to compare the movements of multiple reticles if they overlap, disrupt each other's position, and trigger an error. This kind of visual aid will save massive amounts of time and greatly increase the efficiency of diagnosing and correcting manufacturing errors. The system will get its reticle movement data from a message log of machine actions that is output by the machine's control software. We expect to accurately model the movement of multiple reticles based on the data read from the output message logs. A visual simulation of the reticle motion is necessary because the log files generated by the machine are extremely complicated and can take a human many hours to look through in order to find any errors manually.

Technical Abstract:

Factory automated computers are used in fab to operate the fabrication of wafer production using automated software. In lithography, images of reticles project onto a wafer to etch the design into the wafer. The communication between factory automated computers and the TwinScan lithography system is accomplished using messages through various events called CEIDs. Each CEID contains different sets of configurable parameters (VID). The factory automation software reads them to verify the process is correct and to take corrective actions. SDR logs are then generated containing the interface messages between the production machine and the host software. Usually, the interface logs are very large due to the complexity of the TwinScan system and requires a quick analysis. Monitoring the flow of the Reticle is an important yet painstaking task. This project involves creating a Reticle Simulation program which takes a SDR log as input and simulates the flow of the reticles within the file. A Reticle Simulator GUI is developed showcasing the SDR Log, the Reticle Motion, and a Content display field showing every reticle involved. The simulator projects an animated reticle flow as it moves between stations. This simulation is necessary to detect any significant errors in order to prevent additional resources being invested in other areas, while also significantly reducing the human time consumption.

SepN1 Mutations in Congenital Myopathies

Kamryn Jebb 2020

Faculty Mentors: Shannon Gerry, Alan Beggs

https://fairfield.quip.com/UyjCAe58HoUQ

Abstract:

As an intern in the laboratory of Alan H. Beggs, Ph.D. in the Division of Genetics at Boston Children's Hospital, I assisted with research regarding muscle disorders present at birth. Dr. Beggs is interested in understanding the genetic details of these disorders as they are little-understood and generalized by muscle weakness and progressive disabling symptoms. SepN, a gene that produces a protein essential to muscle cell function, has been identified as mutated in some patients with congenital myopathies. The clinical features of this mutation include early onset muscle weakness, delayed walking, rigidity of the spine, scoliosis, and reduced lung capacity. To better understand this gene, zebrafish with a mutated SepN gene were created. These mutants had curved spines, abnormal muscle fiber structure and a significantly slower escape response compared to organisms with functional SepN genes. The current line of zebrafish with SepN mutations do not show any physical differences when compared to the wild type fish. It is hypothesized that other genes increase their function to compensate for the SepN mutation. To discover what these genes are, DNA sequences with the mutated organisms are currently being amplified and analyzed.

Structural Characterization and Catalysis of Self-Assembling Guanosine-Ribbon and Quadruplex Nucleopeptides

Katherine Bacchi 2022, Sarah O'Neill 2023

Faculty Mentor: Jillian Smith-Carpenter

https://fairfield.quip.com/cdaJACzdEOwp

Abstract:

DNAzymes are sequences of DNA that possess unique catalytic abilities. As the vast majority of DNAzymes contain guanosine-based G-quadruplex secondary structures, there has been recent interest in designing supramolecular structures that contain G-quadruplexes and would also display catalytic functionality. In an effort to design such a G-quadruplex containing supramolecular structure, we have chemically modified the N-terminus of a short self-assembling peptide with guanosine. Two different peptide scaffolds were synthesized, only differing in the C-terminus functional group, and were subsequently self-assembled. Our data suggests that the C-terminus plays an essential role in controlling the final morphology, with the nucleopeptide having the capability to assemble into either a ribbon or quadruplex complex. Theses morphologically different nucleopeptides were structurally and catalytically characterized. Our results suggest that nucleopeptides are a unique self-assembling scaffold with the potential to catalyze a wide range of reactions similar to previously studied DNAzymes.

Synthesis and Characterization of Helical Handedness of Chirally Biased Aib Oligomers by Proton NMR Spectroscopy and X-ray Crystallography

Mark Korst 2021, Etienne Chollet 2021, Karim Alveranga 2022, Rachel Martin 2022

Faculty Mentor: Matthew Kubasik

Supported by Mancini Fund

https://fairfield.quip.com/fPYaACtShTUb

Abstract:

https://fairfield.quip.com/fPYaACtShTUb","Our work relies on the chemical preparation of submicroscopic peptides made of the same amino acid a-aminoisobutyric acid. Intramolecular forces present in these peptides allow them to form into helices. These helices are described as "chiral," and they can turn in right-or left-handed directions. Through examination of past literature, it is evident that the helical chirality of peptides can be influenced through synthetic modifications. The purpose of our research is to create peptides of varying lengths and determine how reliably we could influence their helical chirality. We used three chiral tags in our study. Our laboratory work primarily consists of the synthesis and purification of these molecules, and we confirm our syntheses with a variety of methods: proton NMR and infrared spectroscopy, along with mass spectrometry. Through initial analysis of proton NMR spectroscopy, we noticed subtle differences in helical structure that could be caused by the three tags. We have a series of peptides, varying from 2-8 amino acid residues long, and we hypothesize that by adding the chiral tags to the end of each peptide, we can bias the helix to spin with one handedness. The method to truly visualize the structural configurations of our peptides is x-ray crystallography. We have established collaborations with Purdue University to assist in obtaining x-ray crystal data for our peptides.

Technical Abstract:

Oligomers of a-aminoisobutyric acid were synthesized with varying lengths (n=2-8) and differing C-terminal chiral groups. The Aib residue is achiral and strongly helicogenic. Oligomers of Aib residues form 50/50 (racemic) mixtures of left-and right-handed helices. The synthetic schemes were based on the nucleophilicity of the N-terminal nitrogen, which is able to attack the C-terminal carbonyl - thereby creating new amide bonds. The peptides were carefully manipulated using a variety of reaction conditions and mechanisms, which include amide coupling, ester hydrolysis, and catalytic hydrogenolysis. By utilizing an organized combination of these reaction schemes, along with the characteristic amide-forming nucleophilic acyl substitution, desired peptides of differing lengths were created. Subsequently, attachment of a C-terminal chiral amine which could contain the ability to bias the handedness of the peptide's helix - was performed through similar nucleophilic acyl substitution. A combination of proton NMR and infrared spectroscopy, along with mass spectrometry, was engaged to confirm our syntheses after each step of the pathway. Spectroscopic data recorded from uniquely biased chiral oligomers delineated many structural intricacies. X-ray crystallography and NMR spectroscopy, were

utilized in order to make structural observations of each molecule. X-ray crystallography gives precise measurements of quantitative features such as diastereotopic purity, phi and psi angles, and pitch of helix in question, whereas NMR spectroscopy, particularly varied temperature, may facilitate clarification of a thermodynamically influenced equilibrium position between the rapidly interconverting diastereomer counterparts.

Temporally & Spatially Encoded Optical Imaging

Lilliana Delmonico 2020, Corey Loke 2020, Ronald Chasse 2020, John Moriarty 2020

Faculty Mentors: Ryan Munden, Michael Pawlowski

Supported by Hardiman Scholars

https://fairfield.quip.com/LMGGAuWyMhHD

Abstract:

Frequency encoding is a common method used to detect physical boundaries or objects. Modern applications include radar, ultrasound, and lidar. This method requires a set of known frequencies to be sent to a surface, and then photos taken of the surface. Upon analysis of the frequencies sent to each photo, spatial information can be identified. Our project focuses on a novel frequency encoding method which incorporates spatial and temporal (time) parameters. This new method allows us to convey spatial and height information about textured surfaces that are either solid or transparent. This allows us to further identify location and volume of items on these surfaces for further, more detailed analysis.

Technical Abstract:

Frequency encoding is a common method used to detect physical boundaries or objects. Modern applications of this include radar, ultrasound, and lidar. Generally, a signal of known frequency is released to an object or area and information about the returning signal is recorded. Any noise from the signal is filtered out and an image is produced from the signal information. Our novel approach uses structured illumination with spatial and temporal modulation of the intensity within an optical imaging system to encode more information about the object being imaged. We illuminate the imaged surface with predefined frequencies at specific locations via a projector system. A camera captures a series of images of this surface at a specific rate. Through Fourier analysis of the images through time, features on the surface can be determined with greater accuracy. In particular, this method has important implications in conveying spatial and height information of textured surfaces, from transparent surfaces or different optical layers. Location and volume details can also be obtained about any particles or ridges on a surface via this method. We can take very specific measurements of these surface features for further examination.

The Effects of Early Traumatic Experiences on Emotion Recognition in Individuals with Intimate Partner Violence Victimization and Borderline Personality Disorder

Amanda Ekkers 2021, Kate Lydon 2020

Faculty Mentor: Margaret McClure

https://fairfield.quip.com/hFZ1ATSwwCi2

Abstract:

The current study examines the relationship between an individual's ability to recognize emotions and the experience of trauma in childhood. It was predicted that individuals who reported higher levels of trauma in childhood would display difficulties in identifying facial expressions. Participants who reported Intimate Partner Violence in relationships were

recruited from Fairfield University, and individuals who met DSM5 criteria for Borderline Personality Disorder were recruited at the Icahn School of Medicine at Mount Sinai; control groups without these experiences were recruited at both sites. Participants completed a self-report questionnaire of retrospective report of childhood trauma, and a test of emotion recognition. Statistical analyses reveal that as childhood trauma increased, accuracy of emotion recognition decreased. These results suggest that the experience of childhood trauma may hinder the ability to accurately identify emotions using facial expressions.

Technical Abstract:

As part of two large, ongoing examinations of the relationship between social cognitive errors and clinical symptomatology, the current study investigated the emotion recognition abilities of those who experienced trauma in childhood. It was hypothesized that those with higher levels of childhood trauma would display deficits in facial affect processing. Participants with Intimate Partner Violence (IPV) victimization and Borderline Personality Disorder (BPD) were examined against controls without these experiences. Participants from Fairfield University were recruited through the General Psychology subject pool and were administered the Conflict in Adolescent Dating Relationships Inventory (CADRI) to determine whether they experienced IPV victimization. Participants from the Icahn School of Medicine at Mount Sinai were recruited through media advertising and were assessed using the Structured Clinical Interview for the Personality Disorders (SID-P). All participants completed the Childhood Trauma Questionnaire (CTQ) and the Reading of the Mind and the Eyes Test (RMET). Statistical analysis revealed a statistically significant negative correlation in the overall sample between childhood trauma and accuracy on the RMET ($r=-.35$, $p<.0001$). Follow-up analyses at each site were run. A relationship between facial accuracy and physical neglect, which is a subtype of childhood trauma, at Fairfield University was found, but significant differences between individuals with and without IPV for trauma and emotion processing was not found, likely due to a lack of statistical power. BPD patients reported significantly higher scores on the CTQ than the control group, $F(1,257)=36.63$, $p<.0001$. Qualitative analyses suggest that BPD participants demonstrated worse accuracy on the RMET, but again more subjects are needed to demonstrate statistical significance. Overall, the significant results suggest that facial processing and childhood trauma are related such that individuals who report higher levels of childhood trauma also demonstrate worse facial emotion recognition. More participants are needed to determine if these differences differentiate individuals with IPV and BPD groups from control participants.

The First Cat Call: Reconstructing Ancestral Feline Vocalizations

Julia Wooby 2022, Cristian Navarro-Martinez 2022, Rebecca Buonopane 2022, Brendan Smith 2021

Faculty Mentors: Ashley Byun, Murray Patterson

https://fairfield.quip.com/XX6mAtfqCmqr

Abstract:

The cat family Felidae is widely distributed around the world, with species found in every continent except Antarctica. The 14 call types produced and recognized from 38 known cat species are complex with respect to amplitude, call duration, and frequency. Of the 14 known call types, not all are necessarily produced by a particular species. Using parsimony and working backwards from the calls present in extant Felids, our preliminary analysis has led us to determine that the first ancestor of cats, 11 million years ago, produced spit, hiss, growl, snarl, and mew vocalizations. This reconstruction was conducted by using algorithms and cost matrices developed in Python3. Cost matrices provide a weight to each evolutionary step in order to generate the most likely reconstruction. We plan to use vocalizations downloaded from the Animal Sound Archive (Museum fur Naturkunde Berlin) and analyzed through Raven Pro 1.6 to visually analyze and categorize Felidae vocalizations and ultimately break down each of the calls into its fundamental acoustic components. All reconstructed ancestral calls will then be recreated through musical engineering, which will incorporate these acoustical characteristics. By recreating and understanding the calls of extinct felid species, this work can provide insight into other aspects of the lives of these ancestral carnivores, including socialization, habitat, and behavior patterns.

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The Mediating Effect of Depressive Symptoms on the Relationship Between Interpersonal Offense Rumination and Suicide Ideation in Young Adults

Amanda Franco 2020

Faculty Mentor: David Hollingsworth

Supported by Lawrence Family Fund

https://fairfield.quip.com/cR7fA6n1gsNX

Abstract:

Research has found a strong relationship between the tendency to ruminate (recurring thoughts in response to a negative mood) and negative mental health outcomes, such as depressive symptoms. A frequent negative outcome of experiencing these depressive symptoms is the development of suicide ideation (thoughts). There is research on the relationship between general rumination and negative mental health outcomes, however there is little research that examines ruminating about a specific interpersonal offense (e.g., partner infidelity), depressive symptoms, and suicide ideation. The purpose of the current study was to examine depressive symptoms as a mediator of the relationship between rumination about an interpersonal offense and suicide ideation in a sample of young adults. It was hypothesized that depressive symptoms would significantly mediate the relationship between ruminating about an interpersonal offense and suicide ideation. Participants in the current study consisted of 360 college students recruited from a large Midwestern university. Participants completed a battery of self-report measures to assess for the variables of interest. Results from the study indicated that depressive symptoms mediated the relationship between rumination about an interpersonal offense and suicide ideation, supporting the hypothesis. The findings from the present study showed that young adults who experience rumination about an interpersonal offense, was associated with higher levels of depressive symptoms, which, in turn, was associated with increased thoughts of suicide.

Technical Abstract:

Suicide is currently the second leading cause of death in young adults in the U.S (Centers for Disease Control & Prevention, 2018). Research has found a strong relationship between the tendency to ruminate (recurring thoughts in response to a negative mood) and negative mental health outcomes, such as depressive symptoms (Wade, Vogel, Liao, & Goldman, 2008). A frequent negative outcome of experiencing these depressive symptoms is the development of suicide ideation. In fact, research has found that experiencing depressive symptoms is a prominent risk factor for suicide (Kisch, Leino, & Silverman, 2005). Although there is past research on the relationship between general rumination and negative mental health outcomes, there is little research that examines ruminating about a specific interpersonal offense (e.g., marital infidelity), depressive symptoms, and suicide ideation. Thus, the purpose of the current study was to examine depressive symptoms as a mediator of the relationship between rumination about an interpersonal offense and suicide ideation in a sample of young adults. It was hypothesized that depressive symptoms would significantly mediate the relationship between ruminating about an interpersonal offense and suicide ideation. Participants in the current study consisted of 360 college students recruited from a large Midwestern university. Participants completed a battery of self-report measures to assess the variables of interest. A mediation analysis with 5,000 bootstrapping samples was conducted using the PROCESS macro for SPSS. Results from the study indicated that depressive symptoms mediated the

relationship between rumination about an interpersonal offense and suicide ideation (effect= .02, 95%CI= .01 to .03), supporting the hypothesis. The findings from the present study showed that young adults who experience rumination about an interpersonal offense, was associated with higher levels of depressive symptoms, which, in turn, was associated with increased thoughts of suicide. A clinical implication of the current study is the importance of clinicians assessing for depressive symptoms in patients who experience rumination about an interpersonal offense during suicide risk assessments.

The Role of Mixing in Past Climates

Jordan Hamilton 2022

Faculty Mentor: Robert Nazarian

https://fairfield.quip.com/tfjEA6ruRF43

Abstract:

One of the primary drivers of Earth's climate system is the Meridional Overturning Circulation (MOC). The MOC is important for the circulation of heat, carbon, and nutrients throughout the global ocean. The MOC is one of the two main large-scale circulation patterns in the ocean and is driven, in part, by the breaking of internal waves. It has been proposed that the MOC was significantly different during the Last Glacial Maximum (LGM) than it is today. Previous studies have suggested that a change in ocean mixing during the LGM may be a potential mechanism for the change in MOC strength (Jansen et al., 2016; Schmittner et al., 2015). Although mixing happens throughout the ocean, a significant portion of mixing occurs in submarine canyons (Nazarian et al., 2017a,b; Nazarian et al., submitted; Nazarian et al., in prep). We investigate i) the mixing due to internal waves in submarine canyons and how this was different during the LGM; and ii) whether this is a potential mechanism for the change in the strength of the MOC between LGM and present. We model modern and LGM ocean conditions in two canyons - Eel and Veatch Canyons. By analyzing the dissipation and circulation, we test whether these canyons are responsible for the change in the strength of the ocean's MOC. Furthermore, we compare our results with paleoproxy reconstructions of LGM circulation.

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The Role of Question Difficulty in Eyewitness Reports Across Multiple Interviews

Nicole Palas 2020

Faculty Mentor: Linda Henkel

Supported by Mancini Fund

https://fairfield.quip.com/o1MmAxP17y5c

Abstract:

Eyewitness testimonies are a key part of judicial proceedings. However, decades of research has shown that an individual's memory of an event is not always accurate, even if the witness is quite confident and detailed in their report. Previous research found that individuals are more confident and perceive greater accuracy in their answers if they initially answer easy questions. While many researchers have examined external factors that influence witnesses, limited research looks at internal factors that influence witness consistency. This research studied whether answering difficult questions about minute non-crime details leads people to doubt their memories of the crime itself and change their responses more than answering easy questions.

Technical Abstract:

Decades of research on eyewitness testimonies has shown that an individual's memory of an event is not always accurate, even if the witness is quite confident and detailed in their report. Research found that individuals are more confident and perceive greater accuracy in their answers if they initially answer easy questions. Our research applies this concept by analyzing whether witnesses are more likely to change their responses across multiple interviews depending on if questions were initially easy or challenging, and whether difficulty attributed to scores of confidence and perceived accuracy. The first session included watching a video of a nonviolent crime. Three days later, participants completed a second session involving questions about events before the crime. Half of the individuals were assigned 10 easy questions about observable details and the other half received 10 hard questions about intricate details. Then, all participants received the same 20 questions about the crime itself, which included 10 easy and 10 difficult questions. Five days later participants completed the final session which involved answering the same exact questions about events before and during the crime. After answering each set of questions, participants reported their confidence and accuracy ratings. For Session 2, participants were significantly more accurate and confident for easy questions about details pertaining to events before the crime than those that answered hard non-crime questions. Participants who answered the easy crime questions and had previously answered the Easy pre-crime questions answered significantly more correct questions than participants who initially answered Hard pre-crime questions. For Session 3, all patterns found in the earlier session were also found. However, the spillover effect found in Session 2 while answering easy crime questions was not found. Overall, individuals who initially answered easier questions were more confident and accurate in their answers. While our hypothesis was not fully supported, we did find evidence to support that individuals first exposed to easy pre-crime questions performed more accurately and were more confident about their answers to easy crime questions than individuals in the hard condition.

Using the Implicit Association Task to Investigate Implicit Bias Towards Single Parents

Lane Berisford 2020, Mary Cassidy 2022

Faculty Mentors: Michael Andreychik, Shannon Harding

https://fairfield.quip.com/XnmiA0dlZrsj

Abstract:

Implicit attitudes are spontaneously activated evaluations toward objects, people, or groups. Many studies examining implicit attitudes toward groups have shown that people's implicit attitudes are often relatively independent from their more deliberative explicit attitudes such that, for example, one may report a positive explicit attitude, but harbor a negative implicit attitude. Present studies extend existing work on implicit attitudes by examining how they function with respect to a group that has received little attention in the implicit attitudes literature, namely, Single Parents. In order to examine this topic, we had participants complete a test intended to measure the strength of their automatic associations between the concepts "Good" and "Bad" and the categories "Single Mother" and "Single Father." In addition, participants completed a measure of explicit preference for Single Mothers compared to Single Fathers. In two separate studies, we found that although participants had more positive implicit attitudes toward Single Mothers than Single Fathers, they reported no explicit preference for Single Mothers relative to Single Fathers, consistent with past work demonstrating that implicit attitudes are largely dissociated from explicit attitudes.

Technical Abstract:

The bulk of existing research examining the correspondence between people's implicit (i.e., spontaneously activated) and explicit (i.e., deliberative) attitudes suggests a discrepancy between these attitudes such that, for example, one may report a positive explicit attitude, but harbor a negative implicit attitude. Despite the large amount of research in this area, to the best of our knowledge, there are no studies that examine implicit and explicit attitudes toward single parents. Our project addresses this gap by examining the extent of implicit bias toward single parents, and by looking at the correspondence between implicit and explicit attitudes toward single parents. In order to examine this topic, we had participants complete versions of an Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) which measures the strength of their automatic associations between the concepts "Good" and "Bad" and the categories "Single Mother" and "Single Father." In addition, participants completed measures of explicit preference for Single Mothers compared to Single Fathers. In Study 1, we examined participants' relative implicit preferences for Single Mothers vs. Single Fathers, and found that participants showed stronger associations between Single Mothers and Positive (and Single Fathers and Negative) then between Single Mothers and Negative (and Single Fathers and Positive). Participants did not show an explicit preference for Single Mothers relative to Single Fathers. In Study 2, we examined participants who had positive implicit associations with Single Mothers but neutral implicit associations with Single Fathers. In addition, Study 2 again showed little association between participants' implicit and explicit attitudes toward Single Parents. consistent with past work demonstrating that implicit attitudes are largely dissociated from explicit attitudes.

What To Do When the Assumptions of the Hypothesis Tests Are Not Met

Julia D'Innocenzo 2020

Faculty Mentor: Laura McSweeney

https://fairfield.quip.com/my0nAH49SFhC

Abstract:

My project deals with a statistical software called R, which is used by statisticians to analyze sets of data. The two tests used in this project are called Parametric and Nonparametric tests. I compare these two tests by using different types of data sets which have distinct characteristics. After studying each test, I conclude which type of test is more beneficial under certain conditions.

Technical Abstract:

Parametric tests are the tests most commonly introduced in standard introductory statistics courses. But, there are times when the underlying assumptions of these hypothesis tests, like normality, are not met. When the assumptions of tests fail, then the validity of the information provided from the parametric tests can be unreliable. The nonparametric tests have been shown to be more powerful in these cases (Kitchen, 2009). We present alternatives to standard statistical tests such as, the one mean t-test, the two mean t-tests for independent and paired samples, the One-Way ANOVA test, and the two proportion test. We compare and assess how the parametric and nonparametric tests perform under various conditions using existing and simulated data sets that meet standard assumption criteria and those that do not.

Graduate Research and Independent Projects

Civic Engagement Through the Promise of Democracy

Serena Lo 2020, Thuy Le 2020, Sakshi Mathur 2020, Yanbei Xie 2020, Hari Sri Sai Charan Moparthi 2020

Faculty Mentor: Amalia Rusu

https://fairfield.quip.com/VgFzA7rvIA3x

Abstract:

Civic Education through the Promise of Democracy is part of a two-year project funded by the Davis Educational Foundation. The aim is to promote civic education through the promise of democracy in response to the changing political landscape, both nationally and globally. The project focuses on engaging students with classes on differing perspectives of democracy, democratic struggles throughout history, democratic achievements in other countries, and current threats to democracy, such as fake news, social media, climate change, and threats to human rights. The goal is to promote engaged citizenship based on democratic views such as openness, participation, intercultural understanding and inclusion. The web-based application serves as a supplemental learning tool, teaching aid and resource repository for difficult dialogues. The application has two modules: a student module and an instructor module. For the students, the application is both an educational and interactive experience and has learning modules that contain a variety of learning materials, such as text, images, audio and video. The application also collects student feedback through the form of surveys and quizlets. The instructor module allows instructors to aggregate student responses for use in either class or for future studies. The application has responsive UI, as it is used on a variety of computers and mobile devices, as well as different web browsers. In addition, the application complies with FERPA and maintains student privacy when collecting responses.

Fabrication of Polylactic Acid – Alumina Composite Filament for 3D Printing: An Experimental and Computational Study

Mohammed Thajudeen Syed Mustafa 2020, Andrey Zaznaev 2022

Faculty Mentors: Sriharsha Srinivas Sundarram, Isaac Macwan

Supported by Femia Science Endowment

https://fairfield.quip.com/jlvUAXguazn0

Abstract:

Polylactic acid (PLA) is one of the popular thermoplastic biopolymers used for applications such as 3D printing filament, packaging material, medical devices, and tableware. However, the ultimate strength of PLA is only around 50 MPa, which restricts its use from applications requiring higher strength values. The goal of this study is to fabricate PLA-alumina nanocomposite 3D printing filament with improved mechanical properties compared to pure PLA. There is evidence from the literature stating that alumina enhances the mechanical properties of polylactic acid. PLA-alumina suspensions were prepared by ultrasonic stirring, and the solvent extraction approach was used to obtain thin films, subsequently fed into an extruder to obtain 3D printing filament. The filament is used to print dog bone specimens for mechanical property testing as per ASTM D638 standard. Using dimethylformamide (DMF) as a solvent for PLA leads to a change in polymer's viscosity and other relevant features. This leads to another question addressed in this study about how DMF can affect the mechanical properties of PLA-alumina nanocomposite and what is the underlying cause at the molecular scale. To validate the experimental results, VMD (Visual Molecular Dynamics) is used to visualize and analyze the PLA-alumina complex, and NAMD (Nanoscale Molecular Dynamics) is used to perform all-atom molecular dynamics simulations for control PLA and PLA-alumina complex for 100ns each. The simulations are performed at room temperature although further studies are underway to investigate the effects of increased temperature on PLA interactions with alumina nanoparticles (as required by 3D printers to form the filament). The models for PLA, alumina, and DMF are generated based on CHARMM force field parameters. Based on these simulations, we investigated non-bonding interactions of PLA and alumina in the presence of DMF and analyzed possible causes of the alteration in the mechanical behavior of the PLA-alumina nanocomposite.

