RUTGERS
Ernest Mario School of Pharmacy

RUTGERS PHARMACY RESEARCH DAY

APRIL 20, 2022

ABOUT

Posters will be presented from 4:30-6:00 PM at Ernest Mario School of Pharmacy,
160 Frelinghuysen Road, Piscataway, NJ

Provides a great opportunity to learn about the administrative, basic, translational, and clinical research conducted by PharmD students, fellows, residents, graduate and Ph.D students

DETAILS

- In-Person Event
- Open to the Rutgers Pharmacy community
- All attendees must provide proof of vaccination or negative PCR test from a test taken no more than 72 hours before the event

SCAN QR CODE
TO VIEW THE PROGRAM

FOR MORE INFORMATION

Please contact

Dr. Carolyn Seyss
Carolyn.Seyss@pharmacy.rutgers.edu

Welcome to the 2022 Rutgers Research Day!

Welcome to the 2022 Rutgers Pharmacy Research Day! This is an incredible venue to showcase the innovative research conducted at the Ernest Mario School of Pharmacy. Our world-class research is advancing basic science and improving human health, through the discovery of new pharmaceuticals, innovative technologies, and best practices in healthcare. Nationally and internationally recognized for the caliber of our research program, our school consistently ranks as one of the top 15 recipients among 142 accredited schools of pharmacy in funding from the National Institutes of Health.

The School of Pharmacy researchers collaborate on multidisciplinary work among our departments and across the university. As the state university of New Jersey, Rutgers serves a state that is home to leading hospitals and clinical care centers as well as 15 of the world's largest pharmaceutical companies. In this dynamic research environment, pharmacy scientists and clinicians find broad opportunity for exciting clinical, industry, and academic collaborations.

Rutgers Pharmacy Research Day is an opportunity to experience our collaborative, supportive pharmacy research community of faculty, postdoctoral fellows, graduate students, and undergraduate students. This event showcases high-impact research in the core areas of Administrative and Regulatory Science, Basic Science, Clinical Science and Translational Science.

We thank the presenters today for sharing their innovative work with the broader School of Pharmacy community!

Carolyn Seyss, PharmD
Fellowship Director
Institute of Pharmaceutical Industry Fellowships
Ernest Mario School of Pharmacy
Rutgers University

Michael Toscani, PharmD
Research Professor, Fellowship Director Emeritus
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Renping Zhou
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Joseph Barone, PharmD, FCCP
Dean and Professor II
Ernest Mario School of Pharmacy
Rutgers University

Proceedings of the 2022 Ernest Mario School of Pharmacy Research Day

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Abstract 1

How States Have Changed Their Compounding Recommendations During the COVID-19 Pandemic in Response to Personal Protective Equipment (PPE) Shortages

Elizabeth Wilks, Carolina Guerreiro, Peter Kim, Jaclyn Sigman, Kim Tran, Michael Toscani, Joseph Barone

Rutgers Institute for Pharmaceutical Industry Fellowships, Ernest Mario School of Pharmacy, Rutgers University; Piscataway, NJ.
Ernest Mario School of Pharmacy, Rutgers University, Rutgers University; Piscataway, NJ

Purpose: The COVID-19 pandemic has increased the demand for personal protective equipment (PPE) leading to shortages. Beginning in March 2020, institutional pharmacies have deviated from official United States Pharmacopeia (USP) <797> compounding procedures, which has the potential to affect drug sterility and patient safety. State Boards of Pharmacy (SBOPs) have issued a variety of recommendations. This review consists of publicly available information on state Board of Pharmacy (SBOP) websites through a retrospective analysis of the availability and trends of each state's PPE recommendations.

Methods: In this retrospective analysis, publicly available content published between March 1, 2020 and December 31, 2020 from each SBOP within the United States were reviewed for changes in sterile compounding guidelines during the COVID-19 pandemic in response to PPE shortages. SBOP websites were reviewed for content, and additional internet searches were performed for states without a repository of past news and updates. The following data were extracted into a standardized Microsoft Excel spreadsheet: guidance status, recommendations, and references to USP, Centers for Disease Control and Prevention (CDC), Food and Drug Administration (FDA), CriticalPoint, or other sources. Data were then analyzed for trends.

Results: The most commonly referenced guidance was FDA at 56% of states (n=28). CDC guidance was used by 44% (n=22) while USP was cited by 50% (n=25). CriticalPoint guidance was referenced by 24% (n=12). Interestingly, 18% (n=9) of states created their own guidance while 26% (n=13) issued no guidance.

Conclusion: It was found that 50% of SBOPs deviated from the standard USP < 797> compounding policies during the COVID-19 pandemic. While some SBOPs directed pharmacies to follow alternative guidance for compounding, 26% of SBOPs provided no clear guidance. Ensuring pharmacies uphold standard compounding practices is vital to ensure sterility of products and patient safety.

Program: Institute for Pharmaceutical Industry Fellowship

Category: Administrative & Regulatory Science
Status: Pharm.D. Industry Fellow

Abstract 2

The Influence of Readability on Consumer Engagement: the power of the tweet

Rebecca Palma, Tanvi Lodhia, Valentina Pampulevski, Mark Rametta, Michael Toscani

Rutgers Institute for Pharmaceutical Industry Fellowships, Ernest Mario School of Pharmacy, Rutgers University; Piscataway, NJ.
Bayer HealthCare Pharmaceuticals, Inc; Whippany, NJ

Objective: To determine the readability of tweets posted by pharmaceutical companies and determine if readability acts as a driving factor for consumer engagement on Twitter. Method: Unbranded oncology disease state awareness tweets from top pharmaceutical companies (based on 2020 sales) posted between Jan-Nov 2021 were collected. Information analyzed included likes, comments, and retweets. Text was assessed through readable.io for SMOG index, tone, personalism and reach.

Results: One hundred and eight tweets from five companies were included in the final analysis. We hypothesized that the readability scores of tweets would be above a 6th grade level (SMOG index = 6.0); if the readability score of a tweet was at or below a 6th grade reading level, then the amount of consumer engagement (represented by Twitter interactions) would be higher. The five companies' average SMOG indices were 11.5, 11.2, 12.2, 12.9, and 13.0, which were all above a 6th grade reading level. All 108 SMOG indices were plotted against their Twitter interactions (sum of likes, comments, and retweets) in a linear regression model, which reported an R2=0.0054. The hypothesis was rejected. Two additional analyses were performed. Reach is a calculation performed by readable.io. It represents the proportion of the target audience that can read content easily, accounting for the estimate that 85% of the general public is considered literate. To understand if reach was a driving factor for consumer engagement, a linear regression of reach percentages versus Twitter interactions reported an R2 of 0.0033. To understand if writing style components like personalism were driving factors for reach, the average of reach percentages were calculated for both categories of personalism: "personal" and "impersonal". On average, the tweets that were classified as "personal" had 85% reach while the tweets that were classified as "impersonal" had 75% reach.

Conclusion: As hypothesized, the average readability scores of oncology disease state awareness tweets were above the generally recommended 6th grade reading level. The entire sample of tweets assessed yielded SMOG indices above 6.0, indicating that not a single tweet met the 6th grade reading level. Based on the sample evaluated, readability was not found to be correlated with consumer engagement. Additional research that also includes tweets that meet the 6th grade reading level are needed to further assess the relationship between readability and consumer engagement. Further, the additional analyses showed that consumer engagement is not influenced by reach but reach may be influenced by personalism. To further this research, the use of Twitter functions such as polls, infographics and videos could be assessed for their influence on engagement.