Characterization of this nanocomposite is further performed using atomic force microscopy (AFM), and the data supports the simulation results.

The Study Based Upon SET Game

Wei Hu 2020

Faculty Mentor: Mirco Speretta

Supported by Hardiman Scholars

https://fairfield.quip.com/B6VGAIcRulHy

Abstract:

This study's objective is to determine if there are differences in playing the SET game based on personal traits such as gender and school major. Our study is based on data collected from subjects using our web-based interface based on the SET game. The SET card game has 81 unique cards varying in four attributes across three possibilities for each kind of feature: number of shapes (one, two, or three), shape (diamond, squiggle, oval), shading (solid, striped, or open), and color (red, green, or purple). In the game, certain combinations of three cards make up a SET. For each one of the four categories of features; color, number, shape, and shading, the three cards must display that feature as a) either all the same, or b) all different. In the SET game, there are four types of SETs players identify. Every time one hand of 12 cards are dealt in front of players. In our game, a data set containing all hand combinations satisfying our requirements is generated in advance. We implement a MySQL 5.7.22 database server for data manipulation and storage. A web-based user interface running the game is implemented as our media to collect data. Every hand presented on our website contains exactly four SETs, one for each type. Before beginning the study, we obtained approval from Fairfield University's Institutional Review Board. All participants are required to know the game rules prior to logging into our website. Players voluntarily log into the website and provide their demographic information before they start to play the game. While playing, participants will not realize the difference of game configurations between the typical SET game and our game. Only first SETs picked by players of each hand are stored in the database. A total of 85 users logged into our website and played the game with 36 females, with an average age of 33 years old, and 49 males with an average age of 30 years old. There were 41 users from Engineering, 30 from Mathematics, 5 users from Business, 4 users from Education and/or Allied Professions, 3 from Nursing and/or Health Studies, 1 from Humanities, 1 from Other; and none from Communication, Arts and/or Media, and Social Sciences. Out of 85 users, 76 users found at least one SET and their data of first SET is used in our statistical analysis. The results show there is no relationship between type of SET picked and personal traits.

Technical Abstract:

This study based on the SET® game investigates if personal traits such as gender and school major are related to the way people play the game. We created our own game interface by using the card design and the rules of the SET game. When we worked on website implementation, considering our website is database driven, we use Django 2.1.7 (with Python 3.7.3) web framework to implement our website, together with HTML, JavaScript and CSS to improve the appearance and image display. As for website deployment, we take Cloud based service rather than the campus VPN server due to its accessibility. We deployed the website on AWS EC2 Windows instance (ec2-13-58-158-112.us-east-2.compute.amazonaws.com) and used AWS RDS MySQL to deploy database. The instance is run on a t2.mirco server at the lowest cost and meets our basic requirements when the website has low traffic. And it is flexible to upgrade the server to higher performance in AWS as traffic grows. We uploaded the pre-generate hand table to RDS and stored all data collected from users on RDS. In the SET game, there are four types of SETs. Our game adds some constraints on the game to meet our study design that every hand of the SET game contains exactly four SETs, one for each type, so that we can determine if the types of SET are picked with different probabilities. In order to generate the hand table with specific constraints, we ran a program implemented by Java 1.8.0_181 to create data of four types of SETs. The data is handled in relational databases to exploit their capabilities of data manipulating (i.e. sorting, combining, and inserting). In this study, we show how this approach was successful in solving a combinatorics challenge to create a hand data set that involves all possible card combinations of the SET game®. The hand data required for the study was very extensive. The exact number was unknown as this is an open combinatorics question, but the estimate was in the order of hundreds of millions. We solved this challenge by using a relational database as a computational tool to generate the data set. Our database is implemented on a MYSQL 5.7.22 server. Advanced SQL scripts, based on cross joins, were applied to generate the hand

data. Table partitioning was also applied to improve the database performance of tables whose number of records exceeded the size capability of the database table. The data set created was then used to support our Web based user interface that collects data from our users. On our web-based interface, one randomly selected hand from the data set generated in advance is dealt onto screen. User data including demographic and game data is collected and stored. The statistical software R was used for data analysis to summarize the results of the study. In order to assure data independence, only the first SET picked by participants are used in this analysis. In this case, 76 participants found one SET or more out of the 85 and their data are used for the analysis.

Vapocoolant Spray Versus Intradermal Lidocaine for Reducing the Pain of Peripheral Venous Catheter Insertion: A Prospective, Quantitative, Quasi-Experimental Project

Juan Farfan 2020

Faculty Mentors: Steven Belmont, Nancy Moriber

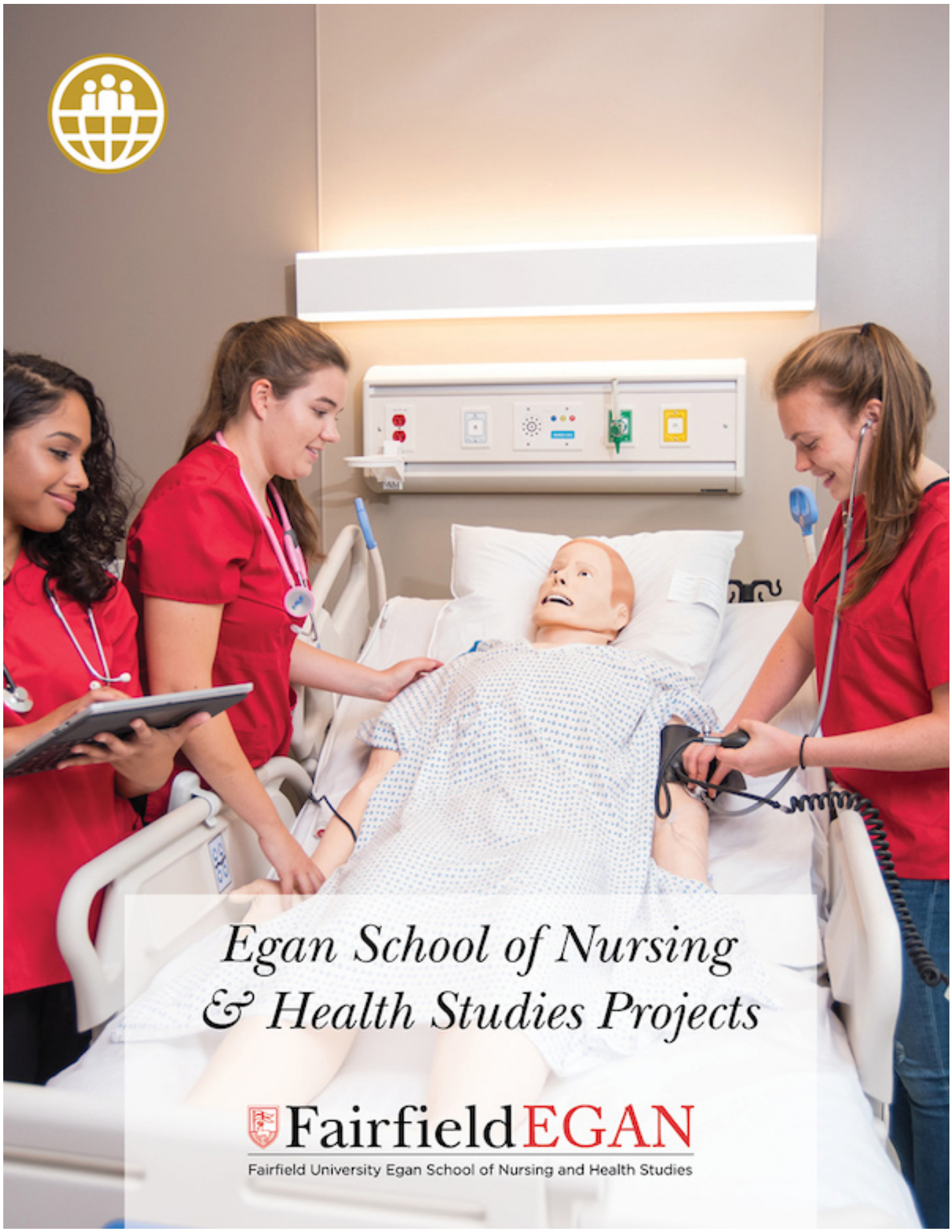
Supported by Lawrence Family Fund

https://fairfield.quip.com/LutpAcjqtRho

Abstract:

The insertion of peripheral venous catheters (PVC) can be painful for surgical patients. This study compared intradermal 1% lidocaine versus vapocoolant spray on patients' pain and satisfaction with the PVC insertion. The study used a non-blinded, prospective, quantitative, quasi-experimental design with a convenience sample of 269 adult patients from the preoperative holding areas of the in-patient and ambulatory units in an inner-city hospital. Intradermal 1% lidocaine was administered to the main OR patients, prior to insertion of their PVC. A vapocoolant spray, Gebauer's Pain Ease (Gebauer Company, Cleveland, Ohio), was administered to the ambulatory surgery department patients. The two groups were asked to rank their PVC insertion pain and satisfaction using a Numeric Rating Scale (NRS). An independent-samples t-test showed statistically significant differences in pain scores between the intradermal 1% lidocaine group (mean 0.24, SD 0.64) and vapocoolant group (mean 2.69, SD 2.3), t168.11=12.27, P=<.001. Average PVC insertion satisfaction did not significantly differ between patients who received intradermal 1% lidocaine (mean 9.79, SD 0.69) or vapocoolant spray (mean 9.70, SD 1.01), t267=-.85, P=.40. Preventing PVC insertion pain, through the use of intradermal 1% lidocaine or vapocoolant spray, can improve patient care and satisfaction. Even though the intradermal 1% lidocaine was associated with less PVC insertion pain, the satisfaction scores in both groups were similar, making vapocoolant spray a viable alternative.

Egan School of Nursing and Health Studies Projects



A Timeline of COVID-19: An Analysis of Global and Domestic Responses

Mary Eble 2020, Chloe Jaras 2020, Daniel Epstein 2020

Faculty Mentor: Deborah List

https://fairfield.quip.com/HHHGAEQlWd41

Abstract:

This project will be a timeline discussing the response to the novel coronavirus both on a domestic and international level. In addition, this project highlights the steps that Fairfield University has taken to combat this emerging pandemic. The novel coronavirus, commonly referred to as COVID-19 was first globally detected in early December; however, the first cases reported to the World Health Organization (WHO) were on December 31st 2019. On March 23, 2020, The Center for Disease Control (CDC) made the decision to implement social distancing, in order to reduce the spread of COVID-19 via respiratory droplets. However, due to the increasing incidence rate, it was necessary for further precautions to be made such as schools and nonessential businesses shutting down across the globe. Fairfield University first addressed the situation on January 30, 2020, informing students and faculty on the existence of COVID-19 and the potential effect it could have on the community. Since the initial announcement of COVID-19, the university developed a task force that has been monitoring the outbreak of this virus. Based on what they found, Fairfield University President Mark R. Nemec, PhD released a statement issuing the immediate closing of the Florence study abroad program and announced that all students must depart Italy with the intention of protecting the health and safety of the students. On March 11, 2020, the WHO declared COVID-19 a pandemic due to the rapid spread of the virus, the severity, and the concerning levels of inaction. Since then, the university has taken additional precautions based on the guidelines released by the Connecticut Health Department, and made the decision to close the main campus, move all classes to online, suspend on-campus move out indefinitely, and postpone the 2020 commencement ceremony. Connecticut Governor Ned Lamont issued a stay home, stay safe initiative. Since leaving campus, the university has been consistently keeping students up-to-date with the WHO and CDC responses and guidelines that have been released. Due to the fact that COVID-19 is a rapidly changing virus, public health officials are still trying to determine the best course of action, on both a domestic and international scale, to combat this global pandemic.

Alarm Fatigue and Its Impact on Patient Care

Julia Niccoli 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/nbxvAtkbGBlY

Abstract:

This research project focuses on alarm fatigue and its impact on patient care and patient safety. Excessive amounts of audible alarms in clinical settings reduce the awareness of healthcare professionals. In the Cardiac ICU at Yale New Haven Hospital, there are many monitoring systems constantly producing audible alarms. The more time that healthcare professionals spend in these settings with multiple alarms constantly sounding, the more cognitive overload and stress they encounter. Over time, they also become desensitized to the alarms and less likely to respond in a timely manner. This causes a phenomenon called "Alarm Fatigue." Many of these alarms are non-actionable, meaning there is no need for a nurse or clinician to intervene. Although more than 75% of alarms that sound in the ICU do not require any immediate intervention, some alarms do require immediate action, and when it is not received, harm can be caused to the patient and in some cases even death. Alarm fatigue is a growing problem that has a negative impact on patient care and safety, specifically in the ICU setting because of the many monitoring systems. Everyday, in healthcare settings, nurses and clinicians ignore audible alarms because they figure that they were non-actionable, so it is imperative that they are

informed on the most recent evidence on alarm fatigue in order to incorporate the best patient care into their practice. In addition to an educational in-service presentation on alarm fatigue, a brochure was created for nurses and other clinicians working in the ICU to read in order to learn what alarm fatigue is, the facts of it, how it impacts patient care and safety, and what can be done to prevent it. Key Words: alarm fatigue, desensitization, overexposure, patient safety, and intensive care unit.

Alarm Fatigue in Telemetry Nursing

Camryn Hobin 2020

Faculty Mentors: Suzanne Turner, Katherine Saracino

https://fairfield.quip.com/dFYtAUsgiVhj

Abstract:

On a telemetry unit, almost every minute several alarms go off at once. Between the continuous cardiac monitoring, pump alarms, and patient call bells, there are always alarms that require attention. Being in an environment with constant ringing or beeping can cause desensitization to alarms and increase the rate of missed alarms. This is known as alarm fatigue which occurs when the nurse experiences a sensory overload from all the noise going on around them. Alarm fatigue in any hospital setting poses a risk to patient safety, a failure to recognize a change in patient condition, and causes important alarms to become devalued by insignificant ones. On the telemetry unit at Yale New Haven St. Raphael's campus Verdi 3 East, staff voiced their opinions that alarm fatigue can get the best of anyone, especially on days when the floor is busier than others. Evidence-based research concluded that alarm fatigue poses a major threat to patient safety. A small educational poster containing the key points of alarm fatigue was created: what it is, why it is dangerous, and how to prevent it. This was presented to the staff during a huddle as a reminder of ways to prevent it from happening to them in order to better protect the patient.

Alarm Fatigue in the ICU

Meaghan Koster 2020

Faculty Mentor: Laura Conklin

https://fairfield.quip.com/NqmKAKotguG1

Abstract:

This capstone projects focuses on how bedside nurses are susceptible to alarm fatigue. For my capstone transition, I worked with experienced SICU nurses in the VA in New Haven CT. I focused my research on the SICU, or any intensive care unit where patients are in critical condition and require a lot of personal attention. These ICU patients are hooked up to various alarms such as IV pumps, bed alarms, and EKG monitors. The evidence-based research shows the dangers of alarm fatigue for not only nurses, but also patient safety concerns, and how night nurses in intensive care units are especially vulnerable. The role of the RN is to take care of the patient by answering all alarms in a timely matter. The RN on duty must take care of his/her own mental wellbeing to recognize when alarms are sounding. The evidence-based research provided a tool that can detect alarm fatigue and find ways to educate nursing staff on how to recognize and prevent alarm fatigue. Nursing is a physically and emotionally draining job. It is important for nurses to assess their own mental status during their shifts to provide the best care to the patients. In addition, education was provided to the night nurses on the prevalence and consequences of alarm fatigue.

Alleviating Patient Anxiety and Stress Prior to Surgery

Monsserat Mendoza Sartillo 2020

Faculty Mentor: Geraldine McSherry

https://fairfield.quip.com/zDtsA1Owuxk4

Abstract:

Patients experience anxiety and emotional distress, that may or may not be physically apparent, in the time before surgery. Preoperative patients awaiting surgery are often nervous about the plan of care. Many factors can contribute to these sentiments of fear. Special populations of patients, such as those with impaired sensory perception or those with different linguistic needs are more likely to be at risk for experiencing stress preoperatively. Nevertheless, any patient at any time can feel overwhelmed before surgery. From first-hand experience, upon entering the operating room, patients were often quiet with firm facial expressions, and when offered a hand to hold they often held on tightly as a nonverbal cue of obvious emotional strain. Research and evidence demonstrate that alleviating anxiety preoperatively results in better patient outcomes, better patient satisfaction, and a more empathetic nursing staff. Some proposed solutions for patients experiencing anxiety preoperatively include: guided imagery, music therapy, breathing techniques, creating a more relaxing operating room atmosphere, and even offering words of encouragement. Delivering an in-service about the research and findings to the staff of South Pavilion perioperative services was conducted to educate the floor staff, and thereby, promote empathy among perioperative nurses so that they can deliver exceptional patient care.

Alternative Measures for Pain Management

Francesca Murati 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/kWs0AVxtc3tX

Abstract:

This research project focuses on the topic of alternative measures for pain management for patients in the hospital, more specifically post operative patients. Even though there are a large number of efforts to decrease pain in the post operative stage, many patients still experience pain in the immediate post surgical period. Evidence based literature states that there is an inadequate management of pain, which can lead to reduced mobility that also can lead to deep vein thrombosis that can turn into pulmonary emboli. When in the post operative stage, most patients are prescribed pain medication, many of which are narcotics, and some sort of physical therapy before they are discharged. It has been found that there are not enough non-pharmacological methods to help reduce the severity of pain in post-operative patients. Non-pharmacological methods have been found as effective as pharmacological methods though with less side effects and complications. The reasons that they are not implemented as often is because of the care provider's attitude or lack of knowledge. Since providers are reluctant to use non-pharmacological methods, nursing curriculum does not emphasize it enough as its own subject. Furthermore, evidence-based research explains that each patient responds to pain management differently and the plan of care should have a wide range of both pharmacological and non-pharmacological methods to effectively manage their pain. Educating nurses and even the patient care associates about alternative measures for pain management is crucial in decreasing pain and pain associated complications in the post-operative floor. In connection to the research presentation, a flyer was created about non-pharmacological techniques the unit staff can use to serve their patient in decreasing their pain.

Appropriate Use of PPE in Healthcare

Alexia Meissner 2020

Faculty Mentor: Laura Conklin

https://fairfield.quip.com/OFlGAREMKYok

Abstract:

This project focuses on the use of PPE and how inappropriate use can cause panic for healthcare workers. In times of crisis, there are increasing needs for equipment that protects nurses, doctors, and other health care workers from becoming contaminated. In hospitals all over the world, the use of personal protective equipment or PPE is something that can be seen being used on every floor in many various situations, but due to the recent health crisis that has overtaken the world, easy access is no longer a given. This project will outline the importance of where and when to appropriately use PPE inside and outside of the hospital setting. With the number of unknowns in these pandemic situations, it is imperative that health care workers, especially nurses, have the equipment that they need so that they are protected when facing daily risk. Educating these healthcare professionals on the benefits and proper usage of the equipment can help reduce the amount wasted and decrease the risk of shortage in a time of need.

Arterial Line Nursing Care and Arterial Blood Gas Drawing

Kathleen Morton 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/2aVxALLjkqVc

Abstract:

Critically ill patients require arterial lines to monitor blood pressure trends, titrate drug therapies, and obtain blood samples for arterial blood gases and laboratory studies. Overall, nurses in the critical care step-down unit do not consistently care for patients with these invasive devices. As a result of this decreased prevalence, there was an observed and verbalized interest to strengthen arterial line care and skills. Evidence-based literature reveals that blood gas samples obtained from an arterial line provide the most exact measurement of the partial pressure of oxygen and carbon dioxide in the body, and gives deeper insight into effective ventilation. The literature also determines that the majority of arterial catheter blood pressure monitoring systems were either overdamped or underdamped, resulting in inaccurate systolic and diastolic pressure readings. Given these findings, it is essential for nurses to maintain protocol-driven arterial line care and accurate arterial blood gas practices. The unit presentation included a simulation session in which nurses practiced the arterial blood gas drawing skills through an assigned competency and video recording. Likewise, an educational handout was developed and shared so that nurses can refer to the specific policy statements, direct patient care takeaways, and steps to retrieve online resources via the hospital's website. In order to fully ensure that patients receive optimal treatment, it is crucial that nurses are aware of the factors and care that affect the safety and accuracy of arterial monitoring.

Assessing and Preventing Elopement of Patients Who Are Experiencing Sundown Syndrome

Helen Ruckes 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/ai7TAdJAavsa

Abstract:

This research project focuses on providing to nurses further education about patients who suffer from sundown syndrome, and how to protect these patients from elopement out of the hospital. As the population of geriatric individuals is increasing in the United States, the incidence of dementia-related diseases is also increasing. Evidence-based literature included in this project discusses some signs and symptoms related to sundowning, including wandering tendencies and elopement, in patients with dementia. Furthermore, the evidence-based research provides screening tools to identify elopement risk, as well as both pharmacological and non-pharmacological treatments to potentially suppress signs and symptoms of sundown syndrome. Educating hospital staff will increase patient safety, help to prevent caregiver burnout and stress, and

decrease the incidence of elopement of individuals experiencing sundown syndrome. In addition to this research project, a flier with an elopement screening tool was created for nurses to refer to, and an educational in-service was provided.

Awareness on Postpartum Depression

Samantha Kolasa 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/PL0WAaub0HCv

Abstract:

On the maternity unit, I found that postpartum mothers do not have adequate knowledge and proper education on postpartum depression (PPD). Patients currently report past symptoms of feeling negative emotions after a delivery but did not seek help during that time period. This mental illness is defined as experiencing depressive symptoms due to hormonal changes a mother experiences after delivery and up to one year after birth. Many mothers are not aware of the signs and symptoms of postpartum depression and assume that they are doing something to induce their depressive emotions. I found that a lot of mothers are nervous to report their feelings because they are scared their baby will get taken from them. Evidence shows that only 40% of mothers report symptoms of PPD to their provider. The methods used to gather my information are interviewing patients and reviewing their Edinburgh Postpartum Depression Scales. Through these methods, it was found that patients experienced few to many symptoms of PPD, such as lack of interest in the baby or feelings of guilt and hopelessness. When asked if these symptoms were reported, most answers were negative, and their fears were expressed. Awareness of this mental disease is imperative for reporting and diagnosing mothers who experience PPD in order to keep the mother and baby safe. A brochure was created on what PPD is and contains signs and symptoms to be aware of and report to a provider. Nurses on the floor agreed that an educational brochure is a great feature for mothers to refer to throughout the first year after their delivery.

Barriers to Transitional Care

Lauren Forney 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/tzk8Aj2u1Rln

Abstract:

This research project focuses on the barriers in transitional care and how to overcome them. Transitional care is the coordination and continuity of care during the movement from one healthcare setting to another. Frequent and disorganized transitional care can have detrimental effects on patients. Some factors that contribute to disorganized transitional care are poor communication, limited access to services, and incomplete transfer information. These factors can result in shortcomings such as medication errors or other gaps in care that could harm the patient. Research on this topic concluded that facilitators to quality transitional care are adequate care coordination, utilization of available resources, and skill in the care giving role. This is relevant in today's society as the aging population continues to grow and receive care from multiple sources due to chronic illness. It is more important than ever for nurses to provide high quality transitional care to ensure the wellness of patients.

Bedside Hand-off Report: Improving Communication to Reduce Clinical Errors

Olivia Baril 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/E5FtAgDkmauu

Abstract:

Nursing hand-off report is a synopsis of a patient and their nursing care spoken from one nurse to the other at the change of shift. During report, the leaving nurse is to communicate both objective and subjective data to the oncoming nurse such as vital signs, a patient's mood or affect, and any psycho-social information relevant to their care. Studies show that when this hand-off report is given at the bedside, the communication is more effective and results in less clinical errors than if it were to be performed elsewhere. Traditional places to exchange nursing hand-off report include the nurses' station or a hallway, but rarely in the patient's room. This research shows that by including the patient physically in this exchange, both objective and subjective information is communicated most effectively. This improvement in communication between care givers improves patient outcomes, patient satisfaction, and reduces overall clinical errors.

Impact of Early Ambulation in Postoperative Patients

Hannah McCarthy 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/ZYbzA7Y6LkmR

Abstract:

This evidence-based practice project reviews the literature to determine if early ambulation in postoperative patients improved patient outcomes and the barriers that prevent early ambulation. Additionally, the literature was reviewed to determine the nursing implications related to early ambulation. Early ambulation is a technique used postoperatively to engage a patient in mild to moderate physical activity (Early Ambulation, n.d.). The literature review showed that early ambulation leads to shorter hospital stays, lower hospital costs, and fewer postoperative complications. In addition, strategies to overcome the barriers associated with early ambulation were highlighted. A search of the Cochrane, PubMed, and Cinahl plus Full Text databases was conducted to reveal studies with successful implementation of ambulation programs. Nurses are required to educate patients on ambulation, collaborate with other health care professionals, and implement ambulation protocols. Future recommendations for nursing include: a need for change in policy when ambulation within twelve hours after surgery is not the standard of care for postoperative patients.

Benefits of Essential Oils in the Acute Care Setting

Caileigh Burke 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/EAgEA0VLvoqS

Abstract:

This research project focuses on the use of essential oils in the acute care setting, specifically in the Intensive Care Unit (ICU). Patients in the ICU have a great deal of stressors including uncertainty about their prognosis, unfamiliarity with their environment, attachment to numerous monitors limiting their mobility, and frequent disruptions to their sleep. Because many of these factors cannot be modified and are essential to providing care, another option for decreasing stress in patients is necessary. Evidenced based research suggests the use of aromatherapy in the acute care setting can help reduce anxiety and aid in adequate sleep. Lavender, an essential oil administered through respiration or back massage, was found to reduce anxiety levels and decrease patient heart rates and blood pressures. Similarly, research shows

Bergamot oil hand massages performed by family members diminish nervousness of the family members, which also helps the patient feel more comfortable and at ease. Orange, an essential oil found to decrease pain in patients with orthopedic fractures and arthritis, may also be useful in an intensive care patient with pain. Educating healthcare professionals on the use of essential oils is beneficial to patient care in order to reduce the patient hardships experienced in the ICU, including anxiety, inability to sleep, and pain. In connection to this research project, a brochure was created for the West Haven VA Medical Center MICU staff, highlighting the benefits and safety guidelines of essential oil use in the acute care setting.

Body Mechanics: Use of Safe Patient Handling and Lifting Devices

Kayla Barroca 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/dpEVAx9gadb7

Abstract:

This research project addresses the need for awareness and interventions in order to help nurses and nurse assistants prevent musculoskeletal injuries. By increasing awareness and implementing interventions, the safety of the nurse and patient will increase as well as quality of life.

Breast Milk Errors in the NICU and the Effects on Infants

Molly McKenna 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/gs8pAzKgYHlK

Abstract:

This research project focuses on breast milk errors that occur within neonatal intensive care units (NICU), and how these errors could potentially impact infant care and safety. When an infant is admitted to the NICU, their mothers cannot physically be with them at all times. This means that the mother must express her breast milk, using a breast pump, and send it to the NICU in the hospital. Within the NICU at Norwalk Hospital, the mother's breast milk is stored in a refrigerator with a patient identification sticker attached. When the milk is to be administered to the infant, the nurse will check the surname on this sticker, matching it to the baby's surname on their ankle band. In addition, the nurse will look at the expiration date also labeled on the bottle. When it is a busy day in the NICU, the process of checking the surnames in order to give the baby the correct milk could become just a quick glance, resulting in a mistake or what is called a breast milk error. The breast milk a mother produces, is created specifically for the child to whom she has just given birth. If the wrong milk is given to an infant, this infant could be exposed to certain components not compatible with their specific immune system. Over the past few years, doctors and nurses have been continuously implementing new systems to ensure that a baby does not receive either expired milk, or milk from another mother. These systems include, bar code systems for scanning breast milk similar to medications, improved storing techniques, and hospitals hiring dedicated milk technicians. This poster was used as an educational tool to ensure that the health care providers, specifically the nursing staff, are educated on the most recent evidence to ensure the greatest level of patient safety.

CardioMEMS: Memory of Your Heart

Katie Campilii 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/HrlbAQSvkeg5

Abstract:

Heart Failure currently affects 5.7 million adults and is the leading cause of in-hospital deaths in the United States. The cost of management of heart failure is a burden not only on the individual, but the United States healthcare system. Remote monitoring systems have come under consideration and trials have been done to slow the progression and manage the symptoms of heart failure. With trials being done resulting in positive outcomes in treating and reducing heart failure, the general public and patients are still highly under-educated on wireless monitoring. The objective of my capstone project is to help educate the general public and those hospitalized with heart failure on the CardioMEMS wireless monitoring device. After completing an in-depth literature review, the data has shown that CardioMEMS is an effective device in improving heart failure patients' conditions and reducing re-admission rates to the hospital.

Central Line Care Bundles in the Pediatric Population

Kiera Feldner 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/1WfMAyVUebcL

Abstract:

Central lines are routes used to provide long term intravenous treatment for patients of all ages. These lines are effective in medication administration but have a high risk of infection. This research was conducted to investigate the efficacy of Central Line Care Bundles in the pediatric population and nurse compliance with these practices in an effort to reduce rates of infection.

Commit to Sit

Samantha Egan 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/9YKNApljADDR

Medical surgical nurses are often so consumed with caring for the physical needs of their patients that sitting down and talking to the patient is overlooked and not a priority. Pulling up a chair, sitting with the patient, and discussing the patient's feelings and knowledge of their medical needs can improve both patient outcomes and patient satisfaction. It has been found that getting down to eye level with patients demonstrates active listening and can help form a therapeutic relationship between the patient and nurse which improves health outcomes. Building this trust between the patient and nurse, can implement an effective therapeutic relationship and help relieve some anxieties the patient may have, improving the overall patient outcome. The "Commit to Sit" initiative takes as little as one minute and can make a huge impact on patient outcomes. An educational poster was made to present to the 8 East medical floor in Norwalk Hospital to implement this "Commit to Sit" initiative.

Communication for Patients with Aphasia

Anne Goyette 2020

Faculty Mentors: Linda Roney, Katherine Saracino

https://fairfield.quip.com/DbGaAB0CrTzo

Abstract:

The loss of formerly intact communication skills can be detrimental. Patients diagnosed with aphasia have to learn to communicate in a completely different way. The focus of this project is improving the communication methods and practices used for patients with aphasia. Evidence-based research shows that patients benefit from individualized speech plans and communication partners. Care of these patients can be frustrating for providers, as not everyone is willing to put in the extended time it may take to communicate their full needs. At the Milford Hospital Acute Rehabilitation Center, the speech therapists work one-on-one intensely with patients for their allotted sessions each day. The rest of the time the patient is in the room or expected to communicate with other providers such as the nurses using a "communication folder" with pictures of a pain scale, toileting needs, and hunger. Educating all healthcare professionals who care for populations with aphasia on the benefits of individualized communication plans is necessary to promote the best patient-centered care.

Constipation in the Post-Operative Patient

Claire Zielinski 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/Ru2yAo3qw4Z9

Abstract:

This research project focused on the issue of constipation in post-operative patients on the medical/surgical unit. Constipation is often induced by pain medication, more specifically, opiates. Constipation is not only an aggravation to the patient, but also dangerous if it is not solved in a period of time. On SLA-2 at Saint Raphael's Hospital in New Haven, Connecticut, possible issues that could arise from constipation are pain, nausea, loss of appetite, or in the worst case scenario, a bowel obstruction. Studies have shown that prophylactic medications could help reduce this, such as the medication Naloxegol. Furthermore, there are multiple ways of increasing the chance of a bowel movement, which were investigated in evidence-based studies. A tool was created to address the constipation that patients endure and to determine the severity and discomfort they are experiencing . A pamphlet was made to inform the nurses on SLA-2 of ways to prevent constipation in the post-operative patient, and resources were provided to educate the healthcare team of this issue.

Continuing Education on Hand Hygiene

Shannon Kerins 2020

Faculty Mentor: Eileen O’Shea

https://fairfield.quip.com/rTF7A2bcRxtf

Abstract:

Hand hygiene is essential in healthcare settings in order to prevent and reduce the spread of infection. This capstone project focuses on the importance of the continuing education of hand hygiene for healthcare professionals. Although hand hygiene has been implemented in every health care orientation, the rate of contagious infectious diseases continues to rise exponentially. According to the CDC, there are over 2 million hospital related infections annually, many of which are transmitted unintentionally by the hands of healthcare workers. Hand hygiene not only protects patients from contracting infectious diseases, but healthcare workers as well. Studies show that an increase in hand hygiene among health care professionals correlates to a decrease in the prevalence of hospital acquired infections. I plan to provide an oral presentation on hand hygiene to nurses on the unit along with a handout on proper hand hygiene techniques to ensure adequate knowledge on transmission of pathogens and effective hand hygiene protocol.

Depression Screening for Stroke Patients

Lejla Markovic 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/bewiATyNsV4h

Abstract:

Caring for a stroke patient involves numerous assessments by nurses. After having one stroke, there is a greater chance of having another. Nurses monitor patients closely in order to determine whether they are declining or improving. However, along with assessing physical health, it is important to assess mental health. All stroke patients are admitted on the Ortho/ Neuro floor at Norwalk Hospital. Stroke is a medical event that causes major changes in a person's life. Some adverse effects of having a stroke could leave a person disabled in different ways. This dramatic change in a person's life is a large risk factor for depression. Nurses on this unit agreed that this is an important factor to assess. Therefore, the evidence-based literature used in this project addresses why screening for stroke depression is important, how depression can affect recovery for these patients and how to screen for post stroke depression. For this project, the recommended depression scale is the Patient Health Questionnaire, PHQ-9, which contains nine questions for the patient. This questionnaire will be shared with the nursing staff. Recommended actions will include adding this questionnaire to the charting system and making it mandatory to complete for every stroke patient.

Detecting Clinical Deterioration in Children: Implementing the Pediatric Early Warning System (PEWS)

Francesca Rallo 2020

Faculty Mentors: Katherine Saracino, Eileen O’Shea

https://fairfield.quip.com/l3o4A0baXTGB

Abstract:

This Transition to Professional Nursing Capstone Teaching Project was completed in conjunction with clinical placement on Pediatric Short Stay at Yale New Haven Children's Hospital. Before the cancellation of classes that occurred with the COVID-19 pandemic, the clinical placement was supposed to occur during the second six weeks of the Spring 2020 semester. Through the clinical, students complete nine 12 hour shifts on a unit under the guidance of a staff nurse preceptor. This Capstone Teaching Project evaluates Pediatric Short Stay and other similar pediatric clinical settings to determine a learning need for the nursing staff. The identified learning need is education on the necessity for implementation of the Pediatric Early Warning System (PEWS). PEWS is a systematic assessment of the child's clinical status during hospitalization which helps to detect and treat deterioration prior to the need for emergency resuscitation measures. The visual project addresses the need for PEWS and gives rationale supported by evidence-based practice literature. The project was designed in hopes that it would be presented to both nursing staff on Pediatric Short Stay and fellow nursing students at the Egan School of Nursing.

Diabetes Education for Haitian American Immigrants

Christina Judd 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/8DgBAD7eOhqn

Abstract:

This research project focuses on the importance of providing diabetes education for Haitian immigrants in the United States. As the rate of diabetes is increasing, providing education is crucial to improve health outcomes; however, many populations have an increasingly difficult time receiving necessary education due to language barriers, cultural differences, and limited access to healthcare. Haitian immigrants are particularly affected by this and are often overlooked. Studies have shown that there are specific needs to consider when providing care for diabetic Haitians like unique risks factors and beliefs around the management of diabetes. There was a need for a diabetes education booklet in Haitian Creole on the 8th floor General Medicine unit at Stamford Hospital. After the creation of this booklet and an informative handout, an educational in-service was presented to the staff to review the new booklet and discuss considerations for care of Haitians with diabetes. While it is difficult to find recent evidence-based research specifically on Haitian Americans, it is imperative for nurses and healthcare providers to take culture, values, and language barriers into consideration.

Do Contact Precaution Patients Need More Contact?

Cara Walsh 2020

Faculty Mentor: Eileen O'Shea

https://fairfield.quip.com/5tztAuQzMcjR

Abstract:

Contact Precautions are an essential part of caring for patients with transmissible infectious diseases to prevent the spread to other patients, staff, or visitors. Diseases such as C-diff, MRSA, and tuberculosis are all transmissible diseases that require health care workers to wear gowns, gloves, and sometimes masks or face shields every time they enter the room. The process of "donning" this personal protective equipment can be time consuming and might even prevent health care workers from entering those patient rooms. Evidence- based literature and research studies have shown that patients on contact precautions experience less contact from health care workers, more preventable adverse effects such as falls and pressure ulcers, increased feelings of depression, anxiety, loneliness, and decreased patient satisfaction with care, as compared with patients not on contact precautions. In order to improve these adverse outcomes of contact precautions, health care workers need to be educated. An educational pamphlet highlighting the adverse outcomes and how to prevent them would be distributed and discussed among the staff of the Infectious Disease Medicine floor at Yale New Haven Hospital. Some suggestions include educating patients about reasons for contact precautions, increasing involvement of interdisciplinary services to provide education to patients on contact precautions, and providing patients with coping strategies to better deal with isolation.

Early Ambulation

Caroline Casey 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/xKBhA6UY8MEr

One of the many problems healthcare providers face is the prevention of hospital readmission, specifically complications that may arise post surgery. While working on a bariatric step down surgical unit, it was of utmost importance to prevent complications post surgery. Pubmed states that "enhanced recovery after surgery protocols (including early ambulation) have been shown to reduce complications and decrease length of stay for various types of surgeries." The purpose of this research project was to complete a review of literature on post surgery patients to assess the effect of early ambulation on patient outcome and then teach the nurses on my bariatric step down unit the importance of proper and early ambulation. The study method used was a review of literature, seeking to assess patient outcome upon early ambulation. I plan to teach the nurses in my unit, who will act as the participants in my study, the importance of early ambulation on patient

outcomes. The study concludes that early ambulation has a positive effect on patient outcome post-op and can reduce hospital stay.

Early Ambulation and Its Impact on Length of Stay on All Postoperative Patients

Theresa Shields 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/QQW8AQzDMbuQ

Abstract:

As nurses, we promote better health outcomes for our patients. One standard that used to be practiced to implement a better health outcome was placing the patient on bedrest after major surgery. Many people believed that limiting movement would promote a better outcome for the patient. However, studies have shown that ambulating patients early after major operations can decrease a patient's length of stay, therefore, decreasing the chances of developing DVT or pneumonia. Some patients are resistant to this idea because of the tradition of staying in bed after surgery. Many people are apprehensive about ambulating quickly due to fears and anxieties that come after surgery. Nurses should be able to advocate for patients that early ambulation is a clinical priority. Educating patients is a crucial aspect of a nurse's job as well as educating themselves. A survey for patients during admission about post-operative care can be done. Handouts to nurses and patients can further educate and promote a better health outcome.

Early Identification and Management of Hypertensive Disorders During Pregnancy

Molly Geiger 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/zhFhALBXVlVq

Abstract:

There are several classifications of hypertension during pregnancy, and different interventions accompany each. Early identification and management of symptoms can help prevent serious complications that can arise from uncontrolled maternal hypertension and preeclampsia. An urban maternity unit in Connecticut has identified the need for an educational handout outlining the different characteristics of gestational hypertension, chronic hypertension, and preeclampsia, the risks that these hypertensive disorders pose to both mother and baby, and the specific interventions recommended for each. The implementation of this handout will ensure that all patients on the maternity unit fully understand the signs and risks of these disorders. It will also ensure that all healthcare staff members have an appropriate tool to utilize when educating patients on the characteristics of each classification, and the reason behind certain interventions, such as the early induction of labor in severely preeclamptic patients.

Effects of Peanut Ball Use on Duration and Outcome of Labor and Delivery

Hannah Ferreira 2020

Faculty Mentors: Jenna LoGiudice, Jessica Marraffa

https://fairfield.quip.com/lUrOAeFmvZv2

Abstract:

During the course of a normal labor, it typically takes several hours for complete dilation and effacement, especially when it is a woman's first pregnancy. Positioning is a very important component of nursing care. When women are in labor and positioned well, this act can assist in allowing the fetus to descend in the birth canal. During labor, women, especially first-time mothers, may benefit from using the Peanut Ball while changing into different positions. The peanut shaped ball is used in the first stage of labor to assist in opening the maternal pelvis and enhance a better fetal position in the pelvis. It is used particularly when a woman has an epidural analgesic and cannot get out of bed. In the literature review of this topic, use of the peanut shaped ball has been shown to reduce the first stage of labor in mostly primiparous women under epidural analgesia (Hickey & Savage, 2019). It has also been shown to reduce the rate of cesarean birth, operative vaginal delivery with forceps or vacuum, and third- or fourth-degree lacerations (Evans & Cremering, 2019). Educating nurses and patients on the use of the peanut ball may improve labor outcomes and allow more opportunity for comfort for a laboring woman under epidural analgesia. Nurses may benefit from using the peanut ball with patients to ease their labor experience and help in positioning the baby to facilitate delivery and decrease rates of cesarean births. An infographic was created and included information on the benefits of using the ball with laboring women, choosing the right size ball for the particular person, and various positions that can be used with the peanut ball.

Effects of Cardiac Rehabilitation

Katie Caldwell 2020

Faculty Mentor: Geraldine McSherry

https://fairfield.quip.com/dah7Ah7kDdPE

Abstract:

This research project focuses on cardiac rehabilitation, with a focused setting of patients admitted into 5-7 East Pavilion in Yale New Haven Hospital's York Street Campus. There is an increasing need for the patient population on this floor to be referred to cardiac rehabilitation. The evidence-based literature included in this project addresses the need for cardiac rehabilitation in patients admitted for any cardiovascular complications including heart failure, myocardial infarction, coronary artery disease, and post-cardiac surgery. Additionally, the evidence-based research supported that patients referred to cardiac rehabilitation and followed through with the program regimen had reduced hospital admissions and an increased quality of life. Patients who participated in a cardiac rehab program had a significant improvement in the following categories: exercise duration, peak oxygen uptake, cardiac function, and peripheral skeletal muscle function. Educating healthcare professionals on the benefits and importance of cardiac rehabilitation in patients with cardiac complications is crucial in reducing hospital readmissions and has a positive influence on individuals' lives. A poster about cardiac rehabilitation and how to refer patients to a program upon discharge is displayed in the staff break room on this unit. This poster is a resource for the nurses to refer back to when educating and reinforcing that patients attend cardiac rehab to ultimately improve their heart and overall health. Keywords: cardiac, rehabilitation, heart, hospital, patients.

Effects of Medical Marijuana on Pain Management

Sarah Jarbeau 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/7B2YAYVbpIfU

Abstract:

Upon admission to the hospital, patients are typically asked numerous questions, one of which is "are you experiencing any pain?" For some patients the answer might be no. However, many patients present to the hospital with a chief complaint of pain. According to the CDC around 20.4% of American adults live with chronic pain. This research project looks at the use of alternative therapy when it comes to pain, specifically with the use of medical marijuana. While medical marijuana is not federally approved by the FDA, some states have made it legal upon meeting certain criteria. Evidence-based research shows that not everyone benefits from the use of medical marijuana, however, a large number of people do. The pain specifically relieved by the use of medical marijuana can be chronic pain, neuropathic pain, and spasticity. The hope is that through this presentation, the nurses in the emergency department will be more aware of the use of alternative therapies to pain, why patients might use medical marijuana, and decrease the stigma surrounding it as it continues to become more prevalent.

Effects of Working Night Shift

Olivia Medico 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/89qIAh1eZ9sq

Abstract:

Unlike a typical workday, when it is time to go home and eat dinner, hospitals must stay open and shifts change. Due to the around the clock necessity of medical service, nurses, as well as other medical staff, are exposed to working the night shift to ensure quality patient care. On the Surgical Step Down Unit of St. Raphael Hospital, many nurses, especially new graduates, are assigned to work night shifts. After conducting interviews, nurses express that they have little understanding about the effects the strenuous night shift has on their health in addition to the belief that fatigue would not alter their performance. Not only can working the night shift sound stressful, studies show it affects on workers socially and biologically due to disruption of the circadian rhythm. The evidence-based research highlighted in this project describes how night shifts damage the natural sleep-wake cycle, digestion, metabolism, immune system, and hormone imbalance. Without the right balance, nurses feel less efficient and alert, leaving the patients without the best care possible. During an in-service session on the unit, the toll of night shifts physically and mentally was discussed, and RNs conveyed their willingness to make health and sleep a priority. This educational reminder allows the RNs to make healthier decisions in order to provide more effective care as well as managing their lifestyles. Key words: night shift, circadian rhythm, digestion, health risks, fatigue, errors.

Enhancing Epilepsy Handoff and Protocols

Noreen Butala 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/rrumA8tiHkEE

Abstract:

This research project focuses on enhancing nursing handoff specifically regarding epilepsy patients by creating a handoff tool that clearly labels what the epileptic patient needs. Epilepsy patients have specific medications that they are being weaned off in order to induce a seizure. Such practices are done to visualize the electrical activity in the brain so healthcare professionals can better understand the patient seizures and thus find a better method of controlling them. Clear communication between nurses during handoff of these patients sometimes lacks transparent information leading to potential errors. It is vital to standardize the handoff with these patients to ensure the safety of each client. The evidence-based literature included in this project suggests that no standardized protocol for seizure patients exists, making this topic important to research and understand. Ensuring the safety of patients is the number one goal of care. In addition to an in-service where this topic was explained, a handoff sheet was created specifically for epileptic patients. The epilepsy handoff

sheet clearly labels types of seizures experienced by the patient, AED medications that patient is on, and a safety checklist if the client experiences generalized seizures.

Evidence-Based Practice on Extubation

Erin Flannery 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/3C29A3aUsF6J

Abstract:

In the ICU setting, many patients have endotracheal tubes placed, which are hooked up to ventilators when the patient can not adequately oxygenate themselves. The goal for any patient after they are intubated is extubation, because the desire is for the patient to breathe on their own and maintain adequate oxygen saturations since endotracheal tubes are not long term. Before extubating a patient, spontaneous breathing trials are done to determine if the patient will be able to tolerate breathing on their own. However, statistics show that many extubations are followed by reintubations soon after. Reintubations are traumatic to the patient's airway and can cause dependence on a ventilator. Due to this, there should be evidence-based practice implemented on spontaneous breathing trials to ensure the patient is able to be extubated before the procedure is actually done. It needs to be determined whether the patient can breathe without the tube in order to avoid sudden reintubation and the risk of damage to the airway. Through these trials, it will be more effectively determined if the patient needs a tracheostomy for more long-term breathing regulation, or if they can be successfully extubated without reintubation.

External Ventricular Drains

Hannah Yacketta 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/Ju6fAtrXdBFr

Abstract:

External ventricular drains are used to monitor intracranial pressure and drain cerebrospinal fluid. Studies show that the lack of accurate maintenance can lead to complications such as insufficient cerebrospinal fluid drainage and eventually the un-detection of intracranial hypertension which can be fatal for patients.

Fall Prevention and Hourly Rounds Protocol

Julia Mayer 2020

Faculty Mentor: Eileen O’Shea

https://fairfield.quip.com/vhOYA8HSFg8d

Abstract:

Patient falls continue to be a leading cause of injuries in hospitals across the nation. Sustained injuries can result in an increased hospital stay and medical costs. The incidence of falls are not independent events because one can increase the likelihood of another, causing additional burden and stress to patients and their families. It is the role of the nurse to

address fall prevention protocols. Evidence-based research supports a safety assessment to determine if a patient is likely to fall. Conducting a "4 P's Assessment" which includes: Potty, Position, Pain, and Placement, can decrease patient falls. This information can be asked before leaving the room so that the patient's needs are met. Research also highlights hourly rounds as a way to decrease patient injury. The hourly check-in not only keeps patients safe, but also improves patient satisfaction rates. Ultimately, hourly rounding reduces preventable problems, use of call lights, and provides a consistent time to reassess the patient throughout a shift. In addition to the evidence-based presentation, a handout was created for the nurses to ensure competency on preventative measures for falls.

Fall Prevention Improvement

Alexandra D'Amico 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/AqA1AZ4zN07h

Abstract:

Throughout my clinical experience at Norwalk Hospital, I identified a learning need for the nursing staff with the help of my preceptor, clinical instructor, and support of the unit manager. There is a need for fall prevention to be better implemented for the purpose of patient safety and recovery, in specific regard to the older adult patient population on the orthopedic/ neurologic floor. Evidence-based literature was referenced for further research on the subject. A poster is to be presented in order to educate nurses on the subject of fall detection and fall prevention. The purpose of the research project is better patient outcomes and improved patient safety on a medical-surgical floor.

Finding Clarity in Complexity: Rothman Index Education

Hannah Megan 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/ZwA6AHdp5K4w

Abstract:

Patient condition is essential in communication between healthcare providers, but it proves challenging to identify a generally accepted definition independent of diagnosis that spans different patient acuity levels. This research project focuses on the education and implementation of the Rothman Index for surgical nurses and their patient population. Proper function of the Rothman relies on the input of nursing assessment, so it is paramount that nursing staff receive instruction of its application and benefits. Ultimately, the Rothman Index only works as well as the information that goes into it. Thanks to the widespread use of Electronic Medical Records, integration of the Rothman Index provides unparalleled continuously updated clinical representations of patient status. When used correctly, studies have shown its accuracy in predicting adverse events, patient deterioration, and mortality rates. Successful application of the Rothman Index can aid in the prevention of potential complications, and improve overall patient outcomes. Through this research, I hope to improve the way nurses comprehend patient conditions and projected risks, and interact with the Rothman Index.