Program: Institute for Pharmaceutical Industry Fellowship

Category: Administrative & Regulatory Science
Status: Pharm.D. Industry Fellow

Abstract 3

Evaluation of Perceived Stress Among Academic-Affiliated Pharmaceutical Industry Fellows

Sana Amin, Carolyn Seyss, Delaney Strong, Joseph Caputo, Amy Sheehan, Amee Mistry, Monica Miller

Purdue University, Massachusetts College of Pharmacy and Health Sciences

Objective: To examine the level of perceived stress that academic-affiliated post-doctoral pharmaceutical industry fellows experience, along with identification of the types of stressors they experience, possible factors associated with higher levels of perceived stress, and the state of resilience skills in this population.

Methods: A multi-item survey instrument was created to collect information about fellow demographics, perceived stress, major stressors, and resilience skills. The survey also utilizes the Perceived Stress Scale (PSS-10), a validated psychological tool to measure the perception of stress, and the brief Connor-Davidson Resilience Scale (CD-RISC-10), a validated scale for measuring resilience. The study sample consists of 391 current postgraduate year one (PGY1) and postgraduate year two (PGY2) industry-affiliated pharmacy fellows in programs with academic collaborations with the Massachusetts College of Pharmacy and Health Sciences, Purdue University College of Pharmacy, or Rutgers University Ernest Mario School of Pharmacy who have a Doctor of Pharmacy degree, representing 69% of fellows in positions with academic partnerships.

Results: Data collection is ongoing and will conclude in May of 2022. Data will be analyzed using descriptive statistics. Regression analysis will be conducted to assess potential relationships between perceived stress, fellow characteristics, and resilience skills. Findings will be compared to previously reported perceived stress levels in PGY1 pharmacy residents. Conclusions: This project contributes to the advancement of pharmacy practice by gauging the need for wellbeing and resilience initiatives directed at pharmaceutical industry fellows. Results from this research may be used to develop a customized wellness initiative to support this population.

Program: Institute for Pharmaceutical Industry Fellowships
Funding: External Funding from Purdue University

Category: Administrative & Regulatory Science
Status: Postdoctoral Fellow

Abstract 4

The Impact of COVID-19 Pandemic and Future Directions to Conduct Clinical Trials

Thi Nguyen, Aaron Tocker, Michael Toscani

Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway, NJ
Daiichi Sankyo, Inc., Clinical Development, Basking Ridge, NJ 07920

Introduction: The COVID-19 pandemic impacted the conduct of clinical trials and led to difficulties enrolling new patients in a trial or meeting a protocol's procedures including mandated visits, laboratory tests, and administration of an investigational drug. To resume clinical trials and to protect patient safety and trial integrity, many sponsors and CROs have amended protocols and adopted digital technology and decentralization with support from regulatory guidelines. Our goal is to review the practices associated with decentralized clinical trials (DCT) method that can be implemented in future clinical trials.

Methods: We used the term "decentralized clinical trial" to search for literature published on PubMed database and Google Scholar between 2003 and 2021. In 2003, it was the first time that decentralized trials model was introduced as McAlindon and his team conducted feasibility study for internet trials; therefore, we chose 2003 as the start date.
For the purposes of this literature review, full-text research articles and regarding DCTs were selected. The search criteria include: 1) Articles published between 2003 and 2021; 2) English language articles, peer-reviewed journals, regulatory agencies, or reports that collected data regarding perspectives on DCTs; 3) Solutions such as technologies, biomarkers, etc. which can be used to support DCTs method. All eligible full-text articles were screened for duplication and relevance and closely examined to determine whether they met search criteria above.

Results: We retrieved a 460 peer-reviewed titles from the database search. Of those articles, 457 were non-duplicates and 376 titles were not given full-text reviews, as their titles and abstracts did not meet the search criteria. Ninety-one articles were carefully examined full text for relevance, and 39 were excluded for not meeting the criteria upon closer inspection. We categorized digital health technologies (DHT) reviewed into five categories utilized or discussed including: the use of at home mobile devices, telehealth, data sharing, delivery of investigational products, and patient recruitment. Among the 51 articles relevant to DHT, thirty were related to home monitoring devices, fifteen were related to telehealth, eight were related to data sharing, three were related to delivery of investigational products, and one was related to patient recruitment.

Conclusion: Our review demonstrates that many research studies are utilizing DCT methods. These methods improve logistics of conducting clinical trials, data collection workflows by implementing technologies to recruit and retain subjects and capture data in real-world settings. Barriers to DCTs include variations in global legal and regulatory requirements, limited biomarkers and sensors, technology platform to support the DCT model, and lack of data demonstrating cost-effectiveness. Therefore, further research is needed to evaluate the value of DCT and the impact it has had on clinical trial outcomes.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Administrative & Regulatory Science
Status: Postdoctoral Fellow

Abstract 5

Comparing the Usability of Pharmaceutical Company Medical Information Websites for Health Care Providers using Click Analytics

Patrick McCurry, Carolyn Seyss

Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy
Pfizer Inc. Global Medical Information

Expanding technological capabilities allow healthcare providers to receive medical information in a myriad of ways. This underscores the importance of the usability of pharmaceutical industry Medical Information websites for healthcare providers to find accurate, balanced, information. Click analytics is a common method employed to evaluate the usability of websites. The objective of this study was to compare the usability of pharmaceutical company Medical Information websites utilizing click analytics. From July 27 – August 29, 2021, a list of 31 pharmaceutical and biotechnology member organizations affiliated with Pharma Collaboration for Transparent Medical Information (PhactMI) was compiled for evaluation in this study. Sites were accessed as healthcare providers, and usability was assessed by counting the number of clicks from the homepage to reach the following resources: chatbot, congress materials, scientific response documents (SRDs), prescribing information, inquiry submission, medical science liaison/sales contact, samples, product information resources, and investigator sponsored enrollment. Clicks were counted from the homepage for each resource and one attempt was made per resource. A maximum number of “3” clicks was allotted to assess high usability and if a resource was directly on the homepage a score of “1” click was assigned. If greater than “3” clicks were required a score of “4” was assigned. The total sum of clicks for each website resource was calculated to assign a composite Usability Score (US). High, medium, and low usability scores were 10-16, 17-23, and 24-29 respectively. 30 Medical Information websites were accessed as healthcare providers. Mean usability score across all companies was 20.1. 12 of 30 (40%), and 10 of 30 (30%) accessed medical information websites scored in the medium and low range regarding usability score, accounting for 70% of Medical Information websites. Demonstrating further an opportunity for pharmaceutical companies to increase ease of use of their corresponding sites.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Administrative & Regulatory Science
Status: Postdoctoral Fellow

Abstract 6

Assessing Diversity in a PharmD Postgraduate Program: Rutgers Pharmaceutical Industry Fellowship (RPIF) with Pfizer

Domenick Francis, Farah Pragga, Juan Razo, Lisa Tarasenko, Carolyn Seyss

Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway, NJ
Pfizer Inc.

The word diversity represents differences in experience across a variety of sociodemographic factors including but not limited to race/ethnicity, gender, and education. Equity is a core value at Pfizer and Rutgers is committed to advancing DEI. The objective of this study was to quantify and assess DEI within the Rutgers Pharmaceutical Industry Fellowship (RPIF) Program with Pfizer.

This was an IRB-approved survey assessing DEI within the previous and current Rutgers-Pfizer post-doctoral PharmD fellow cohort. The survey consisted of 11 questions aimed at assessing these different elements of DEI. A list of Rutgers-Pfizer fellows from 2005 to 2021 was compiled from Fellowship Program records. A total of 70 past and present fellows were identified to participate.
Utilizing the U.S. Department of Health and Human Services' (DHHS) Sex, Race, and Ethnic Diversity of U.S. Health Occupations (2011-2015) survey, the results were compared to the national pharmacist workforce as a benchmark figure for the assessment of diversity.