Focusing on the Person in Patient-Centered Hourly Rounding

Emily Michelini 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/X6VbAfmC0QWf

Abstract:

This project's purpose is to combine person-centered care and hourly rounding to enhance the delivery of effective quality nursing care to patients in the hospital. At Norwalk Hospital in their medical oncology/hospice unit, many patients treated are unable to communicate and dying. Patient individuality is a problem faced in the hospital during treatment; some cancer patients feel that they are just seen as their diagnosis. Nurses on the unit expressed that it would be beneficial to know more about their patients holistically to enhance communication and patient comfort. Currently, hourly rounding is implemented in a split effort between the RN and unlicensed assistive personnel using the Four P method. While physical needs are a priority, psychosocial needs have to be addressed to promote positive health outcomes. Research about patient experiences in the hospital and hourly rounding shows that hourly rounding increases patient satisfaction, decreases the use of call bells, and improves nursing practice. Further research showed that patients who have individualized care with an emphasis on "being known," let patients express goals, feelings, and experiences allowing them to feel more connected with the healthcare providers. This project proposes patient-centered hourly rounding using an "about me" sheet to be completed by the patient and/or family that will be utilized by the RN to promote "being known" while hourly rounding. In addition, the use of the whiteboard will display and document when the patient was last rounded visible to both the patient and family, encouraging the patient to be the center of care.

Glucose Control Yielding Better Outcomes in Critically Ill Patients

Kelsi Farren 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/vmiaAy5foOrB

Abstract:

Research over the years supports better patient outcomes with strict glucose control in critically ill patients. Better patient outcomes were defined as decreased mortality rate, decreased infection rate, less time using mechanical ventilation, and fewer MI episodes. The 3 glycemic domains, hypoglycemia, glycemic variability, and hyperglycemia, have been studied in regard to patient outcomes. Hypoglycemia is strongly correlated with an increased mortality rate regardless of the patient's diabetic status. Glycemic variably also shows a strong correlation to increased mortality rates, but only in non-diabetic patients. Hyperglycemic patients are again correlated with poor outcomes, however, diabetic patients with a slightly higher target glucose range (110-180ml/dL) had better outcomes compared to non-diabetics with a lower target glucose range (80-140ml/dL). Stamford Hospital in Stamford, Connecticut has a policy that directs nurses to keep blood sugar below 150 ml/dL, which often times requires insulin injections. Many non-diabetic patients do not understand the need for insulin since they do not take it at home. The education provided here will allow nurses to gain a more in-depth understanding of why glycemic control is necessary in an effort to be more equipped to educate their patients.

Boarding Admitted Patients in the Emergency Room: The Unwanted Impact on Health Outcomes

Lindsay Fiondella 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/WAQaAawKa4zj

Abstract:

Every day in Emergency Departments across the United States, medically stable patients are forced to wait in the Emergency Room (ER) for beds to be available on their designated floors. This concept of "holding" patients has become a regular occurrence in almost every hospital, and unfortunately can require patients to be kept in the ER for hours or even days with no sign of being transferred. The Milford Hospital Emergency Room faces this dilemma on a daily basis, as their small community hospital gets so full that they have no choice but to hold patients for extended periods of time. Not only is this frustrating for patients, but it exposes them to an increased risk of infection and an overall decrease in quality care. The evidence-based literature used in this project confirms that patient safety is being compromised and results in increased mortality rates for patients being held for longer than four hours. Furthermore, held patients require continuous bedside care that many ER nurses are unable to fully provide due to the fast-paced environment of the ER. The literature suggests that clearly defined policies between hospital floors and ERs must be implemented in order to reduce the negative impacts of holding patients. While boarding patients may be an inevitable problem to some extent, improving patient safety and getting patients where they need to be is always the top priority.

Hospital Acquired Pressure Injuries in Critical Care Settings

Madeline Stone 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/cok9AgUtf92C

Abstract:

This research project focuses on pressure injuries that occur in critical care settings. Patients who end up staying in the hospital, bedridden, for long periods of time become more prone to hospital acquired pressure injuries, otherwise known as HAPIs. Critical care units unfortunately tend to see more HAPIs than other units because of the patient population on these units. Pressure injuries are most common on bony prominences such as the coccyx, heels, and elbows. It is essential that nurses, and nursing techs continue to monitor patients' skin and reposition them per protocol. Pressure injuries can lead to many other life-threatening complications including sepsis. Norwalk Hospital has recently switched brands for their pressure relieving supplies in hopes of seeing the number of patients who acquire HAPI decrease even more. A comprehensive review of the literature will support the use of pressure relieving specialty beds, boots, foam dressings, and creams in the prevention of pressure injuries. The Braden Scale is an evidenced-based scoring system, that predicts the risk a patient is at for developing a HAPI. These products are essential in providing holistic care to patients at risk for pressure injuries based on their low score on the Braden Scale.

How the Use of Pacifiers Reduces the Risk of Sudden Infant Death Syndrome (SIDS)

Kalliopi Kapetanos 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/PvVgAaAPrU0I

Abstract:

This research project focuses on the topic of Sudden Infant Death Syndrome (SIDS), the unexplained death during sleep of an infant less than a year old. Each year, more than 2,000 babies die in the U.S. from SIDS and it is still a major cause of neonatal deaths. Consistent evidence-based literature supports interventions that can be implemented to ensure safe sleep and reduction of risk for SIDS. Some of these findings include back to sleep, firm mattress, and limiting the infant to smoking exposure. Furthermore, the evidence-based literature supports that use of a pacifier during sleep reduces the chances of a baby suffering from SIDS. More specifically, pacifier use has been clinically proven to keep the airway patent during infant sleep and provides an additional strategy to reduce the risk for SIDS for infants at high risk or in adverse sleep environments. In connection to the research presentation, findings were disseminated on the maternity unit at Greenwich

Hospital regarding these strategies that families and nurses can incorporate into infant care in efforts to reduce risk of SIDS.

Hypnotherapy for Pain Control

Christina Rotondo 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/a2vKAkDrVb0y

Abstract:

Based on the current opioid crisis in the United States, and the number of individuals who experience chronic pain, I decided to research alternative ways to control pain other than medication. There are many forms of alternative therapies, but I chose to focus on "Hypnotherapy" as a way to control an individual's long-term pain. Hypnotherapy is the practice of using the power of suggestion to bring about positive change in clients or patients under hypnosis. The goal of this alternative form of pain control is to minimize the use of opioids, and give patients a better quality of life.

Impact of Volume Resuscitation for Severe Sepsis and Septic Shock on Development of ARDS and Hospital Mortality

Greta Freking 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/pmy7AbovNgoE

Abstract:

Aggressive volume fluid resuscitation is a prevalent treatment for patients with sepsis and septic shock. For some time, there has been a debate over whether a conservative or liberal fluid management strategy is best for increasing survival rates and mechanical ventilator free days. Early identification and proper treatment is essential for positive outcomes in patients. Death in patients with acute lung injury is often the result of failure of non-pulmonary organs. Therefore, the impact of various treatments used on septic patients with acute lung injury needs to be carefully assessed to reduce the risk of organ failure. There are both benefits and risks associated with a conservative and liberal fluid management strategy for treating acute lung injury. Determining the treatment with the fewest risks is important in improving the outcomes of patients with acute lung injury. However, the outcomes may be varied as there are risks and benefits associated with each strategy. As well, it is important that the information is not generalized to all people. The data was analyzed for the development of ARDS (acute respiratory distress syndrome) with a need for mechanical ventilation, and in-hospital mortality. The goal is to determine the optimal fluid management strategy for the treatment of sepsis and septic shock and identify potential predisposing factors for ARDS development throughout this treatment.

Implementing Safety Precautions to Reduce Falls on Medical Units

Mary Fischer 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/7YUKAFEP1mcE

Abstract:

Across the board, patient falls are one of the most frequently reported sources of injury in inpatient hospital settings. While not every fall results in a serious injury, all falls are considered harmful in some way. Whether physical or psychological, inpatient falls impact future patient confidence and may result in prolonged hospitalization. Research and education have been done in light of frequent safety checks and bedside handoff in order to reduce the occurrence of inpatient falls. Frequent safety checks are the process of formulating a schedule with the intent of going into each patient room and assessing the environment for any safety concerns, and the patient's overall health status. This also gives a nurse the chance to help their patient change positions and make sure their call bell is within reach should they need assistance at any time during the day. In addition, change of shift report can often be a high-risk time for unintentional patient falls due to the large amount of time a patient is left alone. With the implementation of bedside handoff, not only does the patient have the ability to be included in their plan of care which often includes a fall prevention plan, but the nurse coming on for the next shift has the chance to visualize and assess each patient and their environment. Through education and formation of visual reminders on the Medical Surgical Unit at Milford Hospital, the reduction of inpatient falls can significantly improve patient safety and rapport.

Importance of Acuity Checklists in Intensive Care Units

Brooke Wildes 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/Q5p6AJDUjLXt

Abstract:

Nurses working on Norwalk Hospital's intensive care unit find it difficult to create a safe nurse patient ratio when everyone already has a critical patient assignment and a new admission is arriving. Nurses expressed concern based on recent nurse:patient ratios when they believe that they have an assignment requiring 1:1 care. Evidence has shown that implementing clinical criteria to establish high-risk patients from an acuity checklist/chart can predict which patients are at the highest risk for deterioration. Nurses caring for more than two Intensive Care Unit (ICU) patients at a time can cause fatal complications and inappropriate use of hospital resources. Implementing evidence-based practice to determine patient assignments and ratios in the ICU can reduce hospital acquired complications and increase awareness of inevitable patient deterioration. During a research presentation with a Norwalk Hospital float RN/clinical preceptor, the benefits of implementing ICU patient criteria during shift assignment, and the increased need for ICU nurse:patient ratio education was discussed. This education allows nurses to be more aware of the needs of critically ill patients and the importance of 1:1 care.

Importance of Early Mobilization in Abdominal Surgery Patients

Erin Mellitt 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/aqmdAOp0DMkR

Abstract:

When a patient goes in for surgery, the pain and anticipatory pain often make it unbearable and intimidating to ambulate after the operation. This, in turn, has been proven to cause added problems such as pulmonary complications, delayed healing processes, increased length of stay, and decreased intestinal motility. These complications can often be prevented with the implementation of early mobilization protocol and patient education. On Pomeroy Seven of Waterbury Hospital, the primary patient population is surgical patients, mainly abdominal and orthopedic patients. There is protocol regarding

same day ambulation with those who have had orthopedic surgery, but there is nothing applied for those who have had abdominal surgery, despite the potential risks. Patients can refuse physical therapy, but are not advised regarding potential problems without ambulation. The use of evidence-based practice education in the form of a pamphlet can motivate patients to take that step towards a healthier recovery process. Being informed about the potential long-term effects of the lack of early enactment of mobilization, can motivate patients and decrease fears that go along with potential pain allowing for better patient outcomes.

Improving Oral Hygiene

Nicole Spinelli 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/VgatAWTKpDYb

Abstract:

Implementing oral health hygiene is not often a priority within patient focused care. Oral care is either not provided or offered to patients during their hospital stay. In addition, there is an evident lack of knowledge amongst healthcare providers about the importance of proper oral hygiene. Without oral care, both non-intubated and ventilated patients are at an increased risk of acquiring pneumonia. This research project focuses on providing and practicing oral care to prevent further complications during hospital stays and during re-admissions. Evidence-based practice proves that many tools such as oral hygiene care kits along with oral care assessment devices can provide knowledge on key improvements when performing oral care on patients. Emphasizing the importance of oral hygiene will encourage greater use of this type of care to patients on all units. With regard to the research presentation, a pamphlet highlighting the benefits and drawbacks of partaking in and ignoring oral care, respectively, was created to educate all nurses and compare the risks and benefits.

Improving Outpatient Scheduling to Maximize Patient and Staff Safety and Enhance Overall Quality of Care

Gina Melone 2020

Faculty Mentor: Jessica Marraffa

https://fairfield.quip.com/N0FWADDvbLPQ

Abstract:

Outpatient scheduling is a mandatory aspect of working in an ambulatory healthcare setting. For oncology patients specifically, this includes scheduling chemotherapy infusions, injections for improving neutrophil/erythrocyte counts, vaccinations, etc. The front desk staff who handle the scheduling, speak directly with the patients, either on the phone or in person to set up their appointment dates and times. There is no way for the nurses, nurse practitioners, or doctors to handle all appointments, so the secretarial staff plays an extremely important role at the Bennet Cancer Center. The issue that has been made clear is the lack of information given to the secretarial staff regarding lengths of infusions, injections, and other generally scheduled appointments. Some injection combinations can take at least 20 minutes, but the schedule time only allows for 15. Some chemotherapy infusions can take 9 hours, yet they are scheduled to take place only 5 hours before the center closes. This creates safety issues for patients in that nurses have to either speed up the medication administration process, or stay after hours to finish caring for their patients. Additionally, this causes patient dissatisfaction when they wait an extra 40 minutes to be seen by the doctor or nurse. Once they see the doctor or nurse, they are in and out in 15 minutes, but are less flexible when scheduling a follow-up appointment. Recommendation was made for research into the length of time that should be allowed for each different appointment type, with a scheduling guideline to be constructed for the front desk secretaries and copied for the rest of the staff. It is important for all of the staff to have the same information to institute more efficient and productive patient scheduling.

Incentivizing Early Ambulation in the Postpartum Population

Abigail Furfaro 2020

Faculty Mentors: Katherine Saracino, Sally Gerard

https://fairfield.quip.com/N0RHANQIaMLA

Abstract:

This project focuses on incentivizing early ambulation in the postpartum population. On the maternity floor of Stamford Hospital, nurses encourage early postpartum ambulation, but compliance rates are low. The patient population is generally young and healthy. They are exhausted, in pain, and would rather rest than move around. Evidence-based research has utilized pedometers and activity trackers to quantify postpartum and postoperative ambulation and correlated outcomes with ambulation distances. Studies have shown that early ambulation in the postpartum and postoperative periods has been proven to decrease length of stay, pain severity, and narcotic consumption. It prevents deep vein thrombosis, constipation, and urinary retention. It also has been found to enhance uterine involution, aid in breastfeeding, and prevent postpartum depression. During an in-service on the unit, the benefits of early postpartum ambulation were discussed. The unit was presented with an educational handout to be posted in staff common areas. The unit was also presented with a suggestion for a "Baby Steps" initiative to incentivize this patient population to ambulate. Small posters displaying fun facts about pregnancy and newborns were suggested to be placed every 25 feet within the unit. An educational patient handout regarding early ambulation was also presented to accompany the posters. This would allow the nurses to create appropriate ambulation goals with the patients and improve patient experience to distract from their discomfort and encourage them to ambulate further distances.

Incorporating Pain Management Apps into Patient Care

Alexis Yannone 2020

Faculty Mentors: Katherine Saracino, Geraldine McSherry

https://fairfield.quip.com/ca5gAK57QM9w

Abstract:

This project conducted research on nonpharmacological or alternative therapies for pain management. In developing the project, the hospital had many alternative therapies limited to the cancer population. This being said, the use of technology was examined to assist with the barrier and allow for patient pain management in any setting. This reduced the number of opioids being used. Overall, deep breathing, music, and distraction therapies were used prior to the onset of pain which subsequently reduced the need for medications. The goal of the project was to reduce the amount of medications used to treat pain.

Indications of Epidural Use with Trial of Labor after Cesarean Section (TOLAC) Patients

Ashley Luchini 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/ECxBABOZbTkb

Abstract:

Women who have had a prior c-section delivery are at a higher risk of uterine rupture than those who have not. One of the first indicators of rupture is persistent abdominal pain that does not disappear with contractions. Early detection of rupture is vital to decreasing newborn and maternal complications and death. Therefore, providers at Greenwich Hospital Labor and Delivery expressed a learning need of the indications of epidural use in TOLAC patients. A literature review was conducted, and it was found that epidural use should be strongly advised in TOLAC patients. Epidural anesthesia does not mask the signs of uterine rupture, and there are other pertinent symptoms that indicate rupture has occurred such as fetal decelerations and the need for additional epidural dosing. Epidural use is correlated with a decreased number of emergency c-sections, and it has been shown to increase the rate of successful VBAC deliveries. VBAC is much safer than elective repeat c-sections, has a shorter recovery process, is more cost effective, and produces a greater number of positive mother-baby health outcomes. Overall, there is no evidence to support that epidurals cause negative outcomes in TOLAC patients. An in-service was provided to the Greenwich Hospital Labor and Delivery staff, and the education gained will be implemented immediately in patient care.

Initiating Early Goal of Care and End of Life Discussions in the ICU

Madeline Baer 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/8W4mABb572rP

Abstract:

Often in the Intensive Care Unit (ICU), patients and families are unprepared for the difficult situations that they will face. Advanced directives and power of attorney provide direction when patients are unable to make healthcare decisions for themselves. If patients have not had a discussion about what medical interventions they are comfortable with, it leaves medical staff and families unsure of what to do. In the ICU and other healthcare settings, it is imperative that at-risk clients have goal of care discussions before emergency services could be needed. Many times patients endure painful, traumatic, and ultimately futile procedures that they may not have truly desired. This project shows how nurses can help patients and their families to have those conversations in a more timely and effective way. Palliative care teams and doctors traditionally have these conversations with families; however, they are often overworked or not available at times when families may need assessment and education. By educating nurses and providing tools to evaluate family readiness and understanding, hospitals can decrease the amount of futile or unwanted care for patients. Early and effective intervention by nurses can help patients and families who might otherwise have ended up in ethically challenging situations.

Integrative Medicine for Oncology Patients

Olivia Piccoli 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/poixAKR8YLy5

Abstract:

Oncology patients endure high levels of stress, anxiety, and pain in regards to their diagnoses. It is imperative for their health that they have a way to manage these feelings while also receiving treatment. Pharmacological interventions are effective, however, not always the only option to handle these symptoms. Complementary and alternative therapies are seen to work very well with oncology patients. Stamford Hospital has a Center for Integrative Medicine and Wellness that offers non-pharmacological interventions for patients. On the Oncology floor at Stamford, there is no visible information for patients to see the options that they have while staying at the hospital. Many of them are in the hospital for several days

and would benefit from using alternative therapies. As an oncology nurse, it is very important to utilize all resources to provide holistic care for patient diagnoses. It would be very beneficial for each patient room to have a list of the integrative medicines available. It is evident that this information is lacking for patients, because it was not being frequently used on the floor. A brochure containing proven research to show that utilizing integrative medicine can be helpful for oncology patients has been developed to talk about the services provided. This education will allow patients, families, nurses, and other healthcare providers to incorporate various techniques to reduce stress, anxiety, and pain during cancer treatments.

IV Acetaminophen vs. Opioids for Pain Management

Emily Ferreira 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/ds1uAaMMnleR

Abstract:

This research project discusses the benefits of replacing opioid pain medications with non-opioid pain medications such as IV Acetaminophen. IV Acetaminophen decreases post-operative pain while reducing opioid-induced side effects such as constipation, hypotensive states, respiratory depression, and opioid addiction.

Language Barriers in Postpartum Nursing

Jacquelyn Reardon 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/5SP1AxOMYKtu

Abstract:

This research project focuses on how language barriers, specifically with Spanish speaking mothers in a post-partum unit can result in the nurses spending less time providing education for these new mothers. By spending less time in these patients' rooms, new moms are missing out on vital information for caring for their new baby. Many people living in the United States do not speak English or English is not their first language. Education is a huge part of nursing and can result in higher patient satisfaction rates as well as prevents complications. By educating new moms, the evidenced-based practice reveals it can help to prevent post-op complications for C-section and episiotomies, and encourage good practices caring for newborns. At Stamford Hospital, language barriers result in post-partum nurses spending less time in these patients' rooms. This means less time educating patients on how to care for themselves and their new babies. If I had been able to create an in-service learning session for my unit, I would include information on translation options for these new moms and the need to create pamphlets in Spanish with essential information such as how to hold your baby while breastfeeding, and how to prevent the umbilical cord from getting wet until it falls off.

Listen to Me: Individualizing Pediatric Care

Giana Nerney 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/DDQRARBaVOTb

Abstract:

Pediatric patients are often overlooked when providing input regarding their care. Children may fear hospital visits due to being in new surroundings, interacting with adults whom they do not know, and wondering what will happen next. Communication amongst children, parents, and the health care team needs to improve in order to individualize care and promote overall better experiences for the child during their hospital visit. The purpose of this project is to provide a voice to children during their hospital stay and to help improve their quality of life. Bridgeport Hospital's pediatric unit aims to personalize care by providing worksheets for children to express their interests and dislikes. To expand and enhance this method, the tool, My Care, created from this research, focuses on patients' interests, but also considers patient preferences regarding medical care and interactions with the health care team. Parents of infants and toddlers can provide information regarding their child's sleep preferences and eating habits while older children can complete the tool themselves. The infant and toddler portion of the tool conveys patient preferences if parents are not available at the time. This allows members of the health care team to have a general idea about the patient before entering the room. Aspects such as safety at home, expectations of treatment, and fears are addressed in the form of questions for older children to answer. This can help identify possible concerns regarding safety or negative perceptions of medical care and personnel. The goal is to allow children to feel more comfortable in the hospital setting and to encourage patient cooperation with parents and staff. By providing a resource for children to directly express their interests, fears, and concerns, health care providers will be able to individualize care and limit poor or frightening experiences in children whose opinions were not previously considered.

Lyme Disease in Pediatric Patients

Carlee Lockrow 2020

Faculty Mentor: Eileen O’Shea

https://fairfield.quip.com/f5jqAEN40a1L

Abstract:

Lyme Disease is a tick-borne infectious illness caused by the bacterium Borrelia burgdorferi which is transmitted by tick bite. The CDC estimates that there are about 300,000 new cases of Lyme Disease diagnosed every single year. The purpose of this capstone project is to educate pediatric patients and their families about Lyme Disease and provide them with prevention education. Lyme disease is a common illness in the Northeast, and many cases go undiagnosed which ultimately can lead to more severe and prolonged illnesses. An earlier diagnosis has the potential to lead to preferred patient outcomes and prevent further multi-system complications. Along with an educational in-service, this patient information sheet can provide the general public with beneficial knowledge regarding what Lyme Disease is, ways to prevent the disease, and what the CDC recommends as treatment.

Management and Prevention of Opioid Induced Constipation

Claire Enos 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/Jw5KAaB9bY5e

Abstract:

Opioid induced constipation (OIC) is a major side effect for patients receiving opioids for pain management, happening when opioids bind to receptors present throughout the GI tract and decrease peristalsis. It is the most common, and the most bothersome side effect for patients, along with bloating and straining; impacting patient's comfort, quality of life, and activities of daily living. Specifically, on an orthopedic floor because immobility is a major issue, initially management should focus on lifestyle choices and diet changes in order to promote healthy bowel habits. Fixed-dose oxycodone/naloxone prolonged-release tablets have been designed to address OIC specifically, making improvements in bowel function of patients. Laxatives are among the key prevention options for opioid induced constipation, focusing on

prophylaxis, initiating them prior to opioid administration. Although inexpensive, many patients are dissatisfied with laxatives and there is not too much evidence backing them up. Physicians are advised to reassess patients every day and determine the need for opioids, titrating and adjusting doses for each patient. Use of different prevention and management strategies will help to increase patient comfort, allowing patients to maintain pain management with opioids instead of having OIC lead to discontinuation of their opioids. Awareness, education, and individualized management of OIC may provide a beneficial plan of care for this patient population.

Management of Diabetic Ketoacidosis in Critical Care Settings

Harrison McGovern 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/QHEqA4nf6Rwc

Abstract:

When patients present to the critical care settings, they often have secondary diagnosis that contributes to their primary complaint and reason for admission. One of the more severe secondary diagnoses that exists is Diabetic Ketoacidosis; uncontrolled high blood sugar that results in the burning of fat and release of ketones into the blood as this fat is used up. This high blood sugar combined with acidic ketones being released can impact patient recovery times and result in longer ICU stays. At a community-based hospital ICU, protocol is to place every patient on an insulin drip infusion adjusted hourly based on glucose levels. This is done to not only prevent Diabetic ketoacidosis from occurring, but to maintain a healthy blood sugar level and thus facilitate more positive patient outcomes. By organizing relevant information on DKA and relevant protocols to a poster for easy access on the unit, both nurses and patients will be educated and patient outcomes will improve.

Management of Post-Operative Joint Pain in Older Adults Using Non-Opioid Treatments

Nicole Reynoso 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/aaFiAzBujh5w

Abstract:

This research project focuses on preset pain medication regimens for individuals who have undergone joint surgery. The most common type of medications prescribed to treat moderate to severe post-operative pain are opioids or narcotics. Although these medications help decrease pain, they hold negative effects on elderly clients who undergo joint surgery. The evidence-based literature states that the negative effects the elderly face when taking opioids includes, but is not limited to: urinary retention, central nervous system adverse effects like sedation and cognitive impairment, respiratory depression, and renal insufficiency. In some cases, the benefits of taking opioids do not outweigh the risks in older adults. Studies show that nonpharmacological therapy and nonopioid pharmacological therapy can help significantly to reduce post-operative pain. A flyer was created for the Norwalk Hospital Inpatient Medical Joint Replacement staff to provide information on the effects of opioids on older adults and a list of nonpharmacological therapy and nonopioid pharmacological alternatives to the preset pain regimen on the unit.