In comparison to the U.S. DHHS survey data, this Fellowship cohort had a higher percentage of individuals of Hispanic/Latino, Black, Asian, and other race/ethnicity. While sex and gender identity are not synonymous, this Fellowship cohort had a greater percentage of women than the national pharmacist average.

Program: Institute for Pharmaceutical Industry Fellowship

Category: Administrative & Regulatory Science
Status: Postdoctoral Fellow

Abstract 7

Alzheimer's Disease: Disease Modifying Therapies Perception and Awareness Survey in Ernest Mario School of Pharmacy Experiential Pharmacy Preceptors and Postdoctoral Fellows

Dmitri Aldershoff, Seiwon An, Michael Toscani, Donna Feudo

Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Institute for Pharmaceutical Industry Fellowships, Piscataway, NJ

Alzheimer's Disease (AD) is the most common cause of dementia, with a majority of patients being diagnosed after the age of 65. Aducanamab (Aduhelm®), an anti-amyloid targeted immunoglobulin therapy, was recently approved by the FDA for the treatment of AD, specifically in patients with mild cognitive impairment or mild dementia. Currently, there is no information/data stating the overall awareness/perception that clinicians, more specifically pharmacists, have to this newly approved AD disease modifying therapy (DMT). This study used a 13-item survey to assess the overall awareness/perception of AD DMTs in Ernest Mario School of Pharmacy (EMSOP) experiential pharmacy preceptors and postdoctoral fellows. Subjects were asked to describe their level of familiarity with AD and aducanamab prescribing information, as well as, describe whether there is a need for further education on aducanamab for pharmacists and other medical professionals. There were 61 subjects who completed the survey. Subjects were moderately familiar with AD prevalence, signs/symptoms, potential causes and current symptomatic treatments; however, a majority were not familiar with ongoing clinical trials for AD DMTs and the prescribing information for aducanamab. Also, a majority of the subjects agreed that further education is needed on aducanamab for pharmacists and other medical professionals. Based on these findings, further education surrounding AD and DMTs are needed within the healthcare landscape. Pharmacists will have a major impact when it comes to preparing, administering, and monitoring patients who are prescribed AD DMTs and it is vital that they have the necessary education and training to keep patients safe. Long J and Holtzman D, Alzheimer Disease: An Update on Pathobiology and Treatment Strategies Volume 179, Issue 2, 3 October 2019, Pages 312-339.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Administrative & Regulatory Science
Status: Postdoctoral Fellow

Abstract 8

Multidisciplinary Approach in Automated Dispensing System Inventory Optimization for Improved Efficiency in Medication Dispensing

Nabihah Amatullah, Amar Saini, Deborah Booth, Rakesh Babu, Nicole Rudawsky

Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway, NJ
Atlantic Health System, Morristown, New Jersey

Purpose: Automated dispensing cabinets (ADCs) improve security, utilization tracking, and safety. Optimizing ADC inventory can improve efficiency and timely access to medications. This project sought to identify a process to optimize ADC medication inventory for two ADCs on a single adult medicine unit within a tertiary care hospital and to evaluate its impact.

Methods: This was a single-center retrospective study. The optimization process included generation of reports that outlined medication dispense frequency, quantity used, critical lows, and stockouts. A multidisciplinary team consisting of pharmacists, an ADC technician specialist, and nursing representatives clinically evaluated these reports to determine modifications to the ADCs. Optimization was completed on July 31, 2021. The primary outcome of this study was the change in the number of dispenses from the ADCs in the pre-optimization phase (July 1, 2021, to July 31, 2021) versus the post-optimization phase (August 1, 2021 to August 31, 2021). Statistical significance was determined using a Chi-square analysis.

Results: There was an increase in the number of dispenses from the ADCs by 2,424 (+22%) and a reduction in the number of dispenses from the main pharmacy by 2,575 (-26%) ($p<0.001$). Both phases had a similar number of total dispenses.

Conclusion: A multidisciplinary approach to optimizing ADC inventory utilizing data analytics to inform decision-making significantly increased dispenses from the ADCs. Changes in prescribing practice, drug usage, and formularies should continue to be monitored to support further inventory optimization. Future evaluations can seek to expand this project to other units.

Category: Administrative & Regulatory Science
Status: Pharm.D. Student

Abstract 9

Ten Year Retrospective Review and Trend Analysis of FDA Accelerated Approvals

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Robert Wood Johnson Medical School, Piscataway, NJ; Daiichi Sankyo, Regulatory Affairs, Basking Ridge, NJ

Objective: To analyze characteristics of FDA expedited program designations and utilize a trend analysis in relation to accelerated approval pathways over the past 10 years, including timings to approvals and therapeutic categories.

Methods: A retrospective study was conducted by the authors using the FDA's publicly available databases of expedited programs from www.fda.gov. We analyzed 10 years of NDA and BLA data, excluding supplemental applications, from January 1, 2012 to December 31, 2021.

Results: There were 96 original FDA accelerated approvals over the 10 year span. In 2012 (n=6), there were 6 NDA approvals and 0 BLA approvals, while in 2021 (n=18), there were 12 NDA approvals and 6 BLA approvals. The largest reduction in review time of 4.2 months came with orphan drug designation (n=80). Drugs for solid tumors (n=42) and hematologic cancers (n=30) had the most accelerated approvals. Notably, holding an advisory committee meeting (n=14) increased the time to approval by 4.1 months.

Conclusion: Our data indicates that over the past ten years, there has been an increasing number of NDA and BLA accelerated approvals in the United States. Having certain FDA designations is beneficial for manufacturers, as it reduces time to accelerated approval. Of the four designations studied, orphan drug designation may be most beneficial compared to other expedited programs in terms of shortening review times. This finding is interesting considering that it was not created to grant increased FDA interaction or support. In addition, the requirement for an Advisory Committee meeting notably extended the approval period. Of the various therapeutic categories studied, solid malignancies and hematologic malignancies have had the most accelerated approvals. In aggregate, FDA pathways have enabled more treatments to reach the market while expanding the options for patients and prescribers.

Category: Administrative & Regulatory Science
Status: Pharm.D. Student

Abstract 10

Developing and Assessing a Virtual Interprofessional Pharmacy Student Peer-led Curriculum for Pre-Pharmacy College Students

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School of Dental Medicine (SDM), School of Nursing (SN)
Ernest Mario School of Pharmacy (EMSOP)
Summer Health Professions Education Program (SHPEP)

This study evaluated the effectiveness and scholar acceptance and satisfaction of pharmacy student peer-led teaching by pre-pharmacy scholars enrolled in the Summer Health Professions Education Program (SHPEP) at Rutgers University.

The investigators developed the curriculum for the pre-pharmacy track of SHPEP based on their personal experiences as pharmacy students at Rutgers University and informal feedback from the scholars. SHPEP's goal was to assist scholars in their careers by providing a better understanding of the pharmacy profession. The curriculum focused on six peer-led discussions to increase scholar participation, foster interaction amongst peers, and improve critical thinking skills. The surveys were distributed via email using the online Qualtrics platform, as approved by the Rutgers IRB.

Eight pre-pharmacy scholars completed the 6-week SHPEP curriculum and attended all weekly pharmacy workshops. Only five completed the Week 6 survey. Since the responses were anonymous, Week 1 and 6 responses could not be matched; thus, no formal statistical analysis was performed.

Six survey questions were included in both surveys. They showed that scholar knowledge and confidence improved in all areas, particularly with respect to familiarity with the pharmacy profession and the ability to interact with other healthcare professionals. Scholars agreed or strongly agreed with all seven measures of acceptance and satisfaction of the pharmacy TA peer-led workshops.

Peer-led learning was helpful in fostering discussions amongst pre-pharmacy scholars and TAs. Working with a small group of students allowed the TAs to address all questions and conduct personalized meetings with the scholars. Given the benefits and effectiveness of peer-led teaching and the overall satisfaction scholars had with the pharmacy TAs, it may be useful to continue to incorporate pharmacy peer-led learning in future SHPEP sessions. This study may also serve as an example for other interprofessional health programs that have a pharmacy track in planning their curriculums.

Funding: Robert Wood Johnson Foundation

Category: Administrative & Regulatory Science
Status: Pharm.D. Student

Abstract 11

Association between Race/Ethnicity, Primary Health Insurance Coverage and Access to Alcohol Screening and Brief Intervention

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Background: Several demographic factors can impact access to preventive services. In previous studies, it was observed that the uninsured had the most significant difficulty with access to alcohol abuse screening and care. This paper aimed to study the inequalities in access to Alcohol SBI between adults from different racial and ethnic backgrounds across the U.S. in 2019. This study also investigated if variations in personal health insurance coverage could explain these disparities.

Methods: This cross-sectional study used the Behavioral Risk Factor Surveillance System (BRFSS) from 2019. The study population included noninstitutionalized adults aged 18 years or older. The primary outcome measure was access to Alcohol Screening and Brief Intervention, which was evaluated by self –reported exposure to questions on access to alcohol screening and binge drinking (yes/no).

Results: In the 2019 BRFSS sample, 6947 adults met the inclusion criteria for the study population. The overall likelihood of access to Alcohol SBI was significantly high (77.1%). 79% (N = 1,909) of Hispanics and 81.2% (N = 2,195) of individuals covered through employer-based health insurance had access to alcohol screening and brief intervention. ($p < 0.001$). Non-Hispanic Asians were less than half as likely as Whites to be screened (odds ratio [OR] =0.43, 95 % CI: 0.33 -0.57) and those who had no source of primary health insurance coverage were less likely to be screened when compared to those with employer-based health insurance (odds ratio [OR] =0.77, 95 % CI: 0.55 –1.09).

Conclusions: Overall rates of access to Alcohol SBI were high. However, to improve access to Alcohol SBI across different racial/ethnic groups, more attention should be directed towards providing access to Alcohol SBI to Non-Hispanic Asians. Making it mandatory for general practitioners to offer Alcohol SBI for uninsured individuals will ensure equitable distribution of this preventive service to all classes of society irrespective of socioeconomic status.

Program: HOPE Program

Category: Administrative & Regulatory Science
Status: M.S Student

Abstract 12

Mechanisms of Nitroalkene Inhibition of TLR4 Mediated Macrophage Activation

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Fatty acid nitroalkenes such as nitro-oleic acid (OA-NO2) are endogenously formed signaling mediators. They have demonstrated anti-inflammatory properties but have not been extensively studied in the lung. We report that intratracheal administration of OA-NO2 reduces bleomycin-mediated lung injury histopathologically and impacts pulmonary macrophage populations and activation. To examine mechanisms by which OA-NO2 modulates macrophage activation, the effects of OA-NO2 on LPS-activated RAW 267.4 cells were measured. Cells were collected either 6h, for gene expression analysis, or 24h for protein and metabolic analysis following LPS treatment. qPCR showed a direct inhibition of the TLR4 target genes IL-6 and PDGS2 (5151932* vs 19731230.8†; 449150.0* vs 609.9†-fold changes, respectively), without inhibition of TLR4 opposing pathways (NQO1: 41.4 vs 8.43.4-fold change). OA-NO2 inhibited NOS2 expression when compared to LPS (30473.0* vs 148.2†-fold change), suggesting reduced NF-B activity. OA-NO2 significantly reduced LPS-induced increases in NF-B activity in RAW Blue cells, an effect associated with decreased IK- protein levels in OA-NO2 treated cells. This indicated OA-NO2 may directly bind to NF-B, preventing its activation and marking IK- for degradation. To test this hypothesis, an alkyne-containing OA-NO2 derivative was used to identify proteins that are adducted by OA-NO2. After reaction with biotinylated azide, streptavidin was used to capture alkynyl-OA-NO2 adducted proteins. This revealed that OA-NO2 adducts both the p50 and p65 subunits of NF-B, a reaction that does not prevent nuclear translocation, as determined by NF-B subunit detection following nuclear and cytoplasmic fractioning, but does prevents its ability to transcribe downstream targets. This data indicates OA-NO2 inhibits TLR4 mediated pro-inflammatory gene expression responses through direct post-translational modification and inhibition of NF-B. This therapeutic potential of fatty acid nitroalkenes in the treatment of ALI is further supported by oxygen consumption and metabolomic analyses showing that OA-NO2 shifted macrophages from glucose metabolism to fatty acid oxidation.

Program: Joint Graduate Program in Toxicology
Funding: Supported by NIH Grants HL086621, NIH-4T32ES007148-30, and ES005022, Bristol Meyers Squib Graduate Fellowship, the Eagleton Institute of Politics Graduate Fellowship and funds from Rutgers University

Category: Basic Science
Status: Postdoctoral Fellow

Abstract 13

Toxicity of E-cigarette Menthol Flavoring in a Precision Cut Lung Slice Model of Chronic Pulmonary Disease

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The safety of electronic cigarette (e-cig) consumption is unclear without comprehensive toxicological data on e-cig aerosol and flavor effects on the respiratory system, particularly when lung damage or chronic diseases are present. Surfactant protein-D (SP-D) is a pulmonary collectin known to regulate macrophage inflammatory activity; loss of SP-D results in persistent lung inflammation, which progresses to chronic pulmonary disease. Previously, we demonstrated that e-cig condensate with menthol flavoring induces cytotoxicity, oxidative stress and impaired airway responsiveness (AWR) in a precision cut lung slice (PCLS) model from healthy young mice. In the present studies, e-cig and menthol toxicity was investigated in PCLS from young (2-3 mo) and old (6 mo) mice with chronic inflammation caused by loss of SP-D (SP-D-/-). PCLS were exposed for 4 h to 50-500 mM e-cig condensate generated from aerosols of commercially available e-liquids containing vehicle or nicotine+menthol. In PCLS from both young and old mice, nicotine+menthol caused cytotoxicity as measured by increased lactate dehydrogenase (LDH) release, reduced mitochondrial WST-1 metabolism, and blunted AWR and ciliary beating frequency (CBF). Severe bronchial epithelial cytotoxicity and depletion of glutathione (GSH) were also noted. In PCLS from old SP-D-/- mice, LDH release was 4-fold higher than from young SP-D-/- mice after exposure to nicotine+menthol condensate at concentrations > 300 mM, suggesting a greater susceptibility to toxicity in later stages of chronic disease. GSH was depleted in the tissue after exposure to nicotine+menthol condensate; older SP-D-/- mice were more susceptible to GSH depletion than younger SP-D-/- mice, indicating a reduced antioxidative response in the older animals. AWR was significantly impaired after exposure of PCLS from old SP-D-/- mice to 500 mM nicotine and nicotine+menthol. In PCLS from younger SP-D-/- mice, AWR was also reduced, but to a lesser extend by comparison to control. Taken together, these data demonstrate that toxicity responses to e-cig condensate containing menthol flavoring increase with age in chronic inflammatory lung disease. (NIH P30ES005022 and T32ES007148)

Category: Basic Science
Status: Postdoctoral Fellow

Abstract 14

Structure-Activity Relationship Study of Tetrahydroisoquinoline-3-Carboxylic Acid Derivatives as Inhibitors of the PD-1/PD-L1 Immune Checkpoint Pathway