Managing Clostridium Difficile to Prevent Unit Outbreaks

Laura O'Keefe 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/3CzKAvhGm9s7

Abstract:

Clostridium difficile infection (CDI) is one of the most common causes of healthcare associated infections with almost half a million cases occurring in the United States each year. CDI is an incredibly contagious and resilient bacterial infection that can increase morbidity and mortality, length of stay, and skyrocket healthcare costs. Many hospitals have had an uptick in CDI contraction, so units such as the Neurology ICU at Yale New Haven Hospital want to increase education to enhance patient care and outcomes. CDI was identified as a priority to the unit after review of quality improvement statistics and discussions with numerous staff. Everyone has a role in the prevention of CDI because anyone in the hospital could be unknowingly touching surfaces contaminated with CD spores. In order to promote a safer and healthier patient population, education reinforcement began with the core of the unit staff - its nurses - at an in-service learning huddle. The in-service discussed patients at high risk, prevention, investigation of suspected CDI, evidence-based treatment and management, appropriate precautions, and significant complications of CDI. New research inquires about the importance of bleach disinfection methods in patient rooms, bed linen laundering, appropriate stool testing procedures, and use of probiotics for high risk patients. There was also an educational reference sheet given to the unit to hang on the resource board to advise the staff of new research developments and reinforce important care techniques for working with CD infected patients. Having a standardized understanding of CDI will allow nurses and the entire healthcare team to improve quality of care, and better educate CD infected patients and their family members. Additionally, stressing the importance of incorporating evidence-based practice into CDI patient assignments will hopefully improve patient health, and better the outcomes of the unit.

Minimizing Cardiac Telemetry Alarm Fatigue

Juliana DiMirco 2020

Faculty Mentor: Geraldine McSherry

https://fairfield.quip.com/btWjAi8SCu8C

Abstract:

As essential members of the interdisciplinary team, nurses should be knowledgeable and competent when monitoring, assessing, and interpreting telemetry monitors (Srinivasa et al., 2017). On 5-7, a Cardiovascular Unit at Yale, telemetry alarms are constantly triggered to inform staff on monitored patient's status. However, literature reveals that the majority of triggered alerts are false alarms. Exposure to frequent alarms can have negative consequences. Alarm fatigue is the desensitization and diminished response time to alarms by clinical staff due to constantly hearing an excessive amount of alarms (Srinivasa et al., 2017). Since alarm fatigue is so dangerous, and can lead to a decrease in patient safety and ultimately death, alarm management was made a Joint Commission National Patient Safety Goal (Sendelback et al., 2015). This research project aims to educate nurses on interventions that they can take to decrease the number of false alarms that they hear per day in order to minimize the risk of developing alarm fatigue. The interventions proposed include: (1) providing proper skin preparation and placement for ECG electrodes; (2) appropriately setting default alarms for the specific patient population; (3) customizing and evaluating alarms to each individual patient; and (4) empowering nurses to stay educated and use the best evidence-based practice (Sendelback et al., 2015).

Mobile Applications for Adolescents and Young Adults Transitioning to Independent Diabetes Monitoring

Abby Peters 2021

Faculty Mentor: Jennifer Schindler-Ruwisch

https://fairfield.quip.com/oYypAGa7o2SM

Abstract:

In the past decade, there has been tremendous growth in the field of mobile health (mhealth), in particular for diabetes self-management. The purpose of this review was to systematically review mobile apps that may have features relevant to helping individuals aged 15-25 manage their diabetes as they transition to independent diabetes monitoring. The GooglePlay store was systematically searched to identify diabetes management mobile tools relevant to helping individuals aged 15-25 manage their diabetes. The search identified 189 unique mobile applications (apps) and 29 were included for further review of key features including an abbreviated Mobile App Rating Scale (MARS) assessment. Only one app had any features relevant to adolescents. In total, 20 apps had a feature to share a copy of diet or bloodsugar logs with a family member or provider. Only 9 apps had any interactivity other than tracking. While most apps had graphics, only 5 were deemed high quality. Few apps had evidence-based visible credibility and just one app met all three MARS criteria. This review demonstrates a strong foundation for emerging diabetes mobile tools with the potential to support diabetes self-management globally. Ongoing review of new apps with improved functionality and effectiveness studies of the apps' impact on diabetes management is imperative.

Modern Fight Club: Avoid the Code Grey

Courtney Krechel 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/JcJCA6PON6WO

Abstract:

At Norwalk Hospital, a Code Grey is called on an aggressive or violent patient at risk to harm themselves or others. Agitated and aggressive patients are typical in the Emergency Department (ED) and often are chemically or physically restrained after only brief attempts of mitigation. Managing patient aggression presents a challenge; however, restraints should always be the last option for de-escalation. To reduce the incidence of aggression and consequential restraint, research on techniques to de-escalate patients was conducted. The evidence-based literature encourages healthcare workers to identify early warning signs of increasing agitation using reliable assessment tools like the BARS and BROSET scales. If agitation is identified on admission to the ED, then initial assessment and de-escalation should occur concurrently. The literature cites excessive environmental stimulus as something healthcare workers can control, so decreasing external noise, dimming lights, and providing larger rooms with fewer objects are the first tactics to try to calm an agitated patient. Verbal de-escalation should be attempted next where the use of patience, empathy, and quality time are essential. The literature suggests that allotting more time for the agitated patient to communicate with the nurse allows them time to descend from their heightened sense of distress. Educating emergency staff on the importance of verbal de-escalation and empathetic timing is crucial in avoiding the need for the Code Grey. Workshops on the proper agitation assessment tools and de-escalation techniques should be provided to all healthcare workers, but especially in the ED where healthcare workers are at the highest risk for aggression and violence.

Bringing Multidisciplinary into Team

Julia McGuire 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/DmjUAU7URbG9

Multidisciplinary team meetings add to the traditional incorporation of teamwork in the hospital. Multidisciplinary team meetings extend beyond specialized sectors throughout the hospital and allow for specialists from several clinical

disciplines to coincide together. Studies show that multidisciplinary care has a drastic improvement in team competence, improved treatment recommendations, coordination, and decision making all with patient care in mind.

Nail Polish & Hand Hygiene: Exploring the Need for Research

Debra Mannix 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/YNAqAyQt73DJ

Abstract:

Adequate hand hygiene is vital in maintaining patient safety. Poor hand hygiene is scientifically linked to increasing the risk and incidence of hospital acquired infections (HAIs). Part of hand hygiene includes nail care. A hand hygiene policy update in the Yale New Haven Health System called for the disallowance of gel nail polish worn by all staff and reinstated that artificial nails must not be worn, citing both as increasing the risk of HAIs by harboring more pathogenic bacteria than polish-free nails or regular-polished nails. The response to this policy update was negative due to lack of communication to the staff of Greenwich Hospital and the limited time to remove gel nail polish (48 hours) before the policy went into effect. In researching the sources provided on the policy update and several other scientific articles, little evidence was found supporting the claim that gel nail polish harbors more bacteria than regular polish or polish-free nails, and no evidence was found linking regular or gel-polished nails to HAI incidences. In order for this policy to be scientifically supported by evidence-based guidelines, more clinical research must be done on nail polish worn in patient care settings, as well as more research and implementation of basic hand hygiene and aseptic technique in all patient care settings.

Nitrous Oxide as Pain Relief During Childbirth

Maggie Sakellarios 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/M9bWAheQy8za

Abstract:

This project explores the use of nitrous oxide, commonly known as laughing gas, as a form of pain management during the labor and delivery process. Everyone has a different experience with the labor and delivery process, but it is one the patient will most likely remember for the rest of her life. The labor and delivery process is known as one of the most painful experiences a woman can go through. As healthcare providers, it is our job to present patients with their options for pain management and ensure they receive the best care possible. Nitrous Oxide can provide safe and effective pain relief to patients during the birth process to make them more comfortable and it is becoming more popular in the United States.

Non-Sterile Glove Availability and Its Impact on Compliance

Tara Weber 2020

Faculty Mentors: Rose Iannino-Renz, Geraldine McSherry

https://fairfield.quip.com/ThByA8ajHPvl

Abstract:

My research project is centered around the availability and use of non-sterile gloves in the hospital. While completing my Transition clinical at Yale New Haven Hospital, I found a lack of available non-sterile gloves on the unit. When nurses were participating in patient care, they sometimes failed to don non-sterile gloves, and during emergencies when the care team had to run into the rooms, gloves were not easily available for them to put on, leaving them gloveless while participating in care. This posed a risk to both the patient and health care provider, making the care setting unsafe. In recent years, emphasis on the importance of hand hygiene has been made, and the implementation of hand sanitizer dispensers initiated in many hospitals in order to increase this. Hand sanitizer dispensers are conveniently located and, on my unit at Yale, were located outside of every single patient room and within each patient room. Acknowledging the availability of hand sanitizer dispensers but the lack of non-sterile gloves interested me. First, I completed some research to determine the ways in which donning non-sterile gloves should be considered as an integral part of hand hygiene. Donning sterile gloves has been found to be an integral part of proper hand hygiene and is beneficial in reducing the spread of germs and decreasing the incidence of healthcare-acquired infections. Once the link between hand hygiene and donning non-sterile gloves was made, I then looked for strategies to improve availability of non-sterile gloves on the unit. My research revealed that multiple strategies can be used to improve compliance with and availability of non-sterile gloves on hospital units, using the initiatives taken to implement hand sanitizer dispensers on hospital units. By making non-sterile gloves on the unit more available, it has been shown to increase compliance and decrease infection rates among patients.

Nursing Staff: How Nurse-Patient Ratio Affects Safe, Quality Patient Care

Diana Prinos 2020

Faculty Mentors: Patricia Lamb, Deanna Rivera

https://fairfield.quip.com/LVzvAcis8gU3

Abstract:

When a nurse is struggling during a shift to assess, pass medications, and document six complex and busy patients she has on her assignment, there is the possibility for poor outcomes. Low nurse staffing, including RNs, LPNs, and CNAs, is and has always been something of an issue in almost every acute and long-term care setting. This research project examines how low nurse staffing to high patient ratios can result in poor health outcomes, nurse frustration and burnout, and an overall decrease in patient safety. Not only does this issue bring poor health outcomes for patients and risk for patient safety, but understaffing results in nurses possibly leaving their jobs and quitting due to this problem. Nurse burnout has been shown to be more likely when nurses have high patient ratios and are understaffed according to ScienceDirect. Additionally, the evidenced-based practice of international body has linked low nurse staffing levels to higher hospital mortality rates. When developing the nursing assignment, it is best to give each nurse an equal assignment that still allows them to give safe and quality care to each of their patients during the shift. Standardizing nursing staff to patient ratios is essential to guarantee less error in the healthcare field. Regimenting a certain number of patients a nurse can have during a shift on the unit will help prevent nurse burnout, medical errors, and risk for patient safety.

Nursing Assignments Based on Acuity

Lauren Winnie 2020

Faculty Mentor: Lisa Guardino

https://fairfield.quip.com/GK4hAO9ZbIyK

Abstract:

The charge nurse takes on the role of making nursing assignments for each shift. During my transition clinical, I noted that these assignments were made in blocks, for instance one nurse will take rooms 1-6 and so on. These block assignments continue to frustrate nurses as the most acute patients are not evenly distributed among the staff. This results in unequal

workloads among nurses; they have expressed their frustrations and need for a change. By making nursing assignments this way, patients are also at a disadvantage, not getting the best care possible as nurses are forced to undertake too many care responsibilities. Through my research, I found that it is best to make patient assignments based on acuity. Doing this will result in better patient outcomes. In making nursing assignments with balanced patient acuity, nursing is able to effectively care for patients and manage the workload involved in caring for them. This can be best achieved by the charge nurses using an acuity scale. Most scales include acuity categories such as procedures, education, interventions, and both intravenous and oral interventions. The higher the number the patient scores the more acute the patient is and that can be taken into account by the charge nurse when making patient assignments. In order to implement this change, I provided my findings to the staff and handed out an acuity scale to the charge nurses.

Nursing Burnout

Nicolas Carlucci 2020

Faculty Mentor: Rose Iannino-Renz

https://fairfield.quip.com/RP1VAZZt4xRp

Abstract:

In healthcare today, nurse burnout has become an important topic necessary to discuss in order to decrease its prevalence. Within the Emergency Departments and Intensive Care Units, this widespread phenomenon has caused nurses to become physically, mentally, and emotionally exhausted from the overwork and stress they endure. Understanding the early onsets of burnout and ways to counteract it can not only help nurses to overcome their feelings but can have a direct impact on patient-centered care. This research project examines physical and mental symptoms, explores various techniques to respond to this stress, and includes personal encounters by registered nurses who have experienced first-hand the problems associated with burnout.

Nursing Care of Neonatal Abstinence Syndrome with Absent Parents

Gabriella St. Pierre 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/K0p4AaPfshq4

Abstract:

The number of infants exposed to methadone or other drugs in utero has been increasing steadily, thus increasing the number of infants born with Neonatal Abstinence Syndrome (NAS). The increase of NAS infants has led to a shift from emphasis on pharmacological treatment as first line, to parental interventions, such as skin to skin, breast feeding and rooming in. But these options only work if the parents are present and willing to invest in their child's care. On the pediatric floor of Bridgeport Hospital, many of the parents of NAS infants are absent. Bridgeport transitioned their treatment to non-pharmacological interventions first, which resulted in many positive outcomes such as decreased average length of stay, readmission, and reliance on morphine as the first means of treatment. But it has put a strain on nurses to devise a plan of care with interventions that match what the parents can provide. A nursing education event, in addition to an educational tool with other suggestions on non-pharmacological care alternatives, such as swaddling and facilitated sucking, are important components in ensuring that the same quality of care is provided on the unit for each NAS infant. Successfully accomplishing consistent care reduces the stress on the nurses.

Nursing Education about Perioperative Pain Management

Allison Linaris 2020

Faculty Mentor: Eileen O'Shea

https://fairfield.quip.com/zuYUAFrUebro

Abstract:

This capstone project looks at how to further develop pain management education for nurses in order to decrease postoperative pain related readmissions and increase overall patient outcomes in the perioperative setting.

Nursing Interventions in the Absence of a Child Life Specialist

Rebecca Craffey 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/baFxAVusAa6Q

Abstract:

This research project focuses on educating registered nurses on age and developmentally appropriate distraction-based interventions that can be implemented when a child life specialist is not available in the hospital setting to reduce pain and anxiety in children during painful or invasive procedures.

Opioid Induced Constipation in Post-Operative Patients

Julie Becker 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/T1maADQXJXI7

Abstract:

This project reflects an area of focus during my time on an orthopedic floor at Yale New Haven Hospital. Pain reduction is a main priority for patients on this unit considering the extent of their operations. Often times patients are treated with a range of opioid analgesics to relieve their pain. An unwanted side effect of opioid use is constipation. Generally, a patient cannot be discharged to a rehabilitation center or home without having a bowel movement post-operatively. The effects of opioids on the gastrointestinal system make this difficult and cause overall patient discomfort and slow the process of discharge and new admittance. A prophylactic treatment determined by the Bowel Function Index score, adequate patient education, and use of Naloxegol or another PAMORA class drug can aid in preventing the negative effects of opioid induced constipation.

Overuse of the Emergency Department: Understanding the Problem and Ways to Solve It

Abigail Kinsella 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/LBfAAf3yXciS

Abstract:

Increasing use of the emergency department for non-urgent care is a major concern of health care providers for many reasons. Patients present to these locations with a wide array of symptoms and disease processes, but many can be well-treated at their primary care office or at a walk-in clinic. But is this really the patient's fault? This project examines the reasons why people choose to use the emergency department, implications this can have, and possible solutions to change this. Lack of knowledge, lack of a primary physician, and increased convenience of the emergency department all leads to this problem of overuse. It can result in overcrowding of the emergency rooms, increased costs, poor health outcomes, and less focus on true emergencies. The emergency department cannot just be "convenient" and it is the health care provider's role to educate patients on this. Through thorough research, results on which interventions work best have been discovered. Hospitals need to implement such interventions and staff need to be educated on how to teach their patients when a visit is necessary and what a proper alternative may be. Although there are infinite factors that attribute to this crisis, this project examines a few and suggests ways that health care providers can work together to change this. This issue affects patients and staff alike and a multidisciplinary approach is required in order to see any change occur. This topic is important for everyone in the health care field to be aware of so that proper education and resources may be provided to those in need. By reducing use of the emergency room for non-emergent conditions, quality of care in the emergency room will increase while cost and time spent waiting in the emergency room will decrease. It is vital for healthcare workers to understand the reasoning behind use of emergency departments for non-emergent conditions in order to improve this issue in the future.

Pain Management in the Post-Operative Period

Lauren Riley 2020

Faculty Mentor: Michelle Saglimbene

https://fairfield.quip.com/EyjnAbYHqAWP

Abstract:

This research project focuses on the nurse's role in post-operative pain management. With pain now considered the fifth vital sign, a patient's level of pain has a significant role in their healing process. It is crucial for a patient's pain to be managed following surgery in order to keep him or her comfortable, promote healing, and create a pleasant hospital experience. There are a significant number of ways pain can be managed. At Stamford Hospital, this includes a patient being pre-medicated in the operating room through auto infusers, epidurals, and PCA pump, and receiving intravenous or oral medications from nurses in the PACU areas. Non-pharmacological pain management strategies can also be implemented. The evidence-based research included in this project addresses the ways a patient's healing can be delayed, creating further health complications, if pain is not properly addressed. It is the role of the RN to promote optimal health and comfort for the patient, while simultaneously providing education about what interventions are being provided. Nurses without sufficient knowledge on pain management, especially the ability to educate patients on it, risk creating worse health outcomes for their patients. If I had been able to create an in-service learning session for my unit, I would have included information on how medications such as Fentanyl and Dilaudid are the most commonly used intravenous medications for pain in the post-operative area at Stamford Hospital, how repositioning, ambulating, and/or ice or heat packs are effective alternative methods for pain management, and the need to educate patients on what type of pain they may experience in the post-operative stage.

Palliative Care

Alessia Conte 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/OoxDA4ovTLGW

Abstract:

Although death is a normal part of life, many patients die in hospitals alone and in pain. This is due to the underutilization of both palliative and hospice care. On the oncology floor at Stamford Hospital, patients diagnosed with cancer are not introduced to palliative care and all that it has to offer. Many patients and their families often use palliative and hospice care interchangeably which illustrates an education gap between healthcare providers and their patients. Several staff nurses voiced concerns about being able to initiate a palliative care discussion with their patients due to lack of education and fear that it will create a feeling of mistrust between nurse and client. The role of the RN is to provide symptom management, comfort, and support for both patient and family. In order to facilitate more palliative care discussions between nurse and patient, a handout containing several questions and sentence starters was created to serve as a tool for RNs on the unit. The nurses on the unit were receptive to the handout and showed willingness to receive more palliative care training along with ELNEC certification. This advance in both RN and patient education will provide patients with a better quality of life, fewer depressive symptoms, less aggressive care at end of life, and longer survival.

Palliative Care for Heart Failure Patients

Mary Ann Murray 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/NBrmAkRKQqzl

Abstract:

Palliative care is an interdisciplinary approach to care that aims to improve the quality of life of patients and their families facing chronic or life-threatening illnesses. Palliative care has been proven to increase the quality of life of patients, decrease burden of symptoms, decrease inpatient length of stay, and increase rates of advance care planning. However, it is underutilized in patients with heart failure despite research studies that have proven its benefit to these patients and their quality of life. One major cause of this is the lack of knowledge and misconceptions surrounding palliative care. These misconceptions can be barriers for receiving the most beneficial care for the client that supports their values and goals. Studies have shown that palliative care is often believed to be synonymous with hospice care and this can lead to fear of discussing end of life care. It is crucial that proper education and awareness is done surrounding palliative care to rule our barriers for heart failure patients to receive the best care.

Pediatric Palliative Care

Brigid Marquedant 2020

Faculty Mentor: Eileen O’Shea

https://fairfield.quip.com/a1e7ASbRQTXj

Abstract:

This project aims to educate the nursing staff at Franciscan Children's Hospital about pediatric palliative care. Palliative care is the total care- physical, psychological, and spiritual, of a patient's body, mind, and spirit for children with serious medical conditions and their families. This type of care focuses on quality of life and can be initiated throughout the entirety of a patient's illness. This is an important educational topic in the pediatric medical world as many of the clinicians are uneducated or misinformed on the topic and the benefits it can have on the chronically ill pediatric population.

Perioperative Safety: Need for Continuing Education on Surgical Plume Evacuation in the Operating Room

Kaitlyn Sweeney 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/qYA7AmNrZjhi

Abstract:

This research project focuses on the expressed needs of the Operating Room to reinforce teachings and guidelines of proper smoke evacuation regarding surgical plume. Surgical plume is created by electrical tools, such as, but not limited to electrocauterization, utilized in surgery to burn and/or seal blood vessels. Surgical plume consists of toxic gases, pathogens and particulate matter that can cause harm to the surgical staff and the patient following prolonged exposure. A cohort study of surgical residents identified long-term exposure can cause burning in the pharynx, nausea, vomiting and eye irritation within one year of residency. There is a general lack of compliance when using proper plume evacuation devices for several different reasons including bulkiness of the system, excessive noise and dismissive attitude towards the risks of plume by surgeons and nurses. It is suggested by the Association of periOperative Registered Nurses (AORN) to continue education and implementation of guidelines provided by the AORN to help increase compliance in the operating room. In addition, reinforcing education to the surgical staff about risks to themselves and patients will help increase compliance in using proper smoke evacuation devices despite perceived inconveniences.

Peripheral IV Catheters: Educating Nurses on Proper Maintenance and Prevention of Complications

Hannah Edgerly 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/ERfcAbZWmbQ8

Abstract:

A peripheral venous catheter is a very common and essential device used in a hospital setting. The process of insertion is invasive, as it involves the puncturing of skin into a vein, and a plastic catheter remains for the duration of stay. Multiple complications can occur with this peripheral IV catheter, potentially leading to extra, unnecessary issues, that could ultimately increase a patient's length of stay. These complications include phlebitis, infiltration, and infections that can cause the patient to develop sepsis. Nurses are the first line of defense for preventing these complications. This research project examines the prevalence of these complications in the hospital setting, and how to educate nurses on preventing them. Studies were conducted with adult patients in hospitals, and the research shows that the effectiveness of insertion and lack of maintenance of the venous catheter increases the risk of the complications listed above. Therefore, educating nurses on proper insertion techniques and signs of a complication can result in the reduction of failed IV catheters. This education ultimately leads to an overall decrease in hospital acquired infections, and potential stress on nurses, considering that IV catheters are a significant aspect in a patient's quality of care.

Post-Operative Pain Management: How Perioperative Assessment Can Improve Patient Outcomes

Angelina Buffolino 2020

Faculty Mentor: Marian Villaflor

https://fairfield.quip.com/0XRdAfuwVEh5

Abstract:

This study analyzes the need for improved pain assessment education. The setting is based on a postoperative orthopedic unit. Most patients in the postoperative period are placed on a pain medication regimen. On this schedule, they receive the highest dose of medication that the patient can tolerate, in regular increments. The patient's pain is often exacerbated when they move. It is vital for a patient to ambulate post-operatively to avoid many complications such as emboli, atelectasis, decreased bowel function, and infection. It is also important to keep the patient out of pain so that their vital signs can remain stable. The nurses role in pain management includes working in collaboration with the interdisciplinary team to conduct pain assessments, assess medication needs, administer pain medication, and evaluate effectiveness of interventions. In order to improve pain management postoperatively and to decrease post-operation complications, it is vital that the nurse conduct a comprehensive pain assessment. The skill of pain assessment is difficult to master, as agreed upon by skilled nurses on an orthopedic floor. Therefore, this study was conducted in order to create an educational tool for new nurses on how to perform a comprehensive pain assessment. This will promote proper intervention implementation and continuation of patient care free of adverse events. This educational PowerPoint was created to be easily comprehensible and accessible when printed and posted on a unit.

Preventing Catheter-Associated Urinary Tract Infections in the Neuro ICU

Kathryn Peters 2020

Faculty Mentors: Katherine Saracino, Eileen O’Shea

https://fairfield.quip.com/yNmDAsuqyuK2

Abstract:

This capstone project focuses on educating nurses on the prevention of catheter-associated urinary tract infections in the Neuro ICU, at Yale New Haven Hospital. Urinary tract infections (UTI) are the most common type of healthcare-associated infections. Approximately 75% of the UTI's acquired in the hospital setting are associated with urinary catheters. The evidence-based literature included and researched during this project shows that the most important risk factor for developing a catheter-associated urinary tract infection is prolonged use of a urinary catheter. Prolonged use, proper adherence to hand hygiene, and proper care of catheters are the most important steps to take towards decreasing the rate of infections in the hospital setting. Evidence-based practice shows that quality improvement programs and reminder systems can be implemented in the hospital setting to increase the adherence to these guidelines. Additionally, evidence-based practice showed that the use of alternative materials for indwelling catheters can decrease the rate of infections. Educating the nursing staff in the Neuro ICU on the guidelines for prevention of catheter-associated urinary tract infections will help decrease the amount of infections on the unit. Suggesting catheter alternatives on the unit will also help decrease the infection rate. A handout was created for the Neuro ICU nursing staff which included information regarding the best prevention measures the nurses can take as a unit, to decrease the rate of catheter-associated urinary tract infections in their patient population.