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Cancer immunotherapies, specifically immune checkpoint inhibitors (ICIs), have revolutionized cancer care and demonstrated durable survival benefits in patients across a wide range of solid and hematologic malignancies. While antibodies targeting PD-1 and PD-L1 are widely used in clinical practice, there are currently no FDA-approved small molecule ICIs. Small molecules offer an alternative therapeutic modality to the antibodies with potential for oral administration. Given that ICI monotherapy elicits responses in only 10-59% of patients in clinical trials, there is a strong impetus for the development of highly potent, orally bioavailable, small molecule ICIs suitable for use in combination with other oral anticancer agents. Here, we present our design, synthesis, and structure-activity relationship study of a series of 1,2,3,4-tetrahydroisoquinoline (THIQ)-3-carboxylic acid derivatives. The new inhibitors were generated by cyclizing the benzylamine to the ether linker of the (5-cyanopyridin-3-yl)methoxy moiety of our previously reported inhibitor LH1305. We found that inhibitors with appendages off the 1-position of the THIQ (e.g., LH1388, IC50 = 21.4 nM) resulted in greater inhibitory potency as compared to those with attachment on the nitrogen atom (e.g., LH1352, IC50 = 329 nM). LH1388 is a promising compound for further optimization into potent inhibitors against the PD-1/PD-L1 immune checkpoint pathway.

Program: Pharm.D./Ph.D. Program
Funding: 2020-2021 NJCCR Predoctoral Research Fellowship Award

Category: Basic Science
Status: Ph.D Student

Abstract 15

Acat-1 Inhibition Reduces Inflammatory Response to Bleomycin-mediated Lung Injury

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Acute lung injury (ALI) is characterized by epithelial damage, barrier dysfunction, and pulmonary edema. Macrophage (MΦ) activation and failure to resolve play a role in in ALI, thus MΦ phenotype modulation is a rational target for therapeutic intervention. Large, lipid-laden MΦs have been observed in various injury models, including intratracheal bleomycin (ITB), suggesting that lipid storage may play a role in ALI severity. The mitochondrial enzyme Acat-1 is highly expressed in MΦs where it catalyzes the esterification of cholesterol, leading to intracellular lipid accumulation. We hypothesize that inhibition of Acat-1 will reduce MΦ activation and reduce ITB-mediated lung injury. K-604, a selective inhibitor of Acat-1, was used to reduce lipid accumulation in ITB. Male and female C57BL6/J mice (n=16-21/group) were administered vehicle, K-604, ITB, or ITB +K-604 on d0, vehicle or K-604 on d3, and were sacrificed on d7. ITB caused significant (*p<0.05 v PBS) body weight loss (-13.92±2.05%* v 2.66±0.78%) and an increase in cholesterol accumulation (71.63±11.7 μM* v 15.51±9.1 μM) and size (29.67±10.6 μm* v 11±4.3 μm) of pulmonary MΦs. These changes were mitigated by Acat-1 inhibition, as ITB+K-604 mice had significantly (#p<0.05 v ITB) reduced body weight loss (4.04±1.03%#), cholesterol accumulation (13.79±5.4#), and MΦ diameter (14.0±3.7 μm#), confirming successful inhibition of Acat-1 in the lung. Histological analysis showed that K-604 significantly reduced ITB-induced alveolar wall thickening (2.3±0.05 μm# v 4.35±0.04 μm) and reduced measures of consolidation and cell infiltration. K-604 administration rescued ITB-mediated loss of resident alveolar MΦs (CD45+/Siglec F+/F/480+, CD11c+, CD11b-) (72.00±5.67%# v 49.58±8.52%) and was found to decrease the % of pro-inflammatory alveolar MΦs (CD45+/Siglec F+/F/480+, Ly6c+, CD206-) (3.86±0.88%# v 8.22±1.76). These data suggest that Acat-1 inhibition alters lipid metabolism within pulmonary macrophages, affecting cell phenotype and function. Thus, Acat-1 may be a target for intervention in ALI.

Program: Joint Graduate Program in Toxicology
Funding: Supported by: NIH HL086621, 4T32ES007148-30, Bristol Myers Squibb, and funds from Rutgers University

Category: Basic Science
Status: Ph.D. Student

Abstract 16

Insulin Regulation of SUMOylation, Expression, and Transport Activity of Organic Anion Transporter 1

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Background: Organic anion transporter 1 (OAT1) expressed in the kidney proximal tubule cells plays an essential role in the elimination of numerous anionic drugs commonly used in clinic. Post-translational modifications of OAT1 were reported to modulate its transport function, protein expression, and stability. The purpose of this study is to explore the regulatory effects of insulin and its downstream signaling pathway on the post-translational modification of OAT1 by SUMOylation, OAT1 expression, and transport activity.

Results: Insulin treatment increased OAT1 uptake activity in a dose-dependent manner, with 15 to 40% of increase after 10 nM to 1 μM of insulin treatment. The stimulation from insulin was reversed by PKB-specific inhibitor, afuresertib. Furthermore, the increase of OAT1 transport function was accompanied by increases in cell surface expression (~35%) and SUMOylation (~50%) of the transporter. Afuresertib was able to reverse both the increases in OAT1 surface expression and SUMOylation, suggesting PKB specificity of the regulation.

Conclusions: The results demonstrated that insulin modulates the SUMOylation, protein expression, and transport activity of OAT1 through PKB signaling pathway. Low insulin level and low OAT expression and function were observed in diabetic rats, which would affect OAT-mediated drug elimination. Our study provided insights into the mechanism underlying insulin-regulated OAT activity in vivo.

Program: Graduate Program in Pharmaceutical Science

Category: Basic Science
Status: Ph.D. Student

Abstract 17

Analysis of muscle promoter activity in AAV vectors

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Gene therapy is a promising strategy for treating a large variety of diseases. An important consideration in the eventual application of many of the gene therapies in patients is restricting expression to particular cells and tissues involved in disease pathogenesis. Tissue specific (or selective) expression would likely reduce off-target or side effects, minimize immunological attack of transduced cells and might enable use of lower doses/titer of the therapeutic vectors, among other advantages. In this study, we focused on identify strong muscle-specific promoters for the Adeno-associated Virus (AAV) based gene therapy vector to drive transgene expression in muscle cells and tissues. Based on previous published muscle specific promoters and using regulatory elements from genes, which are expressed at high levels in the muscle, 6 muscle-specific promotors and regulatory element combinations (Pmus1-6) have been designed and cloned into the AAV9 vectors which express reporter gene luciferase. In vitro assay showed that all Pmus vectors have moderate to strong expression in differentiated C2C12 muscle cells but little to no expression in HEK293T cells. Among all 6 muscle-specific expression vectors, Pmus6 has the highest expression level in differentiated C2C12 cells. AAV vectors have a packaging capacity of 4.7 kb. To maximize the gene of interest size in the AAV vector, we deleted 3 regulatory sequences in Pmus6 and tested the change of gene expression levels in C2C12 cells. We found that by removing one element in the Pmus6 vector, the gene expression level is enhanced compared to the original vector. The vectors we designed here could be used as a platform for developing gene therapy approaches for neuromuscular diseases in which different expression levels are needed in muscle cells and tissues.

Program: Graduate Program in Pharmaceutical Science

Category: Basic Science
Status: Ph.D. Student

Abstract 18

HDAC inhibitor SAHA regulates metabolic rewiring and DNA methylomic reprogramming in inflammation-induced normal human lung epithelial cells

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Suberoylanilide hydroxamic acid (SAHA) is a HDAC inhibitor that possesses anti-cancer effects via different epigenetic and non-epigenetic mechanisms. However, the role of SAHA in metabolic rewiring and epigenomic reprogramming to inhibit pro-tumorigenic cascades in lung cancer remains unknown. In this study, we aimed to investigate the regulation of mitochondrial metabolism, DNA methylomic reprogramming and transcriptomic gene expression by SAHA in LPS-induced inflammatory model of normal human lung epithelial BEAS-2B cells. LC-MS study was conducted for metabolomic study while next-generation sequencing (NGS) technology was utilized to study epigenomic CpG methylation and transcriptomic gene expression. We also examined the effect of SAHA on NRF2 signaling in HepG2-C8 and BEAS-2B cells. Our results show, SAHA significantly increased the NRF2-ARE-luciferase activity and enhanced expression of NRF2 target gene NQO1. The metabolomic study revealed SAHA treatment significantly regulated methionine, glutathione and nicotinamide metabolism with alteration of the metabolic levels of methionine, S-adenosylmethionine (SAM), S-adenosylhomocysteine (SAH), glutathione (GSH), nicotinamide, 1-methylnicotinamide, and NAD in BEAS-2B cells. Epigenomic CpG methyl-seq showed SAHA revoked a list of differentially methylated regions (DMRs) in the promoter region such as HDAC11 and ZNF232 genes. Transcriptomic RNA-seq revealed SAHA abrogated LPS-induced differentially expressed genes (DEGs) of proinflammatory cytokines such as IL-1α, IL-1β, IL-2, IL-6, IL-24, and IL-32. Integrative analysis of DNA methylome-RNA transcriptome revealed a list of genes, of which CpG methylation correlated with changes in gene expression. Taken together, SAHA drives rewiring of metabolism, epigenetic CpG methylation and transcriptomic as well as regulates NRF2 signaling potentially contributing to the overall anti-cancer effect.

Program: Graduate Program in Pharmaceutical Science

Category: Basic Science
Status: Ph.D. Student

Abstract 19

Nfe2l2 regulates metabolic rewiring and epigenetic reprogramming in mediating cancer protective effect by Fucoxanthin

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Fucoxanthin (FX) is a carotenoid with many pharmaceutical properties due to its antioxidant/anti-inflammatory and epigenetic effects. NFE2L2 is involved in the defense against oxidative stress/inflammation-mediated diseases, like anticancer effects elicited by phytochemicals including FX. However, the role of FX and NFE2L2 in metabolic rewiring, epigenomic reprogramming, and transcriptomic network in blocking pro-tumorigenic signaling and elicit cancer-protective effects remain unknown. Herein, we utilized multi-omics approaches to evaluate the role of NFE2L2 and the impact of FX on tumor promoter TPA-induced skin cell transformation. FX blocked TPA-induced ROS and oxidized GSSG/reduced GSH in Nfe2l2 wild-type (WT) but not Nfe2l2-Knockdown (KD) cells. Both Nfe2l2 KD and TPA altered cellular metabolisms and metabolites which are tightly coupled to epigenetic machinery. The suppressive effects of FX on TPA-enhanced SAM/SAH was abrogated by Nfe2l2 KD indicating Nfe2l2 plays a critical role in FX-mediated metabolic rewiring and its potential consequences on epigenetic reprogramming. Epigenomic CpG methyl-seq revealed FX attenuated TPA-induced differentially methylated regions (DMRs) of Uhrf1 and Dnmt1 genes. Transcriptomic RNA-seq showed FX abrogated TPA-induced differentially expressed genes (DEGs) of Nfe2l2-related genes Nqo1, Ho1 and Keap1. Associative analysis of DEGs and DMRs identified the mRNA expression of Uhrf1 and Dnmt1 were correlated with the promoter CpG methylation status. Chromatin immunoprecipitation assay showed FX restored Uhrf1 expression by regulating H3K27Me3 enrichment in the promoter region. In this context, FX/Nfe2l2's redox signaling drives metabolic rewiring causing epigenetic and transcriptomic reprogramming potentially contributing to the protection of TPA-induced JB6 cellular transformation skin cancer model.

Program: Graduate Program in Pharmaceutical Science

Category: Basic Science
Status: Ph.D. Student

Abstract 20

Hydroxytyrosol drives redox rewiring and metabolic reprogramming in cancer cell line

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Hydroxytyrosol is a potent antioxidant and anti-inflammatory component of olive oil. Hydroxytyrosol carries out its anticancer activity by activating molecular signaling pathways, leading to apoptosis and cell cycle arrest in various cancer cell lines. In this study, we investigated redox rewiring and metabolomic reprogramming as potential target pathways for the biological effects of hydroxytyrosol.

Human Beas-2b cell line was treated with different concentrations of hydroxytyrosol for 24 hours. Cytoplasmic level of 116 metabolites was investigated using LC/MS. Level of reactive oxygen species generated was measured by flow cytometry. Cell viability study was performed using MTS assay.

Analysis of metabolites showed that hydroxytyrosol illustrates both anti-oxidant and pro-oxidant effects on metabolites. At low doses, Hydroxytyrosol significantly increased the level of glutathione. However, high dose hydroxytyrosol caused increased amount of oxidized glutathione and increased ratio. Nonetheless, hydroxytyrosol increased pool level of TCA cycle metabolites at high dose. These findings were consistent with ROS levels, where their levels decreased with low dose hydroxytyrosol, and increased with high dose hydroxytyrosol. Cell viability study showed the increased killing effects of hydroxytyrosol in a dose-manner.

Program: Graduate Program in Pharmaceutical Science

Category: Basic Science
Status: Ph.D. Student

Abstract 21

Sulfur Mustard Vapor Alters Epidermal Growth and Differentiation in Gottingen Minipig Skin

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Sulfur mustard (SM; bis (2-chloroethyl) sulfide) is a highly reactive bifunctional alkylating agent known to be a potent skin vesicant. SM can cause inflammation, epidermal erosions, and blistering. We have been investigating mechanisms of skin injury and wound repair in the Göttingen minipig in response to SM. Saturated SM vapor caps were placed on the dorsal flanks of 3-month-old male minipigs. 48hrs post-SM, skin was debrided for 7d with wet-to-wet saline gauze soaks. Animals were sacrificed 9, 14, 28, and 60 days post-SM and full thickness skin biopsies prepared for histology and immunohistochemistry. H&E and trichrome stains were used to determine pathological changes caused by SM. 9d post-SM exposure, a well-formed eschar overlying a hyperplastic neoepidermis was observed, as well as a dermal inflammatory infiltrate. Changes in inter-rete epidermal thickness were transient, increasing from 68 +/- 3 µm to 112 +/- 13 µm by 28d, returning to control levels by 60d. Loricrin, a marker of cornified keratinocytes and terminal differentiation, was constitutively expressed in the stratum corneum of control skin. A 2-fold increase in stratum corneum loricrin was observed 9d to 28d post-SM which returned to control levels by 60d. Proliferating cell nuclear antigen (PCNA), a DNA polymerase co-factor important in DNA replication and repair, was contiguously expressed in cells along the basal layer of control skin. Post-SM, PCNA expression was upregulated in both supra-basal and basal layers which persisted for at least 60d. Epithelial cadherin (E-cad), a transmembrane protein essential for cell-cell adhesion and communication, was expressed throughout the epidermis in control skin. SM transiently decreased E-cad expression 9d to 28d post-SM returning to control levels by 60d. These data suggest that SM alters cell growth, differentiation, and repair following injury. Enhancing the wound healing process may be an effective route for developing SM countermeasures.