Preventing SIDS by Promoting Safe Sleep

Chloe McKeon 2020

Faculty Mentor: Ryan Keenan

https://fairfield.quip.com/4m33Avw8c0I7

Abstract:

This research project focuses on Safe Sleep practices to prevent Sudden Infant Death Syndrome (SIDS). SIDS is the sudden and unexplained death of a baby under the age of one. Most SIDS deaths are associated with sleep, which is why the Safe Sleep or "Back to Sleep" campaign was developed in 1994. Although rates of SIDS have gone down since then, the CDC claims that there are about 3,500 sleep-related deaths among babies in the United States every year. Evidence-based literature included in this project outlines the different aspects of Safe Sleep practices, such as the use of firm crib mattresses, keeping objects out of the crib, and putting the baby to sleep on their back. Educating parents on Safe Sleep practices is crucial to decrease the rate of Sudden Infant Death Syndrome. Many parents report that they were educated about Safe Sleep practices initially when their baby was born, but not thereafter. It is important that parents are continually educated about Safe Sleep practices in order to prevent SIDS. In connection to the research presentation, a flyer was created for healthcare staff to review and provided to families who come into Connecticut Children's Medical Center (CDC 2019).

Prevention of Critical Care Nurse Burnout

Brooke Mazzamaro 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/UgYrAXDHrfTb

Abstract:

We observed burnout rate in all specialties of nurses globally, but in particular, critical care nurses are exposed to a number of stressful situations and extremely critical patients. As a result, their level of burnout tends to happen sooner in their careers, which ultimately effects the level of care provided to patients. It is important to identify the symptoms of burnout, and learn how to deal with this issue on a primary prevention level. Some intensive care units (ICUs) have been participating in studies that engage in mindfulness behavior during a shift, and its effects on levels of burnout. It has been found that even five minutes of mindful meditation have significant results on stress reduction of ICU nurses, and moreover, lower burnout rates. In addition, studies show that burnout rates correlate highly with moral distress in critical care nurses. With the amount of traumatic patients and experiences ICU nurses have been exposed to, this creates a great deal of moral distress and compliance with dying patients identified as compassion fatigue. This ultimately decreases the level of care provided to patients in the hospital. This project highlights how to recognize burnout in oneself and others, burnout's effect on compassion for patients, and how to prevent burnout at an early level.

Prevention of Ventilator-Associated Pneumonia through the Use of Bundle Care

Colleen Chittick 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/g2byATQQEKWT

Abstract:

Ventilator-associated pneumonia (VAP) is a lung infection that develops in a person on a ventilator. A ventilator is a machine used in the intensive care unit (ICU) to assist a person with breathing. The machine provides the patient with oxygen through a tube placed in the patient's mouth or nose, or through a hole in the front of the neck. VAP occurs when germs enter through the tube and colonize in the patient's lungs causing infection. Patients in the ICU are at a high risk for VAP, which leads to increased morbidity and mortality. VAP is the leading cause of death among hospitalized patients requiring

mechanically ventilated airway support. To reduce complications, length of stay, morbidity, mortality and related costs from VAP, specific measures should be taken to prevent and decrease the incidence of VAP. The nurse has an important role in assessing the patient and implementing the recommended preventative measures. After observing the activity and nursing interventions consistent with the unit, I believe there is a need for re-education and further enforcement of preventative measures to decrease the incidence of VAP.

Prone Ventilation of Adults with Acute Respiratory Distress Syndrome (ARDS)

Anna Derrane 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/wbJqA2uAaJb1

Abstract:

As we continue to navigate the ongoing COVID-19 global pandemic, acute respiratory distress syndrome (ARDS) is a complication we anticipate in the growing critically-ill COVID population. Patients diagnosed with ARDS generally have a poor prognosis due to the degree of hypoxemia they endure; however, the most recent evidence suggests that prone ventilation of these patients both improves their oxygenation and decreases mortality. Prone ventilation is a relatively new method of treatment for ARDS, so it is imperative that nurses acquire more education on the process of prone ventilation and the evidence that supports its use in clinical practice. This education is crucial especially in the COVID population as the virus primarily targets the lungs. In addition to an educational in-service, a pamphlet was created for nurses to refer to when incorporating prone ventilation into a patient's plan of care to ensure the procedure is executed safely and provides patients with optimal oxygenation.

Protecting ED Nurses During Outbreaks of Infectious Pathogens

Patrick Cole 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/MYu8Af5UwCHy

Abstract:

Emergency room nurses are some of the first health care personnel to come in contact with sick patients. It is important that nurses are protected with proper and adequate personal protective equipment (PPE) so that they do not infect others and can provide quality care. When larger quantities of people are sick with infectious ailments, like the annual flu, nurses and other health care providers are at risk to also become infected. This anticipated risk is mentally fatiguing for nurses, and causes a higher turnover rate. Therefore, emotional support should be provided during times of outbreak, as well as increased supplies for protection.

Caring for Patients Receiving Hospice or Palliative Care

Shelby Leland 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/csx1AUFMaoEP

On in-patient oncology units such as 6 East at Norwalk Hospital, many patients suffer from chronic diseases or acute events that qualify them for either hospice or palliative care. Both hospice and palliative care can drastically improve a patient's quality of life, pain management, and symptom control. However, many new graduate oncology nurses lack adequate knowledge and skills that are crucial to providing proper education and treatment to patients receiving this care. This research project focuses on educating new graduate nurses on the differences and best evidence-based practices for both Hospice and Palliative Care, so that nurses feel comfortable caring for these patients. After speaking with managers and experienced nurses on the unit, the conclusion was reached that there is a need for providing new nurses with hospice and palliative care education. In this project, evidence-based research was collected to be presented to nurses on how to answer patient and family questions regarding palliative and hospice care. In addition to the research presentation, a flyer was developed to pass out to the 6 East medical oncology staff including the core competencies for end of life care.

Providing Support in Acute Rehabilitation

Laine Delaney 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/Nr3JAslrqMsQ

Abstract:

The emotional support provided by the registered nurse in the acute rehabilitation setting is just as crucial as the physical care offered. This is central to the care provided on the Acute Rehabilitation Unit at Yale-New Haven Hospital in Milford. A comprehensive assessment of an individual who has just suffered a debilitating stroke has many nursing diagnoses such as "ineffective coping." "Ineffective coping" is the inability to realistically assess stressors and use available resources to cope with stress. A comprehensive review of the literature supports that ineffective coping can lead to a longer recovery for a patient on an acute rehabilitation floor. Although they are very busy, taking a few moments to sit with patients after their physical assessment is complete, can significantly impact patients' emotional well-being. Illuminating progress toward physical recovery goals can support emotional recovery. These ideas are central to providing holistic nursing care for patients undergoing acute rehabilitation.

Reducing Stress and Anxiety in Parents of Premature Infants

Abigail Marcou 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/giFEAqVAMjRD

Abstract:

The sudden responsibility of taking care of a newborn can be stressful for any new parent. However, parents of infants born premature experience an additional sense of stress and anxiety. As healthcare improves and the age of viability of a fetus gets lower and lower, the number of infants born premature in the United States is increasing. Infants born prior to 37 complete weeks gestation are considered preterm and typically have to be admitted to the Neonatal Intensive Care Unit. At the Stamford Hospital NICU, premature infants are only able to be discharged home once they reach at least their 35-week gestation mark and cleared by the neonatologists. During this time, mothers are often discharged from the hospital while their newborn remains in the NICU. This separation can be a source of stress for parents along with seeing their tiny newborn hooked up to various monitors and machines. The evidenced based literature addressed in this project explains the importance of including interventions that involve the parents as much as possible in the care of their infant in the NICU. Providing family based care in the NICU has been shown throughout various studies to decrease levels of stress and anxiety in parents with premature infants. As a result of this project, NICU staff were educated on the results and benefits of utilizing family based care in the NICU to address and decrease parents' stress and anxiety, which can lead to increased

patient satisfaction and decreased hospital readmissions of premature infants receiving care in Neonatal Intensive Care Units.

Reversal Agents for Patients on Oral Anticoagulant Therapy Suffering Major Bleeding

Julie McCarthy 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/QauNAFtRpTll

Abstract:

Anticoagulant therapy has become the front-line defense to preventing secondary complications of embolic activity. For patients on blood thinners, an otherwise uncomplicated injury can become a life-threatening bleed. To prevent against life-threatening bleeds, trauma team activation is initiated for patients with a history of blood thinners and for major bleeding reversal agents. There now exists a reversible agent for most blood thinners on the market, a substantial factor for controlling major bleeding. These reversible agents change the standard of care for patients, but there exists a gap in knowledge about proper reversal agents for specific anticoagulant therapy among healthcare providers. A literature review was conducted to further education. For patients on Xarelto (rivaroxaban) or Eliquis (apixaban), Andexxa, the newest reversal agent, should be used (Tomaselli et al., 2017). For patients on Coumadin (warfarin), Kcentra should be used for major bleeds (Tomaselli et al., 2017). For those on Pradaxa (dabigatran), Praxabind should be the reversal agent used (Tomaselli et al., 2017). Promoting education about the correct reversal agents improves patient outcomes for those with a history of blood thinner usage who suffer major bleeds. A chart will be provided to the Emergency Department staff in the form of a badge reel. It will illustrate the correct reversal agent for the correct anticoagulant therapy. Keywords: anticoagulant, reversal agents, major bleed, blood thinner.

Risk for Medical Error During Transition-of-Care

Janea Butler 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/vS5fAPl5V7WL

Abstract:

This project explores the potential risks that can occur during transition-of-care in the healthcare setting.

Practice Changes for the Rotating Nurse

Abigail Maggiore 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/ZLW0AWt2yBwr

Abstract:

Nurses constantly face various challenges that negatively affect their emotions and overall mentality; however, these challenges also have strenuous physical consequences on nurses. Accepting work as a night shift nurse is an adversity in and of itself because nurses must train their minds and bodies to follow a sleep pattern typically unnatural and difficult to adapt to. However, when nurses are asked to rotate between day and night shifts, the challenges become much more demanding on nurses' mental, emotion, and physical health. Not only are errors more likely to occur due to sleep deprivation, but the nurse who is affected by these rotating shifts is constantly under intense stress. After years, months, or even weeks of these rotating shifts, nurses face the issue of burnout and often quit their current jobs in hopes of finding a hospital that can foster development of their physical and mental needs. The results of my research, represented on my poster, aims to educate the night shift nurses working on SLA (Sister Louise Anthony) 2 at Yale New Haven Hospital St. Raphael Campus, on the emotional, mental, and physical affects of rotating between day and night shifts can have on their overall health. Studies show that regularly rotating between day and night shift nursing produces negative effects on a nurse's overall well-being; therefore, it is negatively looked upon and should be avoided whenever possible. Through this research, nurses can further educate themselves about the risks that rotating day and night shifts can have on their overall well-being and decide for themselves if a job that requires this work is worth the negative health outcomes that they may acquire as a result.

Safe Staffing In Critical Care

Julia Joshi 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/MBMiAa2UF5ts

Abstract:

Inadequate and unsafe staffing in critical care units can lead to poor patient outcomes as poor staffing can be a barrier to proper care for critical patients. Patients' conditions in critical care units fluctuate in acuity, constantly requiring a staff well prepared and able to properly care for patients in a critical condition. With patients' status and conditions constantly changing, staffing based on a fixed nurse-to-patient ratio is not adequate. Staffing in critical care requires a collaborative effort of all nurses to base assignments on acuity, nurse ability, nurse experience, and complexity of the patient's status while also collaborating with family and loved ones. There have been multiple staffing models created including ratio based, acuity based, and care zone based. However, focusing on staffing alone has shown poor outcomes as the factor of having a healthy workplace environment is neglected. Burnout rates of critical care nurses are high as they can be overworked easily. In order for optimal care to occur, adequate staffing based on acuity along with a healthy work environment must both be present. Considering collaborative factors including patient acuity, workload, technology, nurse abilities, and a safe work environment leads to less nurse burnout and better patient outcomes.

Shh...The Babies are Growing!

Samantha Chauvin 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/jObGAG7O0Dir

Abstract:

Most premature infants will spend the first few weeks to months of their lives in the Neonatal Intensive Care Unit (NICU). The goal of the NICU is to provide high-quality patient care in order to maximize the outcomes for neonates. As a technology-driven environment, infants are exposed to persistent, unpredictable sounds that differ greatly from that of the protective intrauterine environment. This research project focuses on noise levels in the Neonatal Intensive Care Unit and the effect on premature neonatal growth and development. The Level III NICU at Greenwich Hospital is designed as one large room where staff can monitor multiple infants at one time. This environment lends itself to overstimulation from

sounds of cardiopulmonary monitors, ventilator support, and conversations between staff and family. The literature demonstrates that most NICUs exceed the National Recommended Noise levels, which has negative impacts on the neurosensory and physiological development of premature neonates. Furthermore, evidence-based literature suggests that reducing noise levels would create a safer, more suitable environment for the neonate to grow and develop. Although noise in the NICU is unavoidable, practices can be developed to improve the environmental setting for the neonate in the NICU. A handout containing evidence-based research has been created for staff of the NICU at Greenwich Hospital including information on the appropriate noise levels in a NICU and interventions on how to reduce overall noise levels.

Stroke Prevention Education for Cardiovascular Patients Upon Discharge

Emily Matli 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/tt9sAQOb85aQ

Abstract:

This research project focuses on the importance of nurses educating patients with certain risk factors about ischemic stroke and secondary stroke prevention at discharge, with a focus on a telemetry floor. The projected audience of this project is nurses doing discharge teaching to patients who had a stroke or have atrial fibrillation. When a patient has atrial fibrillation, they are at higher risk for an ischemic stroke because the condition causes blood clots to form in the heart and get sent to other parts of the body, specifically the brain. Once a patient has one ischemic stroke, they are at even higher risk of having a secondary stroke. The evidence-based literature included in this project addresses the negative patient outcomes that exist due to the lack of discharge education about risk factors and prevention to ischemic stroke. Some of the negative patient outcomes include multiple hospital stays, paralysis, and even death. Discharge education for at risk patients on the risk factors, signs, and symptoms of ischemic stroke is integral to the prevention of stroke and secondary stroke. In addition to an educational in-service, a checklist will be given to nurses on PCU/telemetry to review with cardiac patients and their families at discharge.

Surgical Site Infections and Hand Hygiene in the SICU

Caroline Herdje 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/gAcUAR0NbJhc

Abstract:

My project focuses on decreasing surgical site infections through the use of hand hygiene. This project was prompted by a slight increase in surgical site infections and decreased hand hygiene compliance on my unit. I completed research on the effectiveness of hand washing as a preventive measure against infection. I also researched recommended ways to wash hands, when to wash hands, and why healthcare professionals may not consistently wash their hands. The protocols and solutions that units and hospitals can implement to increase their hand hygiene compliance by healthcare workers were also evaluated. Information was prepared for and discussed with co-workers, which included the research on surgical site infections and hand washing, best hand washing techniques, and some solutions to the obstacles of hand hygiene. Although this topic was developed with the intention of decreasing surgical site infections among surgical ICU patients, this topic and practice of hand washing is especially relevant to all of us today during this COVID-19 pandemic.

The Benefits of Bedside Nursing Handoff

Christine Reid 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/TVQsASmBZVxu

Abstract:

Patient handoff at change of shift for nurses has an important role in clinical nursing practice. It allows nurses to exchange all important and new information about the patient. On Verdi 3 East at Yale New Haven Hospital St. Raphael's Campus, nurses reported that they would like to have increased continuity of care and get the patients more active in their care. Bedside handoff allows the oncoming nurse to visualize the patient as he or she is receiving all the information related to the patient. Bedside handoff encourages patients to be involved actively in their care and promotes patient safety. It also allows an opportunity for patients to correct misconceptions and ask questions. The evidence-based literature included in this project reveals that many nurses were not satisfied with change of shift report, and statistical improvement was achieved after change was implemented. With bedside handoff, patient's satisfaction with involvement in their plan of care improved. Use of bedside handoff promotes staff accountability, reduced medication errors, and improves patient satisfaction overall. A checkoff sheet was created for the nursing staff on Verdi 3 East for each aspect of care to go over with the patient and oncoming nurse.

The Benefits of Delayed Bathing in Newborns

Kayla Chin 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/CFMmAxbnMRas

Traditionally, newborns are scheduled to receive their first bath approximately two hours after birth. However, as neonatology evolves, it has been shown that there are potential benefits to delayed bathing until the newborn is at least twelve to twenty-four hours old. The purpose of this study is to compare the health outcomes of newborns after delayed bathing versus the outcomes of newborns bathed within the first two hours of life. Health outcomes are measured by the rates of hypoglycemia and hypothermia in these two groups. Although participants in this study are newborns, the choice of delayed bathing versus non-delayed bathing is directly impacted by the decision of the child's parents and healthcare team. Evidence-based practice studies have shown that newborns' health outcomes were improved due to the education and implementation of delayed bathing. Therefore, parental and provider education is of utmost importance in this study. It was found that in delayed bathing, the incidence of hypoglycemia decreased by two percent, while the incidence of hypothermia decreased by four percent. Overall, delayed newborn bathing has been shown to improve newborn health substantially in a variety of different ways including better mother-baby bonding, improved successful breastfeeding rates, and a reduced risk of hypoglycemia and hypothermia as discussed in the case study.

The Benefits of Mindfulness for University Students

Christina Maher 2020

Faculty Mentor: Patrick Kelley

https://fairfield.quip.com/c3PNAItwarbr

Abstract:

Mindfulness training is increasingly being adopted by educators and counselors to address mental health concerns amongst university students (Galante et al., 2018; Riet et al., 2018). Current research supports mindfulness with empirical evidence as an autonomous, accessible, and cost-effective intervention for stress and anxiety (Flett et al., 2020; Kuyken et al., 2015). The primary aims of this study are (1) to evaluate the prevalence of anxiety and stress amongst Fairfield University students; (2) to examine current research regarding the efficacy, feasibility, and cost-efficiency of mindfulness for university students; (3) to examine current research regarding the cognitive benefits of mindfulness training, including its capacity as a prophylactic intervention to enhance mental health, well-being, and social-emotional behavioral functioning for students. To address these aims, an anonymous online survey incorporating both the Five Facet Mindfulness Questionnaire and the Perceived Stress Scale will be administered to Fairfield University students in all four class years to quantify prevalence of student stress and mindfulness. It is hypothesized that scores on the Perceived Stress Scale will be inversely correlated with scores on the Five Facet Mindfulness Questionnaire. A literature review of articles indexed on Psycinfo will be conducted regarding cognitive benefits and intervention feasibility for mindfulness training. The implications of this study will be beneficial in establishing if mindfulness training is an effective and cost-effective approach to promoting mental health in students. The study will conclude with a data-informed recommendation for educational strategy at Fairfield University based upon survey and research findings regarding the prevalence of stress among students and both the cost and efficacy of mindfulness training.

The Effect of Silver Impregnated Dressings on the Bioburden of Infected Wounds

Emily Wallace 2020

Faculty Mentor: Geraldine McSherry

https://fairfield.quip.com/8QphAXcD0dg1

Abstract:

Despite providing clean dressing changes at least once per shift to open infected wounds, strictly adhering to Yale New Haven Hospital's wound care protocol is not always adequate enough to reduce localized infection and promote healing. On the infectious disease unit located on 9-5 East, numerous patients require frequent dressing changes in an effort to close their wounds and eradicate the bacterial infection within them. In addition to the routine irrigation and debridement provided, a silver impregnated dressing can be applied directly to the infected or dead tissue instead of normal sterile gauze. As opposed to the protocol incorporating traditional gauze, research has shown a decrease in the amount of bacteria infiltrating the wound and localized infection when dressed with a silver impregnated dressing. The evidence-based research illustrates that the usage of silver is successful in instantly killing a broad range of microorganisms, even some that are antibiotic resistant. Incorporating this into routine wound care not only assists in providing a bacteria-free environment for healthy granulation tissue to flourish, but also increases a patient's overall comfort through a more efficient healing process. To advocate for integrating silver into YNHH 9-5's routine wound care, a brochure was created to present to the nursing staff during the morning safety huddle. The nurses expressed their heightened interest in the topic of utilizing silver dressings and can now provide their current and future patients with more effective wound care.

The Use of Meditation for the Veteran Population

Erielle De Jesus 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/kT7JApGopmg4

Abstract:

Many patients at the Veterans Hospital have experienced a life full of stress provoking moments that lead to diagnoses of anxiety or PTSD. Just before the lights go off for the night shift in the step down unit, many patients find themselves

anxious for a variety of reasons. This causes a lack of sleep for the patient during the night hours. These patients from the step-down unit come from various backgrounds and illnesses that required treatment and monitoring during their time of rest. Nurses understand that cluster care is important to control the number of times that they go into a room, but cannot control the anxiety they feel that prevents them from getting a full night of rest. Using mindfulness based therapy or meditation can provide a self-controlled way to treat these anxieties. These techniques use mind and body practices that focus on the body and mind in a controlled manner. Research of interventions used have been shown to improve symptoms of PTSD. In addition to the findings of this research, an app available to mobile devices was introduced to ensure an easy and effective way to provide guidance in meditation.

The Importance of Developmentally-Appropriate Positioning in the Neonate Population

Emily Roy 2020

Faculty Mentor: Jessica Marraffa

https://fairfield.quip.com/QGusA339Yphr

Abstract:

One of the main philosophies endorsed by Neonatal Intensive Care Units (NICUs) across the country focuses on providing developmentally-appropriate care of the neonate. The aim of developmental care is to create an environment that mimics intrauterine conditions for both premature and critically-ill infants, and to minimize the overall stress of the NICU hospital environment. Remaining in line with the recommended care components under the umbrella term, developmental care, helps to reduce hospital-associated short and long-term complications neonates otherwise would be susceptible to. This research project focuses on the clinical significance and educational components of developmentally-appropriate positioning and its impact on neonate well-being. It is crucial that care providers and parents are educated on the importance of maintaining the neonate in a position akin to the intrauterine environment until, at minimum, the time frame that would have marked full-term gestation. Evidence-based research has shown that this critical intervention allows for optimal growth, neural development, weight gain, normothermia, maintenance of proper muscle tone, and reduces the duration of NICU stays. Two infographic flyers were made, one geared toward health care professionals and the other toward parents, so both populations can better understand the proper developmental positioning of neonates. Additionally, a to-scale model was created to illustrate the mother's uterine size and the fetus' size at 30 weeks of gestation for further visualization of in utero fetal positioning.

The Importance of Early Mobilization for the Post-Operative Patient

Rachel Abriola 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/o3mMAyH5Wrvq

Abstract:

This research project focuses on the importance of early mobilization in a post-operative patient, with a focused setting of the Orthopedic Medical Surgical Department. There is an increasing cost of healthcare in the United States, especially in complications and re-hospitalizations in post-operative patients. Extended hospital stays and complications in post-operative patients is a growing issue in many hospitals across the nation. Evidence-based literature addresses negative patient outcomes that exist because of decreased mobilization which leads to: longer hospital stays, decreased patient outcomes, and increased costs. Furthermore, the evidence-based research rationalizes the importance of using early mobilization or "day of mobilization" to enhance patient outcomes, decrease stay or chance of re-hospitalization, and

reduce cost. Educating healthcare professionals on the benefits and proper ways to utilize early mobilization is crucial in the process of teaching the importance of early mobilization on the Orthopedic Medical Surgical floor. In addition to the research conducted, a handout was given to an urban Orthopedic Medical Surgical floor staff that included information regarding the importance of early mobilization in post-operative patients.

The Importance of Implementing Routine Postpartum Depression Screening in Maternal Health

Jesse Morra 2020

Faculty Mentors: Katherine Saracino, Michele Lecardo

https://fairfield.quip.com/SqoQA3d6P2Pu

Abstract:

When a mother is in the postpartum phase after having given birth, her emotional and mental wellbeing becomes just as important as her physical wellbeing. The labor process and having to care for a child afterward make this population especially vulnerable, as we worry about the possibility of the mother becoming depressed. On the postpartum maternal and child health floor at Norwalk Hospital, the rooms often fill with exhausted but happy mothers and their spouses or families. Although the patient and family often express their gratitude and excitement over having a newborn child, the whole process can be very overwhelming and taxing on the mother. Postpartum depression affects about 10-15% of all mothers and can develop or persist for months after childbirth. Universal screening maximizes the likelihood of prompt identification of postpartum depression. This research project focuses on the importance of using a diagnostic screening tool for postpartum depression and clinical risk factors indicative of PPD. Furthermore, evidence-based research indicates that the most common and effective measure to screen for depression related to childbearing is the Edinburgh Postnatal Depression Scale. Educating healthcare providers on the optimal timing for screening, how to manage patients who screen positive for depression, and treatment options for women with PPD is crucial in the process of eliminating risk for harm to the patient or their baby.

The Importance of Incentive Spirometry

Emily Broadhurst 2020

Faculty Mentor: Laura Conklin

https://fairfield.quip.com/eGOWABhC53nw

Abstract:

This research discusses the need and importance for the use of incentive spirometry with a focus on medical surgical units. On Medical Surgical units at the VA in West Haven, there has been a recent regression in the use of incentive spirometry. Hospital acquired infections are a common complication within today's health care system. Often, patients develop hospital acquired pneumonia while they are post-op, non-ambulatory, or in pain. Evidence based research has shown the risk for this expensive complication can be decreased significantly with the proper use of an incentive spirometer. This project focuses on educating the nurses of 4 West in order to support proper implementation and use of incentive spirometry. The evidence-based literature in this project addresses the need for incentive spirometry. Three research studies are used to compare patient outcomes while using incentive spirometry compared to without use. Additionally, scientific literature is used to outline the benefits, when and how to properly use an incentive spirometer. Furthermore, a scientific article is used to highlight common barriers to patient adherence. This will help nurses understand how to better advocate and educate their patients about incentive spirometer use. In order to properly educate the nurses of 4 West, an educational in-service was completed with a Powerpoint, highlighting key information. The proper implementation of incentive spirometry will benefit the patients on 4 West by preventing complications relating to hospital acquired infections.

The Importance of Preventing Catheter Associated Urinary Tract Infections

Elizabeth Powers 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/CNTQAqLEU091

Abstract:

This research project focuses on prevention of catheter-associated urinary tract infections (CAUTI) in a hospital setting. CAUTI is a common infection in hospitals and associated with use of urinary catheters. Catheter-associated urinary tract Infections are caused by the improper use of urinary catheters and believed to be preventable in many cases. Prevention of catheter-associated urinary tract infections has become a priority effort of many hospitals. There are many guidelines for proper use of urinary catheters in an attempt for hospitals to reduce the occurrence of CAUTI. The literature referenced in this project addresses the prevalence of catheter-associated urinary tract infections in hospitals and prevention methods implemented. Prevention methods common to many hospitals include using proper aseptic technique when inserting and removing a urinary catheter device and assessing the site of the catheter along with the necessity of the catheter daily. Education of health care professionals pertaining to the prevention of CAUTI has also been found as an effective method in an effort to lower the frequency of catheter-associated urinary tract infections. Through use of visual aids on the Intermediate Care Unit at Greenwich Hospital, the staff will be educated on the prevention of catheter-associated urinary tract infections.

The Importance of SCD's Pre-surgical and the Prevention of DVT’s

Cindy Louis 2020

Faculty Mentors: Katherine Saracino, Lisa Guardino

https://fairfield.quip.com/hD93AfJBAlNb

Abstract:

Sequential compression devices (SCD) are very important and beneficial for the health of patients, especially in the case of surgical patients. One of the highest priorities for surgical patients is deep vein thrombosis. After surgery, clots can form, typically in the veins of the lower extremities, that can break off and lodge into the lungs, resulting in serious lung and respiratory issues post-surgery. To prevent deep vein thrombosis and maintain blood flow throughout the surgical patient's lower extremities, SCDs are placed on the legs of the patient prior to surgery, and remain on their legs through post-op and eventually to their admitting floor if they are admitted. The purpose of these compression devices is to mimic walking and maintain adequate blood flow and circulation to the lower extremity for the duration of the time that the patient would not be ambulating. The prevention of deep vein thrombosis begins if the SCDs are donned properly and remain on the legs of the surgical patients. Educating nurses by reinforcing the benefits of SCDs will ensure and improve the outcomes of surgical patients.

The Nurse's Role in Increasing Visitor Adherence with Isolation Precautions

Darian Kenneway 2020

Faculty Mentors: Geraldine McSherry, Katherine Saracino

https://fairfield.quip.com/LNDmAvm1I6bq

Abstract:

This research project focuses on the nurse's role in increasing visitor adherence to isolation precaution policies. Adherence to isolation precaution policies is a crucial strategy in the effort to prevent and control the spread of infection. Healthcare workers are usually highly educated about the use of isolation precautions and personal protective equipment (PPE). However, healthcare workers are not the only ones at risk for spreading infection. Visitors of patients in the hospital are often not educated enough to adhere to the isolation precaution policies implemented. This evidence-based research addresses multiple barriers to visitors adhering to isolation precaution policies, most in relation to a lack of understanding. The findings of this research project include the need for members of the healthcare team to provide written and verbal education easy for visitors to understand. Healthcare teams need to monitor for factors that may impede adherence to isolation precaution policies and implement effective interventions in order to increase visitors' understanding and adherence to isolation precaution policies and ultimately promote the prevention of spreading infection. In alignment with this project, a brief in-service was provided to the nurses on the East Pavilion 9-5 unit at Yale New Haven Hospital regarding their role in educating visitors about adherence to isolation precautions.

The Role of Nutrition During Surgical Intensive Care

Sophia Chavez 2020

Faculty Mentor: Mary Murphy

https://fairfield.quip.com/9zQ8AnYr9DVk

Abstract:

This research project is centered around the Surgical Intensive Care Unit (SICU) at West Haven's VA Hospital. There remains the lingering question of what healthcare professionals can do for surgical patients in the ICU to further enhance their recovery since the main objective is to promote a faster recovery and diminish complications after surgery. The evidence-based literature included within this project reveals how inadequate and delayed nutrition is a common complication for patients in the SICU, which can lead to other health issues. Studies have uncovered that early nutrition in the SICU patients obtains a significant role in critically ill patients because it provides energy, protein, and nutrients to optimize healing. Although there are debates about the type and amount of nutrition required of critically ill patients, the literature shows that it is dependent on the individual patient's underlying medical condition, nutritional status, and available route of nutrient delivery. However, it is certain that when the patient enters the recovery phase, their nutritional needs increase significantly. Therefore, by providing education on introducing early nutritional interventions, this can lead to better patient functional recovery and quality of life for SICU patients.

Top 10 Best Apps for Stroke Survivors

Brianna McDonald 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/B6BuAkTMv1Ag

Abstract:

This capstone project focuses on identifying and managing personal modifiable factors for post-stroke patients. I plan to provide a leaflet that lists the top 10 best apps for stroke survivors. This leaflet will be displayed with other stroke education

information on the Neuroscience Unit at Yale New Haven Hospital. I will provide copies to be distributed to patients as part of their stroke education prior to discharge. On this unit, patients have expressed that they did not know stroke risk factors such as hypertension, diabetes, atrial fibrillation, and smoking led to a stroke. A role of the nurse is to provide stroke education to patients, prior to discharge, on modifiable risk factors which include, but are not limited to, smoking, hypertension, diet, alcohol consumption, and physical inactivity. Lifestyle and behavior modification, such as smoking cessation and physical activity, can reduce one's risk for having a stroke. Stroke is a major cause of hospitalization, specifically in the elderly population, throughout the United States. Modifiable risk factors are very important to address with patients, as intervention strategies aimed at diminishing these factors can ultimately lead to decreasing one's risk at having another stroke. It is my hope to improve the identification and management of risk factors by providing a leaflet listing useful apps to post-stroke patients prior to discharge.

Transitioning Registered Nurses into Solo Telemetry Monitoring

Emily McEwan 2020

Faculty Mentor: Laura Conklin

https://fairfield.quip.com/VJzzAUbhZ2st

Abstract:

This Capstone project focuses on telemetry and the registered nurse's role in telemetry monitoring. In many hospitals, units requiring telemetry have the help of telemetry-certified monitors who sit and watch the monitors of various patients for any dysrhythmias or abnormalities that may occur in the course of a shift. In recent years, hospitals transitioned from this procedure and introduced the idea of solo RN telemetry monitoring where dedicated telemetry monitors have been discontinued. This project centers on educating nurses and other health care professionals about promoting effective patient care while transitioning nurses and their units into independent telemetry monitoring through the use of teamwork, prioritization, and communication. The evidence-based literature included in this project addresses the positive outcomes that exist in regard to solo RN telemetry monitoring and supports the proposition that this transition can create better care for patients and a healthier, organized, team-based work environment. In addition to the research presented, an educational poster was created for those who work at the VA and more specifically on the unit, where it can be showcased for future reference. The nurses were able to share concerns and ask questions prior to the presentation and, once presented with the information included in the presentation, demonstrated a willingness to change and a new understanding about why it is important to patient care and how it can be achieved.

Treatment of ARDS with Prone Positioning

Carisa Mascellaro 2020

Faculty Mentor: Linda Roney

https://fairfield.quip.com/eIuzA1dTNGEe

Abstract:

Acute respiratory distress syndrome (ARDS) is a dangerous condition that typically occurs in patients who are critically ill or injured . This project evaluates the use of prone positioning, which means lying flat on the chest with the back facing upward, as a form of treatment for ARDS.

Triage to Thrombectomy: Education on a New Stroke Treatment

Nicole Zastko 2020

Faculty Mentor: Patricia Lamb

https://fairfield.quip.com/oeaPAoFFU0sR

Abstract:

When a new procedure is implemented into a healthcare setting, it can be a challenge for everyone to fully understand what it is and the procedures. This research project is focused on education about a new treatment of acute ischemic strokes with large vessel occlusion called thrombectomy recently introduced to Greenwich Hospital. Ischemic stroke is when an artery is blocked by a blood clot, cutting off blood flow to the brain and damaging the cells. Evidence based research explains why endovascular thrombectomy is beneficial. Prior treatment for acute ischemic stroke was only tPA, a thrombolytic medication that breaks up the clot. This treatment is very dependent on if the patient is on blood thinners, had a recent surgery, or any other cause for blood loss related to the treatment because a risk of tPA is major bleeding. Thrombectomies are done in interventional radiology, where a catheter is threaded through the femoral artery to the location of the clot and a retrieval device removes the clot. Especially when done in addition to tPA, there is a great chance of decreasing permanent deficits. It is also a revolutionary stroke treatment for patients who do not qualify for tPA, who would previously be given only supportive care. An educational in-service was presented to nurses in the Emergency Department at Greenwich Hospital that included this information about endovascular thrombectomy.

Anticoagulation Therapy: Decreasing Rate of Pulmonary Embolisms

Nicole Klein 2020

Faculty Mentor: Suzanne Turner

https://fairfield.quip.com/iBsbA7mgV7bc

Abstract:

After a patient undergoes surgery, they are at great risk for developing blood clots that can break off from the sides of blood vessels and travel throughout the bloodstream that can land in various major organs. When this happens, the blood clot can cause blockages in the blood vessels causing a lack of oxygen and subsequent organ damage. They can lodge in the lungs, becoming a pulmonary embolism (PE); in the heart, which can lead to a heart attack; or in the brain, causing a stroke. Patients become even more at risk when it involves the breaking bones that hold large arteries. For these reasons, patients on the V4E musculoskeletal and orthopedics floor at St. Raphael Hospital in New Haven are at high risk for developing major issues related to DVTs. Patients that come out of orthopedic surgeries do not always understand the need for anticoagulation therapy or the extent of the consequences if they do not follow the guidelines as prescribed by their physician. There is extensive research and data that points to the successful use of anticoagulation to prevent DVTs and PEs put into evidence-based practice for nurses to provide optimal care for their postoperative patients. This study will review and compare literature about the benefits of post surgical anticoagulant use. Educating nurses in various anticoagulation therapies and their effectiveness will allow for better patient education, patient outcomes, and shorter length of hospital stays post operatively.

Use of Bispectral Index Monitoring in Mechanically Ventilated Patients

Jessica Pil 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/F7F7ANKZefIP

Abstract:

Mechanically ventilated patients on neuromuscular blocking agents (NMBA) and sedation at the Intensive Care Unit (ICU) in a small community hospital need more reliable and consistent guidance for the titration of sedation depth. Until recently, sedation has been assessed indirectly, primarily by using vital signs and subjective sedation scales. Subjective sedation tools are limited in measuring sedation with patients on NMBA. Bispectral (BIS) monitoring provides an objective tool by monitoring electroencephalographic signals in the brain to monitor for sedation. Ventilated, sedated, and paralyzed critical care patients are at risk for over and undersedation which increases the risk of extended hospital stays and poor patient outcomes. Though BIS monitoring is a low occurrence, it is a high risk situation and the ICU nurses need to be knowledgeable in the use of BIS monitoring in their mechanically ventilated patients on NMBA. An in-service was provided to the nursing staff to update and increase awareness on BIS use for patients in a 14 bed community ICU.

Use of Cold Caps to Prevent Chemotherapy-Induced Hair Loss

Caroline Kolenski 2020

Faculty Mentor: Jessica Marraffa

https://fairfield.quip.com/fdAZA7Ycelpn

Abstract:

Chemotherapy-induced hair loss is a side effect that results from certain chemotherapy treatments. It is a challenging effect for patients to cope with, which inclined research on how to prevent it. Cold caps are fitted, helmet-like headgear cooled to low temperatures to hinder hair loss. These caps are kept on the scalp before, during, and after treatment to increase effectiveness. Nurses and ancillary staff attend training sessions to learn how to properly apply the cold caps and operate machinery. While the Bennett Cancer Center at Stamford Hospital provides this training, a limited number of patients qualify and use cold cap therapy. This relatively new practice and lack of use allows for medical personnel to forget how to properly apply and educate patients on the cold cap system. Common concerns include out-of-pocket expenses that can cost thousands of dollars for the whole treatment as well as improper education on application. It is important for both staff and patient to understand the application, use, effects, and extra care before using cold cap treatment. This education can prevent cold thermal injuries and subsequent hair loss in targeted areas of the scalp. Recommendation was made for information sessions to be implemented for oncological staff to practice proper application and advance knowledge of latest evidence-based practices and studies to relay to patients.

Use of Complementary and Alternative Medicine in Perioperative Care

Brianna Mahon 2020

Faculty Mentor: Sally Gerard

https://fairfield.quip.com/PXTLA0wCDnWa

Abstract:

The way that the United States healthcare system treats pain in clients, particularly in surgical cases, is heavily reliant on use of narcotics both in the hospital and home setting. Popularized in the early 2000s, pain became the "fifth vital sign" for patients during their hospital stays. The emphasis that the healthcare system puts on pain control has contributed to mass-prescription of narcotic medication that many healthcare employees proclaim is unsafe. Many patients are sent home with large supplies of narcotic drugs that have the potential to be abused, misused due to lack of education, and depended upon. This study researches complementary and alternative methods to perioperative symptom management, including pain control, post-operative nausea, and psychological symptoms such as anxiety. The implications of using

complementary and alternative medicine (CAM) in the perioperative setting include improved patient outcomes, patient-centered goal-setting and care, and reduced use of narcotics for symptom management.

End-of-life Communication From Nurse to Patient

Silvana Cardona 2020

Faculty Mentor: Katherine Saracino

https://fairfield.quip.com/6r6NAIeRinPa

Abstract:

A lot of people do not like thinking about death. Talking about death is even harder for others. But when it comes to those decisions when you are battling life or death, knowing the outcome you want and others want for you is extremely important. This research project focuses on end-of-life communication and an effective way for nurses to communicate this with patients, with a focused setting of the Immediate Care Unit (IMCU). Knowing the different options and feeling well-educated about what these options entail for you or a loved one at their end-of-life is very important. As a nurse, you are with a patient and their family when they are at their most vulnerable. These moments could even be their last. Especially if a person has a DNR (do not resuscitate) code status. With that being said, there are many times where patients and family members pick a code status without knowing what it means or looks like until it is unfortunately too late. Therefore, having the correct language, resources, and knowing how to explain code status to patients and family members is extremely critical for nurses. This project will be a resource for nurses to use so that they can provide patients and families with the most effective communication for end-of-life. Therefore, through the literature reviewed for this project, the Stamford Hospital IMCU staff will receive a pamphlet resource that addresses important end-of-life communication tips that they can use when talking to patients and families.

Will Collaboration and Cooperation Between Professional Registered Nurses and Certified Nurse Aides During Bedside Report Improve the Quality of Care and Patient Safety?

Kim Burrows 2020, Myriam Beamonte 2021

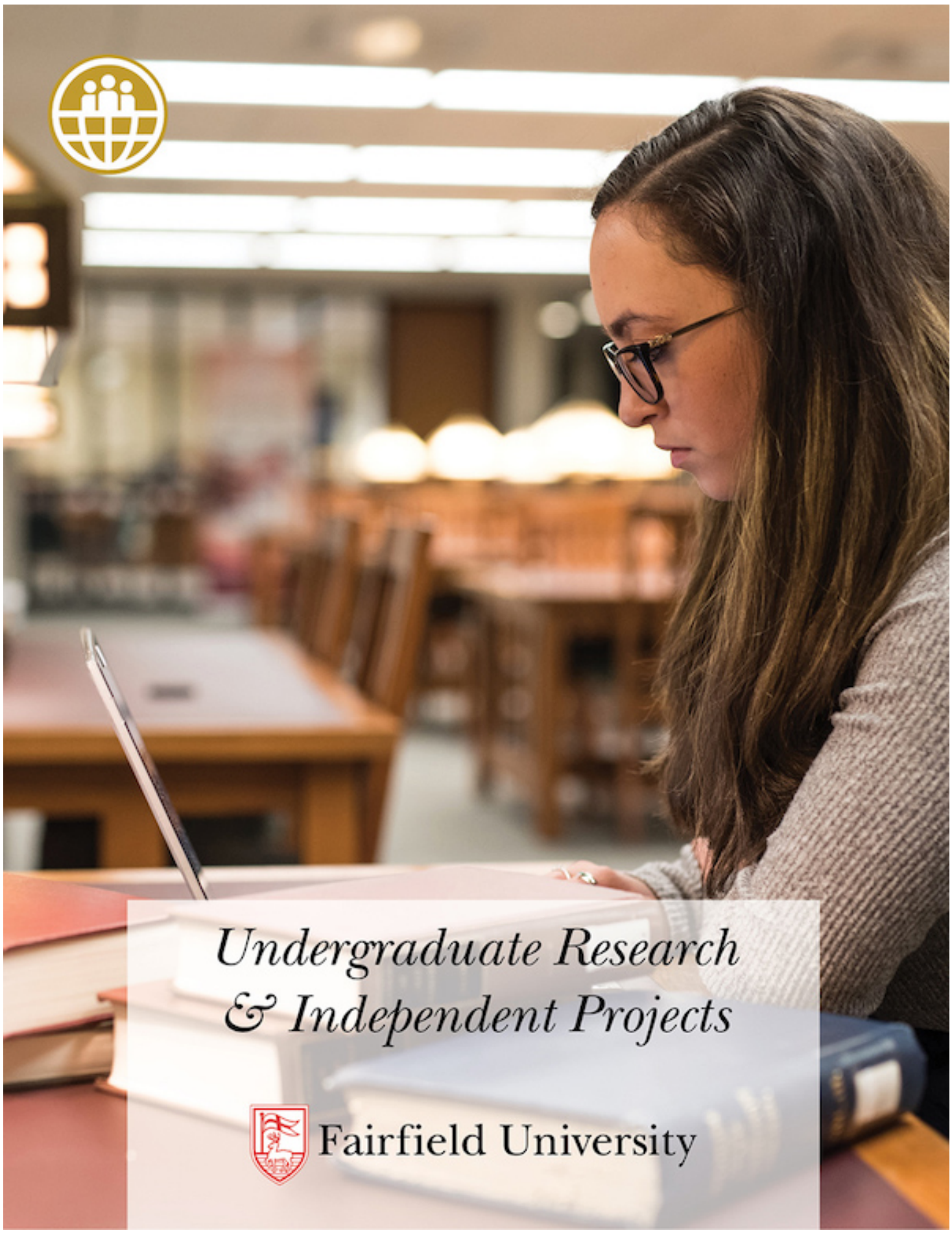
Faculty Mentor: Carole Pomarico

https://fairfield.quip.com/JuO7ABr6wZxa

Abstract:

The purpose of this project is to promote an effective bedside shift report. In 2007, the World Health Organization included the importance of improving handover communication in their Nine Patient Safety Solutions. While bedside shift report has been shown to enhance patient safety by improving communication between patients, their families, and the care team, it is not without challenges (Baines, Mackay ,Kaan, Lloyd ,LeSage, Third, McNamee, Nordby, & Bello, 2018). With an extensive literature review as a basis for our study, we then polled the Registered Nurses and Certified Nurse Aides regarding their concerns on bedside shift reporting. After compiling the results of the questionnaire, we shared the results and educated the staff on the importance of bedside shift report. We devised a plan and implemented a checklist for the staff to use during hand-off reporting in order to expedite and enhance communication while improving patient safety and quality of care.

Undergraduate Research and Independent Projects



Impact of a Music Therapy Intervention on Measures of Salivary Cortisol Levels in Nursing Home Residents with Dementia

Sophia Chavez 2020

Faculty Mentor: Alison Kris

Supported by Corrigan Scholars Fund

https://fairfield.quip.com/G3C4ADbIqkvK

Abstract:

While some research has demonstrated the effectiveness of music therapy for nursing home residents suffering from dementia, others have failed to demonstrate an impact. The purpose of this pilot study was to explore the use of a novel outcome measure, salivary cortisol, as an outcome measure in a randomized controlled trial of music therapy for older adult nursing home residents living with dementia. In this study, music was provided to attempt to relieve feelings of anxiety associated with dementia. The methods utilized in this study was the randomization of nursing home residents into two groups (music therapy vs. muzak therapy) and they were provided with music therapy three times per week, for a total of 4 weeks. Salivary cortisol samples were taken for the duration of the music therapy to ultimately capture if the music therapy maintained a biological effect on the stress levels known as cortisol levels. However, there were no statistically significant differences in salivary cortisol levels throughout the study period in either the intervention group or the control group.

Technical Description:

Background: While some research has demonstrated the effectiveness of music therapy for nursing home residents suffering from dementia, others have failed to demonstrate an impact. It has been hypothesized that more sensitive outcome measures, not reliant on self-report, are needed to detect what may be small reductions in anxiety associated with music therapy. The purpose of this pilot study was to explore the use of a novel outcome measure, salivary cortisol, as an outcome measure in a randomized controlled trial of music therapy for older adult nursing home residents living with dementia. Theoretical Framework : Kolcaba's theory of comfort suggests that patients can help patients find relief from stressful situations. In this study, music was provided to attempt to relieve feelings of anxiety associated with dementia. Methods: Nursing home residents (n=10) were randomized into two groups (music therapy vs. muzak therapy), and provided with music therapy three times per week, for a total of 4 weeks. Pre-test, post-test measures of salivary cortisol were taken before and after therapy during week 1 and again at week 4. Measures of salivary cortisol were assessed using the Salmetrics Cortisol Immunoassay Kit. Results: Measures of salivary cortisol ranged from 0.057-0.51 ug/dl. Individual pre-test, post-test measures were highly correlated for both week 1 and week 4 samples (pre-test r=.95, p=.015, post-test r=.95, p=.051). However, there were no statistically significant differences in salivary cortisol levels throughout the study period in either the intervention group or the control group.

Starfish International: Advancing Girls Education Through Service and Humanity

Micah Martin-Parchment 2021

Faculty Mentors: Anita Deeg-Carlin, Kimberly Baer

Supported by Brennan Fund

https://fairfield.quip.com/SlnAAlLaj8Db

Abstract:

Starfish International is a nonprofit in Lamin, The Gambia. It serves to empower and educate young girls by providing them with a world-class education focused on service to humanity while also providing international service-learning opportunities for volunteers. This research project was based on a different way of life and culture. Starfish's work does in that community is very noticeable in all students who take part in the program. For my research project, I showcase some of the work I witnessed in The Gambia.

The Benefits of Boreholes vs. Water Sachets

Margaret Williams 2020, Kaitlyn Aussenheimer 2020

Faculty Mentor: Anna-Maria Aksan

https://fairfield.quip.com/zWZRA6Un3LYs

Abstract:

Our research discusses the health gains of clean water and develops a cost-effectiveness comparison for providing clean water to rural villages through use of purification sachets versus drilling boreholes. Our study follows five countries: Kenya, Zambia, Peru, Haiti, and South Sudan with villages of 5,000 individuals. We calculate a monetary value for the health gains in each of the five countries in terms of mortality and morbidity reductions. Access to clean water reduces rates of death and sickness related to impure water. Compared to purification sachets, we found that although boreholes require a greater investment up front, the incremental cost-effectiveness ratio (ICER) was much lower for boreholes for the countries studied. Therefore, we conclude that boreholes are more cost-effective at providing clean water to villages. Additionally, we calculate a monetary value for the time savings of boreholes since water no longer needs to be collected from far distances. The internal rate of return (IRR) indicates that the time savings quickly surpass the high upfront investment cost of drilling boreholes.

Manumissions of Enslaved Persons in Fairfield, CT

Brendan McCarthy 2020

Faculty Mentors: Cecilia Bucki, Rose Rodrigues

Supported by Vincent Rosivach Faculty Student Collaborative Research Fund

https://fairfield.quip.com/falIADDDramM

Abstract:

Gradual emancipation in Connecticut centered around the presentation of manumission/emancipation scripts to the Town Selectmen in order to prove an enslaved person was able to care for themselves. This research is centered around finding these manumission scripts presented to the Town Selectmen of Fairfield in order to further evaluate the process of gradual emancipation, and the various steps to achieve freedom through this procedure. The records found were not readily available for viewing and often buried deep within the Connecticut archives. These documents represent an important step in order to shed light on the raw data present within the Fairfield Slavery Database.