Program: Joint Graduate Program in Toxicology, Pharm.D. Honors Research Program, Summer Undergraduate Research Fellowship, Pharm.D./Ph.D. Program
Funding: NIH AR055073, ES020721

Category: Basic Science
Status: Pharm.D/Ph.D Student

Abstract 22

Novel Keap1-Nrf2 Direct Inhibitors Reduce Estrogen-Induced Effects in Estrogen Receptor-Positive Breast Cancer

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Estrogen-mediated signaling promotes cell proliferation and tumor growth in estrogen receptor-positive breast cancers. Estrogen metabolism produces quinone adducts which cause oxidative DNA damage and potential carcinogenicity. Activation of the transcription factor Nrf2 and downstream cytoprotective genes initiates antioxidant responses and detoxifies xenobiotics. Nrf2 activation can be achieved by inhibiting the protein-protein interaction (PPI) between Keap1 and Nrf2, which activates the antioxidant responsive element (ARE) pathway and defends cells against oxidative damage. The purpose of this study was to investigate whether the novel direct inhibitors of Keap1-Nrf2 PPI could reduce estrogen receptor (ER) response in MCF-7, human ER-positive breast cancer cells. MCF-7 cells were treated with 100 pM of estrogen in the presence or absence of 10 μM of Keap1-Nrf2 PPI inhibitors (LH601A, LH1092, LH1093, LH1095 and LH1101). mRNA was extracted after 48-hour treatment and RT-qPCR analysis was performed to compare gene expression levels. The results showed that the mRNA level of PGR (progesterone receptor) was increased by estrogen treatment, and this upregulation was significantly reduced by the Keap1-Nrf2 PPI inhibitors. In addition, estrogen treatment decreased the mRNA levels of Nrf2 target genes, NQO1 (NAD(P)H quinone oxidoreductase 1) and HO-1 (heme oxygenase-1), and the Keap1-Nrf2 PPI inhibitors reversed this effect. The findings suggest that the novel Keap1-Nrf2 PPI inhibitors have an anti-estrogenic effect and antioxidant activity by activating Nrf2. The Keap1-Nrf2 PPI inhibitors may serve as chemopreventive agents in estrogen-stimulated breast cancer.

Program: Summer Undergraduate Research Fellowship
Funding: This research was supported by the National Institutes of Health grant R01 AT007036, ES005022, Busch Biomedical Grant, and the New Jersey Health Foundation.

Category: Basic Science
Status: Pharm.D. Student

Abstract 23

The Potential Role of HEPES in Promoting Carcinogenesis

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N-hydroxyethylpiperazine-N-ethanesulfonate (HEPES) is commonly used as a buffer in research and in the clinic. The use of HEPES is detrimental for in vitro gametogenesis (IVF) success, with studies reporting an increase of cancer incidence in individuals conceived by IVF. We asked whether HEPES plays a role in carcinogenesis and potentially leads to the increase of cancer incidence. Our in vitro studies using a primary culture of epithelial cells, from which all carcinomas originate, demonstrate that HEPES facilitates cell transformation. We have found that HEPES induces cell growth and promotes cell immortalization via synergistic mechanisms with p53 blockade. p53, the most studied tumor suppressor gene, is often mutated in cancer. Therefore, our findings open new avenues in understanding the mechanisms of carcinogenesis and shed new lights on HEPES usages, particularly in IVF.

Program: Pharm.D. Program

Category: Basic Science
Status: Pharm.D. Student

Abstract 24

The Potential Roles of KIF4A and RAD51AP1 in FOXM1-mediated PI3K Inhibitor Resistance in Metastatic Breast Cancer.

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Background: PI3K inhibitor drugs are used to treat a variety of cancers, including breast, gastric, ovarian, prostate, glioblastoma and endometrial cancers. PI3Kα inhibitors target the p110α subunit of PIK3CA. With the exception of a subset of patients with double PIK3CA mutations, the majority of patients treated with PI3Kα inhibitor monotherapy show minimal response. Persistent FOXM1 expression has been found to be a contributor to PI3Kα-specific inhibitor resistance. However, the mechanisms influencing high FOXM1 expression in breast cancer remain to be determined. This study focuses on the co-expression of KIF4A and RAD51AP1 with FOXM1 and their potential influence on FOXM1-mediated PI3Kα inhibitor resistance in metastatic breast cancer.

Methods: 146 patient data samples that underwent mRNA sequencing were compiled from the Metastatic Breast Cancer Project online database. Statistical analysis was performed using Spearman's coefficient to determine the strength of the correlation between various genes and FOXM1 gene expression. The R2 value was used to determine the influential nature of the relationship.

Results: The KIF4A and RAD51AP1 genes had the highest co-expression with the FOXM1 gene, with Spearman's coefficients of 0.856 and 0.814, respectively. The correlation between FOXM1 and KIF4A gene co-expression indicated a R2 value of 0.61. The correlation between FOXM1 and RAD51AP1 gene co-expression indicated a R2 value of 0.73.

Conclusion: The outcomes of this study determined that KIF4A and RAD51AP1 genes had the highest co-expression rates with the FOXM1 gene in metastatic breast cancer data samples. With Spearman's values greater than 0.8, the expression of both genes hold fairly strong positive correlations with FOXM1 gene expression. RAD51AP1 gene expression had a slightly higher positive correlation with FOXM1 gene expression than KIF4A. Further investigation is needed to determine whether KIF4A and RAD51AP1 targeted therapy would improve response rates in PI3Kα inhibitor monotherapy.

Program: Independent Research

Category: Basic Science
Status: Pharm.D. Student

Abstract 25

Role of RUNX2 in the resistance of both BRAF inhibitor and PD-1/PD-L1 antagonists in melanoma

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Melanoma is the deadliest form of skin cancer. The V600E activating mutation of the MAPK pathway effector BRAF occurs in about 45% of cutaneous melanomas. Unfortunately, most patients with melanoma treated with BRAF V600E inhibitors (BRAFi) relapse after initial response. However, the mechanisms of resistance have been always addressed without considering the contribution of the immune tumor microenvironment. Furthermore, melanoma patients, frequently showed resistance to the standard current immunotherapy, based on PD-1/PD-L1 blockade We hypothesize that the links between oncogenic signaling and immune suppression is crucial in fully understanding the overall mechanisms of resistance. The transcription factor RUNX2 might represent one major link. We characterized RUNX2 as a regulator of receptor tyrosine kinases (RTKs) such as EGFR and AXL, both up-regulated during resistance to BRAFi. Furthermore, we also showed that RUNX2 regulates PD-L1, a ligand of the programmed cell death 1 (PD-1) receptor expressed by cytotoxic T cells. Upon ligand/receptor interaction, PD-1 dampens T cell effector functions and promotes immune suppression. Our long-term goal is to help develop new strategies to counteract resistance to both BRAFi and immunotherapy, based on anti-PD-1 blocking antibody.

Category: Basic Science
Status: Pharm.D. Student

Abstract 26

Intratracheal instillation of nitrogen mustard induces damage to the rat small and large intestines

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Bis(2-chloroethyl) methylamine, NM, a sulfur mustard analog, is a potent vesicant and alkylating agent. In rats, exposure to NM leads to inflammation, edema, and formation of ulcerative wounds in the skin, eye, and lung. In these studies, we investigated the effects of intratracheally instilled aerosolized NM in the gastrointestinal tract. Male Wistar rats were anesthetized and exposed to NM (0.125 mg/kg) or PBS control using a Pencentury Microsprayer™. Animals were sacrificed 28 days post-NM, ileum and colon were removed, rinsed with PBS for histological analysis and immunohistochemistry, and the fecal pellet collected for future study. Hematoxylin and eosin staining of NM treated rats had blunted villi in the ileum and thinner muscularis externa in both the ileum and colon. NM caused shortening and fragmentation of orcein stained elastic fibers in the colon submucosa as compared to control animals. Total goblet cell numbers,determined by alcian blue/periodic acid-Schiff stain, were found to be similar in both NM and control animal colons. Interestingly, control animal colon goblet cells were larger and contained more dark blue acidic mucins compared to NM. Expression of mucin-2, a glycoprotein associated with intestinal protection and nutrient facilitation, was upregulated in the villi and lumen of control ileum as compared to NM animals. These data suggest that 28 day exposure to intratracheally instilled NM causes damage to the small intestine, specifically the villi and crypts, as well as colonic goblet cells and the submucosa of both the ileum and colon of rats, impacting normal intestinal function. Future studies will investigate the mechanisms of NM injury, and the use of obeticholic acid, a synthetic bile acid, to mitigate NM induced damage to the intestines 3 and 28 days post exposure. Supported by NIH AR055073.