From Prospective to Committed: A Critical Analysis of Fairfield University's Diversity Recruitment Initiatives

Alice Rodriguez 2020

Faculty Mentors: David Crawford, Rachelle Brunn-Bevel, Mehmet Cansoy

https://fairfield.quip.com/YY0iAAjWwbSN

Abstract:

The Office of Undergraduate Admissions has a series of initiatives to increase the interest and enrollment of students from historically underrepresented identities or backgrounds, which include, but are not limited to, racially/ethnically diverse, first generation, low income background, immigrant, and LGBTQIA+. One of our initiatives is called the Multicultural Visitation Program Spring Overnight (MVP), which is a weekend where admitted students are invited to stay on campus overnight with a current student host and attend a series of multicultural-centered events. The objective of MVP is to allow prospective students to meet, learn, and engage with the many forms of diversity at Fairfield, and to learn about the plethora of resources that Fairfield offers to support a diverse student body. My research examines the college decision experience of current students of color at Fairfield University. I aim to understand not only what decision factors influenced our current students of color to attend Fairfield, but also to asses how and if MVP has influenced their final decision. In addition, my research evaluates whether MVP affects prospective students' understanding of the demographic diversity and multicultural related resources on campus.

Small Scale Coffee Farming in the Atlantic Rainforest of Minas Gerais, Brazil: Opportunities for Increased Environmental Sustainability

Matthew Little 2022, Valeria Baduell 2021

Faculty Mentors: Dina Franceschi, Anita Deeg-Carlin

Supported by Bailey Family Fund

https://fairfield.quip.com/fmCAAeTMih2v

Abstract:

As farming technologies and machineries advanced, large-scale coffee plantations developed an ability to produce larger amounts of product, while many innovations remain out of reach to small-scale coffee plantations. The coffee industry in Rosario da Limeira, Brazil, consists mostly of small-scale plantations, located in deforested areas of the Atlantic Rainforest within the buffer zone of the Serra do Brigadeiro State Park. The plantation's simplicity allows a variety of experimental farming methods to be enacted, pioneered by the Iracambi Rainforest Research & Conservation Center, in an attempt to decrease the negative external costs associated with agricultural deforestation. This paper details the implementation of environmentally sustainable farming practices at small-scale, family-operated coffee plantations in Rosario da Limeira and identifies opportunities for advancement.

Expanding the Outreach of Environmental Education

David Denaro 2020

Faculty Mentor: James Biardi

https://fairfield.quip.com/Dls1APaGDl7G

Abstract:

Environmental education teaches a better understanding of environmental issues in order to develop the skills and knowledge base necessary to make responsible environmental decisions. Some places have limited access to this type of learning, and it is important that outreach is expanded and made more easily accessible to all communities. During Summer 2019, I interned at the Ansonia Nature Center in Connecticut, a city funded nature center set in an urban environment. It is one of the only places available for residents to become better acquainted with nature and environmental issues. As such, they seek to make environmental education easier and more accessible. In order to do this, they will implement a new program known as the "Education Station Trail Project." Four stations, located within the nature center's set of trails, will serve as a way for educators to conveniently self teach students about nature on their own time with hands-on activities that supplement their current school curriculum. Educators are provided with online learning materials, and a backpack associated with each station, which includes materials for on-site activities. During my internship, I helped with the implementation of this project by organizing and adding the various materials needed, such as curriculum, activities, videos, and guidelines. Although the "Education Station Trail Project" has not yet been fully implemented, significant progress was made towards getting the program started. The Ansonia Nature Center is currently working to finish this project and hopes to implement it very soon.

Book Self

Justin Gomez 2021

Faculty Mentor: Jo Yarrington

https://fairfield.quip.com/JxefAatkDuHN

Abstract:

After taking an "Experiments in Drawing" and "Artist Book Construction" course with Professor Yarrington. I incorporated what I learned into more developed concept pieces. I created art with found books by using deconstructive and reconstructive techniques and developing an important concept of self reflection. This semester I held a solo-exhibition where I used books being thrown out and gave them an entirely new meaning. As a Psychology and Studio Art major, I wanted to merge the disciplines. The concept is about the viewer's self awareness and reflection in a way that they might think of themselves as these book art pieces. We are perceived based on societal expectations and norms, just as books exist in similar form. I wanted to express our ability to engage within ourselves and notice what we tend to ignore. Each installation piece has its own unique qualities and shadows that explore the concept of what the self can be. Thread is another component that ran throughout the gallery to express connectivity and balance. Art and reflection go hand in hand, and allowed me to exhibit a materialized concept of the self.

Green Village Initiative eCookbook

Katherine Mullen 2020

Faculty Mentor: Joel Beatty

https://fairfield.quip.com/qgJwA5EuwJVK

Abstract:

During the Spring 2020 semester, students in the Multimedia Writing class at Fairfield University helped compose, edit, design, and possibly publish an eCookbook for the Green Village Initiative (GVI) based in Bridgeport, Connecticut. Motivation for this communication is to educate people about healthy whole-food ways of cooking and inspire them to take those actions into their own hands and actually execute them. The book focuses on the community gardeners who volunteer for GVI, and emphasize how their knowledge is crucial to sustaining and growing the community. The project will start with the transcribing of recordings of interviews conducted by Dr. Joel Beatty of the Fairfield University English Department. From there, we will make the text a combination of the stories shared through the interview process in conjunction with the recipes they provided. We formatted the recipes while creating a narrative of the people who proposed the recipes. The goal was to make the project visually pleasing with colors, fonts, photos, etc. in order to give the digital cookbook depth by using PowerPoint, InDesign, Lightroom, and other tools within the Adobe Cloud.

Are Town Employees in Greenwich, CT Able to Afford Housing Within its Borders?

Reinaldo Gonzalez 2020, Michael Gurge 2020

Faculty Mentor: Jonathan Delgado

https://fairfield.quip.com/Ev5xAIMzfRLJ

Abstract:

Preliminary results from a townwide survey conducted by the Greenwich United Way with Fairfield University faculty and students showed that housing was a major concern for its residents. This prompted us to ask the following question: Are town employees in Greenwich, CT able to afford housing within its borders? The purpose of this research project is to analyze the housing stock and costs in the town of Greenwich along with the average salaries of town employees to determine how many are able to live in town. Greenwich is known as a town with an exorbitant cost of living but has municipal employees just like any other town. There are inherent benefits to having employees live in town, whether that be a deeper connection to the populace or a better understanding of the town's needs. Using American Community Survey census data collected from Social Explorer, the town's zoning and housing data with town salaries, we estimate how possible it is to live and work in Greenwich, CT.

The Gender Wage Gap

Ariela Rodriguez 2020

Faculty Mentor: Kathryn Nantz

Supported by Corrigan Scholars Fund

https://fairfield.quip.com/QavuAtraOHFS

Abstract:

Throughout history, women have faced many obstacles that barricaded them from being recognized as an equal member of society when compared to their male counterparts. And yet, although women have successfully overcome these challenges, there is still one challenge that has resonated and continued to test women's equal positioning in the 21st century - the gender wage gap. The pay gap is based on the average difference between the remuneration for men and women who are working. Overall, women are generally paid less and as women and society have advanced with education capabilities, legislation, and adjusted socio-cultural beliefs of men and women, women still face getting paid less than men. Thus, to combat this issue, I propose that there needs to be more legislation integrated around this and a better look into how education has affected the pay gap and whether or not this area should be the main focus for women to pursue. Thus, throughout my project, I researched and analyzed recent and upcoming legislation that combats the pay gap and provided a regression analysis based on the dollar difference of the pay gap and the educational rates of women attaining a Bachelor's degree.

Fibonacci’s Introduction of the Hindu-Arabic Numeral System to Europe

Thanh Le 2022

Faculty Mentor: Kimberly Baer

https://fairfield.quip.com/RMwxAShuxTA8

Abstract:

Everything has its origin, and so does the usage of numbers. The Roman numeral system that uses combinations of symbols like I, V, X, C to represent numbers, had been used in the Western world for all mathematical purposes. In the 15th and 16th centuries, the Hindu-Arabic numeral system that we use today with digits 0, 1, 2 etc., replaced the Roman system as the main one used in Europe. That continues until today. The person who had a crucial role in bringing the Hindu-Arabic numeral system to Europe is Fibonacci (1170 - c. 1240, Republic of Pisa, today Pisa, Italy). Fibonacci was a famous mathematician in the Republic of Pisa. Fibonacci's name and achievements are widely recognized today in the mathematical community. During Fibonacci's time, Italy was made of small independent city-states. The Republic of Pisa was the one that thrived commercially, religiously, and intellectually. This research project discovers how Fibonacci introduced the Hindu-Arabic numeral system to Italy and Europe, how this numeral system gained importance, and then makes connections between the change in numeral systems to the other changes happening in Europe at the time.

My Academic Development Journey: From France to Princeton

Jessica Castillo 2021

Faculty Mentor: Kimberly Baer

Supported by Lawrence Family Fund

https://fairfield.quip.com/lZYYAAspvbjH

Abstract:

My project briefly summarizes my academic journey and the developments that unfolded in part because of my experience abroad in Aix-en-Provence, France made possible with a travel grant from the College of Arts and Sciences. This journey chronicles my academic development from my study abroad experience to subsequent internship opportunities and post-

graduate programs. I will show pictures of my travels and experience and discuss the impact my study abroad experience had on my developmental trajectory.

The Transient and the Intransient: An Analysis of Van Gogh's Work During His Final Years

Juliet Bonsangue 2020

Faculty Mentor: Kimberly Baer

Supported by Brennan Fund

https://fairfield.quip.com/vFuBACKuHtpz

Abstract:

Through studying and examining Van Gogh's personal life and conceptions of the world, one may remark on Van Gogh's tendency to depict opposing ideas in his artwork: death and life, sad and rejoicing, empty but full. Perhaps one of the most important opposing ideas in Van Gogh's work was the idea of the transient within, or coexisting with, the intransient. "Ce qui ne passe dans ce qui passe, ca existe." What does not pass in that which passes, exists. Van Gogh saw the eternal within the ephemeral. Through his acute observations of nature and the world around him, Van Gogh found relationships between the things that remained permanent and those that were forever changing. This paper will analyze and compare and contrast three main paintings from the final years of Van Gogh's life, while connecting them to this dichotomy. Ultimately, Van Gogh came to change how he depicted this theme, which has larger implications about his change in ideology before his death in 1890.

The Effects of Emerging Technologies on the Environment

Enkeleta Mjeshtri 2020

Faculty Mentor: Milo Peck

Supported by Corrigan Scholars Fund

https://fairfield.quip.com/9ZaiAeam5mAI

Abstract:

For the past two decades, a global trend and emphasis towards automation and data exchange in manufacturing technologies and processes has emerged. Included in this emphasis has been the Internet of Things, Cloud Computing, and various Artificial Intelligence Applications. This emergence was coined in 2011 as Industry 4.0. This trend has resulted in a spark of innovation for emerging technologies holding the potential for environmental benefits. Industry 4.0 has grown to encompass all business operations, and aspires to change how things are made, and the workforce involved. The area of Industry 4.0 has recently focused on providing solutions to the ecological problems faced by production. Ultimately, Industry 4.0 encompasses many elements that aim to fulfill the needs and opportunities of the technology, effects in the production and manufacturing stage, and most importantly analyzing their impact on environmental sustainability. This research project analyzes the different technological concepts of Industry 4.0 to identify their purpose for operations, sustainable goals, and long term implications. Furthermore, it identifies each technological advancement's inputs (i.e. the energy source, material, and information needed), and the resulting output (i.e. the product or waste produced), and finally deciding if its overall impact on the environment is negative or positive.

Employee Turnover Rates in Eastern Asia

Christopher Fischer 2020, Collin Paris 2020, Abigail Dovan 2020, Lauren McGrath 2020, Nicholas Giardiello 2020

Faculty Mentor: Mousumi Bhattacharya

https://fairfield.quip.com/G4a0A65L8NwB

Abstract:

High employee turnover rates have proven to be detrimental to large Multinational Enterprises and general Human Resource Management (HRM) within Eastern Asia and China. To better understand this pressing issue within the region, we examine the role of cultural agents within the society of Eastern Asia and China. The paper first introduces what HRM is and why high employee turnover rates are a pressing issue for the region. Sequentially, the paper examines the culture of the region and how this may affect the HRM issue at hand. We use several different categories for this, including History and Politics, Religion and Philosophy, Education system, Social systems, Economic factors, Legal system, Influence of Arts and Media, Workplace Norms, Notion of Time, Speed, Teamwork, and the Communication Process (verbal, written). Following this analysis, we will see how the culture combined with our HRM issue of high employee turnover rates is similar to or different from that of the United States. To better understand this comparison, we examine Hofstede's dimensions, looking at graphs including Individualism vs. Collectivism, Power Distance, Masculinity vs. Femininity, Uncertainty Avoidance, and Long term vs. Short term Orientation. Lastly, we attempt to understand how cultural and other factors affect the current HRM Issue within Eastern Asia and China. In completing all of this, the reader will be understand why a high employee turnover rate is an issue within the region and how the culture is incorporated in that.

The Lack of Leadership in the Middle East

John Appleman 2020, Brett Morrison 2020, Patrick O'Leary 2020, Dylan Beckwith 2020, Jarrod Mullally 2020

Faculty Mentor: Mousumi Bhattacharya

https://fairfield.quip.com/Nv4IAbziQvkT

Abstract:

This research project's goal is to explore the leadership capabilities or lack thereof in Middle Eastern businesses. The Middle East is a complex area facing hardships on all fronts, from war, to political unrest, to religious tensions. This project takes a look into why the leadership in corporate Middle East is not capable and falling behind in a modern age of progress and forward thinking. The lack of leadership and leadership development in the Middle East leads to many other issues such as employee retention, equal rights and pay for women and men, and religious tolerance. This project also takes a comparative look into the different areas of Hofsted's Dimensions between the five countries we chose and the United States to see why there is such a disparity between the two regions.

The Issue of Equal Employment Opportunities in Africa

Erin Rider 2020, Kristina Lovenberg 2020, Raymond Portocarero 2020, Kristin Kunnapas 2020, Gregory Niccolai 2020

Faculty Mentor: Mousumi Bhattacharya

https://fairfield.quip.com/M2foAFu0XN1d

Abstract:

The goal of this research is to shed light on the issue of employment opportunities in Africa. To do this, we researched several regions of Africa and compared them through their history and politics, religion and philosophy, the influence of art and media on society, their notion of time, and education and social systems. We also utilized Hofstede's dimensions to further illustrate the similarities and differences between the five regions in Africa. Once this information was gathered, we conclude that these regions, although separated by land, are similar in their values and cultures in the workplace. The emphasis on structure, family, and respect has shaped the workplace to what it is currently. The lack of opportunity comes from organizational structure and societal roles that each person believes they embody. In addition, the lack of employment opportunities comes from the lack of education provided after primary school, thus making it difficult to obtain a job without certain skills.

Culture Analysis and Human Resource Management Implications in Southeast Asia

Audra Connolly 2020, Courtney Dye 2020, Adam Riobo 2020, Emma Nayden 2020, Winston DeMartini 2020

Faculty Mentor: Mousumi Bhattacharya

https://fairfield.quip.com/blbaA9RYYMcl

Abstract:

The purpose of this project is to explore the human resource management implications in Southeast Asian Countries excluding China. We examined many cultural factors that influence human resource policies and affect how people respond to their environment. The particular issue we chose to focus on is diversifying human resource management practices and policies. The Southeast Asian region is not as culturally expanded as the United States. More specifically, Southeast Asian Countries are not as developed in their human resource management practices, so they are more susceptible to change. In terms of research methods, we used a large variety of references. Furthermore, when studying the culture of this region, we relied more on qualitative research found from various books and journals. We explored written work and narrowed it down to the most important findings. We discovered that Southeast Asian countries are very diverse in terms of how businesses are managed in each country, the human resource management practices are utilized, and people are managed. Moreover, there are vast cultural differences between the following five countries: Malaysia, Singapore, the Philippines, Thailand, and Vietnam. These dimensions have serious implications on the human resource practices of the region affecting everything from individual relationships to company strategy.

Issue of Recruitment and Its Aspects in Latin America

Tycho Cortese 2020, Seamus O'Brien 2020, Jennifer Sok 2020, Cayla Preston 2020, Luka Heinrich 2020

Faculty Mentor: Mousumi Bhattacharya

https://fairfield.quip.com/COvkAhmQPr9j

Abstract:

Latin America faces many challenges when it comes to human resource management. The five countries focused on are: Brazil, Mexico, Colombia, Peru, and Argentina, which have numerous face-offs when it comes to their human resources departments. The main issue we found was their recruitment process, along with their lack of succession planning. Brazil was ranked the most difficult country to enter, immediately creating a challenge to a more open and diverse workforce. They have a very complex legal framework and high costs as well. According to SHRM, the most common workforce challenge is lack of succession planning, cited by 57% of respondents to research. Next is loss of talent in key skill areas, followed by aggressive recruiting from other competitors, the inability to attract necessary talent, and the inability to pay at competitive levels.

Sexual Perversity in Nineteenth-Century Literary Realism

Grace Dembia 2020

Faculty Mentors: Nels Pearson, David Crawford, Johanna Garvey

https://fairfield.quip.com/ABXMAaSM3uer

Abstract:

My research project will focus on sexual perversity in nineteenth-century literary realism. Before looking at specific literary examples where characters possess perverse sexualities, I first define sex, gender, and human sexuality. After analyzing the sex/gender/sexuality system in which sexual perversity relies on, I then define sexual perversion in the nineteenth century. In doing this, I focus on Richard von Krafft-Ebing's Psychopathia Sexualis and Michel Foucault's The History of Sexuality. Shortly after my analyses of these studies of human sexuality, I discuss punishment in the nineteenth century. I focus on a work published by Michel Foucault, but I summarize and analyze Discipline and Punish. Next, I break down Victorian norms of female sexuality and the ways in which women learned gender during the nineteenth century. Finally, I move onto my analyses of Gustave Flaubert's Madame Bovary and Frank Norris's McTeague. There are various scenes within Madame Bovary and McTeague that suggest the protagonists' sexual perversity. Whether the protagonists act on their sexually perverse impulses or covertly hint at their perverse desires, each novel contains a multitude of scenes depicting sexual perversity. Many minor characters deviate from the realm of sexual normalcy as well. Due to their problematic sexualities, these characters are subjected to prolonged experiences of death which supports my claim that sexual perversity and punishment were heavily intertwined throughout the Victorian era. Flaubert and Norris reinforce the popular trope of not allowing perverse bodies to die quickly or peacefully. Instead, both authors allow these particular bodies to suffer for as long as possible in order to publicly condemn their sexually deviant acts. It is interesting to note that each novel consists of other perverse characters as well - individuals who hoard their wealth, murderers, thieves, and those who rely on violence to succeed. However, these deviants do not get punished in the same way that the sexually perverse do. I argue that the difference lies in the offense of their "crimes." Sexual deviants are so offensive to the collective consciousness, that they must be punished for there is no hope for them to be reformed. Due to this idea, society reverts to punitive forms of punishment only when handling the sexually perverse. To conclude my project, I look at current forms of punishment imposed upon those labeled as sexually perverse in today's society. I suggest that transgender and queer bodies take up this contemporary role of being categorized as sexually perverse. To support my claim, I provide recent statistics from the Human Rights Campaign and the Trans Murder Monitoring Report. Additionally, I argue that female sexuality is still extremely stigmatized in contemporary society and that women who assert their sexual agency are punished today. I then write about the popularity of abuse pornography and virgin manipulation films which suggests that sexually liberated women have to be abused so that they can openly partake in any form of sexual activity. It is commonly thought that no one is sexually repressed in today's world and that we, as a society, are more accepting of sex that differs from heterosexual, procreational sex. However, I believe that this claim is grossly inaccurate and I plan on explaining why in my conclusion.

Social Discourse Around Civil Rights Movement in Post-War New York

William Woods 2020

Faculty Mentor: Nels Pearson

https://fairfield.quip.com/zVHFAkeyqyAY

Abstract:

This English capstone project, explores the socio-political discourse of America during the Civil Rights movement. I specifically hope to understand what ideals of liberty, freedom, and justice mean to different individuals on different parts of the political spectrum. In terms of progressive voices, I focus on voices with an association with New York. The form of autobiography will be especially important to the development of the project. Texts written by Miles Davis, Nina Simone, Bob Dylan, Harry Belafonte, Malcolm X, and James Baldwin will primarily inform my thesis. The conservative side of the Civil Rights Movement will draw from voices around the country. Others may include William F. Buckley and William Faulkner. I am interested in defining the form of institutional racism in a part of the country which was not as strictly segregated as Jim Crow South.

The Black Janus

Diallo Simon-Ponte 2020

Faculty Mentor: Nels Pearson

https://fairfield.quip.com/aKnxA3GvjPwF

Abstract:

An introspective analysis on the black psyche at Fairfield University.

"Keep Off Indian Property": Reclaiming Reproductive Rights on Federally Regulated Reservations

Brianna Coppola 2020

Faculty Mentor: Peter Bayers

Supported by Corrigan Scholars Fund

https://fairfield.quip.com/gBqoAar4YAQj

Abstract:

Healthcare delivery and access are important issues as they both have the potential to change the outcome of patient care. This is especially true concerning Native American women as their reproductive health continues to be regulated by the United States government. More than 1 million Native Americans receive health care services through the Indian Health Service, a federal agency that began through negotiated treaties between Native American tribes and the government for land and resources. Although seen as an obligation, the courts have not recognized a basis for Indian legal entitlement to benefits, therefore, Indian healthcare is subject to change due to administrative disavowal. This erratic funding not only

makes it difficult to achieve their goal to provide the highest health status possible but also to attain female reproductive health, which they define as, "A state of complete physical, mental and social well-being in all matters relating to the reproductive system's functions and processes." According to Women Studies scholar, Kimala Price, reproductive health is a human right connected to the political, social, and cultural context. Women have the right to be informed and have access to safe, effective, and affordable methods of family planning and fertility regulation, yet, on Native American Reservations, such rights are limited due to access, cultural restrictions, and knowledge. I explore questions such as, do Native American women truly have a choice concerning their health when there is limited access; and what type of education do women receive concerning their reproductive health? Although I touch on topics such as abortion and contraception, this project is not focused on discussing pro-life or pro-choice, but details the social constraints Native American women face due to the lack of access and education allotted them through the federal government which limits their ability to choose motherhood and control its timeline.

Art of the Book: Evolution of Period Style From 1520-2020

Eileen Michaud 2020, Molly Lamendola 2022, Lydia Cross 2020, Matthew Waldemar 2020, Danielle Janof 2020, Maria Klein 2020

Faculty Mentor: Philip Eliasoph

https://fairfield.quip.com/SMT3AhOVpur7

Abstract:

The Spring 2020 Art History capstone class has curated a virtual exhibit exploring seven distinct period styles from the Renaissance to the present day. Students had the privilege to utilize original print material from the rare book collections of the Pequot Library in Southport, Connecticut to illustrate the evolution of period style. The "art of the book" provides us with a unique lens through which to understand historical style sensibilities and the contexts in which they emerged. Using original print archives from the Pequot Library, students independently constructed their own visual arguments connecting book style to other realms of the visual arts, including fashion, industrial design, painting, and sculpture. Students developed their own visual period summaries in words and images throughout this virtual exhibit, which captures the unique spirit of the ages that span Western art history since the Renaissance. The goal of this project is to introduce the myriad ways in which objects of visual culture may expand our understanding of broader historical developments and societal values.

BAWDY Project: A Study on Masculinity Through Art

Matthew Waldemar 2020

Faculty Mentor: Robert Epstein

https://fairfield.quip.com/829hAYaxmtvZ

Abstract:

The human body is central to how we understand facets of identity such as gender, sexuality, race, and ethnicity. Historically, the use of material culture (i.e. sculpture and paintings) have been used as a guidebook to articulate these ideal attributes. Today, printed advertisements and digital media now serve as contenders in this ever-evolving playbook. This project is a digital exhibition studying the progressive gender reformulation of the twenty-first century. This exhibition surveys the art canon to understand how visual culture constructs our notions of the ideal male form and the culture of

masculinity. A selection of curated works, featuring emerging artists, is placed in tandem redefining our understanding of the body, gender, sexuality, race, and ethnicity as a whole.

Willingness to Pay for Safe Drinking Water in the Galapagos Islands: A Referendum Contingent Valuation Study

D.J. Ciampi 2021, Samuel Alofsin 2020, Pablo Idrovo 2020, Taylor Rogers 2020, Daniel Salomao 2021, Meghan Dana 2022

Faculty Mentor: William Vasquez

https://fairfield.quip.com/c2xlAE5wbi05

Abstract:

Unreliability of water systems has become a major concern in many developing countries. A referendum-format contingent valuation (CV) survey was implemented to investigate household preferences, in monetary terms, for improved water services in the Island of Santa Cruz, Galapagos, Ecuador. A random sample of 154 households report that they adopt a variety of averting measures (e.g. in-home water storage and bottled water consumption) to cope with service interruptions and low water quality. Conservative estimates indicate that households are willing to pay an increase of about $35 in their water bill for reliable supplies of safe drinking water.