Program: Pharm.D. Honors Research Program
Funding: NIH AR055073

Category: Basic Science
Status: Pharm.D. Student

Abstract 27

Ozone-induced changes in mouse large and small intestine

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Ozone (O3) is an industrial pollutant known to reduce lung function through inflammation and cell damage. The purpose of this study was to determine the effects of inhaled O3 on gut epithelium. We hypothesize that inhaled O3 induces changes in intestinal homeostasis and mucin production. Transgenic female mice (CD11b-DTR, JAX #006000) were depleted of infiltrating macrophages using 25 µg/kg IP diphtheria toxin (DT) or PBS (control). One hour following injections, animals were exposed to O3 (0.8 ppm, 3 h) or air. Twenty-four hours later, animals received a 2nd dose of DT or PBS and were sacrificed 48 h post-O3 or air exposure. Distal colon and ileum were collected, washed with PBS, and prepared for histology and immunohistochemistry. Due to compromised ileal structure, goblet cell number, E-cadherin, and Muc2 could not be evaluated. Goblet cells were visualized using Alcian blue/periodic acid-Schiff stain which binds to mucins. DT administration increased goblet cell number significantly compared to Air control (p value < 0.02, $n= 12$ colonic crypts per animal). DT/O3 mice possessed significantly more goblet cells than DT/Air (p value < 0.001). Both DT and O3 administration were found to increase levels of acidic mucins. Muc2, an oligomeric glycoprotein secreted by goblet cells that protects the intestinal epithelium, was upregulated in the colon following O3 exposure; DT/ O3 > DT/Air > O3 > Air. E-cadherin, necessary for epithelial cell-cell adhesion, was downregulated in the colon following both O3 and DT exposure; Air > DT/Air > DT/O3 > O3. Taken together, these data suggest that increased goblet cell number and mucus hypersecretion may compensate for compromised intestinal integrity following environmental toxins. Future studies will investigate the effects of O3 on intestinal integrity and microbiome of CD11b-DTR mice versus matched WT C57BL/6J mice. Supported by NIH R25ES020721, NIH AR055073.

Program: Pharm.D. Honors Research Program, Rutgers Honors College, Summer Undergraduate Research Fellowship
Funding: NIH R25ES020721, NIH AR055073

Category: Basic Science
Status: Pharm.D. Student

Abstract 28

Role of RUNX2 and CD155 in Immune Suppression of Hepatocellular Carcinoma

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Hepatocellular carcinoma (HCC) is the third leading cause of cancer-related death worldwide. Despite considerable advances in treatment modalities, the long-term survival of HCC patients remains poor. The underlying mechanisms, responsible for the progression and high recurrence of HCC are weakly elucidated. However, one of the main predictor of outcome in HCC is the antitumor immune response. Towards identifying immune-related factors and mechanisms, controlling HCC progression, we found the expression of Runt-related transcription factor 2 (RUNX2) protein, significantly increased in human HCC specimens. This increase is correlated with low survival of HCC patients. Further, using our HCC animal model, we found that RUNX2 is involved in the inhibition of NK cells tumor recruitment and the promotion of HCC. Importantly, we demonstrated the role of RUNX2 in the upregulation of CD155, a crucial immune regulatory molecule that modulate NK cell tumoricidal functions. We also found that CD155 is highly expressed in human HCC specimens, and similarly as RUNX2, its expression is correlated with the survival outcome of HCC patients. Therefore, our findings showed RUNX2 and CD155 as a new axis in the modulation of NK cells in HCC.

Program: SEBS Undergraduate Student

Category: Basic Science
Status: Undergraduate Student

Abstract 29

Epidemiology of Peripheral T-cell Lymphoma (PTCL) and Anaplastic large cell lymphoma (ALCL) in the EU-27

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Background: Non-Hodgkin lymphoma (NHL) is divided into two main types of lymphomas, B cell or T cell, based on origin. T-NHL makes up a minority (~20%) of newly diagnosed NHL cases. Most NHL cases are seen in adults; however, children and adolescents can also develop NHL. The pediatric epidemiology of specific subtypes of T-NHL, especially rare subtypes such as PTCL and ALCL, are not well established in EU-27.

Objective: The objective of the analysis was to determine gender- and age-specific PTCL and ALCL incidence and prevalence in the pediatric population in the EU-27.

Methods: Data from the United States (US) Surveillance, Epidemiology, and End Results (SEER) 21 Registries, Nov. 2020 (2000-2018) was analyzed using SEER*Stat software (v8.3.9) to calculate the incidence and prevalence of PTCL and ALCL (overall, by gender, and age groups) for 2018. These rates were applied to the age- and gender-specific 2020 EU-27 population projections to estimate the pediatric burden in the EU-27.

Results: The estimated annual overall incidence of PTCL in 2020 for ages <1 year, 01-04 years, 05-09 years, 10-14 years, and 15-19 years were 0, 17, 34, 47 and 35, respectively. 5-year overall prevalence of PTCL in the same age groups were 0, 31, 118, 135, and 253. The estimated annual overall incidence of ALCL in 2020 for ages <1 year, 01-04 years, 05-09 years, 10-14 years, and 15-19 years were 0, 0, 23, 35 and 23, respectively. 5-year overall prevalence of ALCL in the same age groups were 0, 16, 63, 83, and 182.

Conclusion: Pediatric PTCL and ALCL are rare diseases with increasing incidence in older adolescent age groups compared to children. Population-based studies are needed to better characterize pediatric PTCL and ALCL patient population for improving patient care and survival in the EU-27.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Clinical Science
Status: Postdoctoral Fellow

Abstract 30

Representation of Race, Ethnicity, and Gender in Heart Failure: An Analysis of Enrollment Demographics in Clinical Trials

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The objective of the study is to evaluate the representation of race, ethnicity, and gender in heart failure clinical trials. Enrollment demographics from heart failure (HF) clinical trials from 2000 to 2020 were analyzed through a literature review of publicly available data found on clinicaltrials.gov. The primary outcome was enrollment fraction (EF), which is defined as the number of trial enrollees divided by the estimated U.S. heart failure cases in each subgroup expressed as a percentage. We identified 123 randomized, phase III, HF clinical trials that met the inclusion criteria, 24 of them were included in the final analysis due to the inclusion of race, ethnicity, and gender within their baseline characteristics.

The white trial participants had an EF of 1.25% and served as the reference population. A statistically significantly lower representation was observed in African Americans with an EF of 0.22%; $p<0.0001$ and a higher representation in Asian/PI participants with an EF of 1.67%; $p<0.0001$. Hispanic trial participants had an EF of 0.41% which was also significantly lower than the white population ($p<0.0001$). For gender, the EF of males was 0.92% which was statistically significantly higher than females with an EF of 0.70%, $p<0.0001$.

As seen in the results, races of White and Asian/PI are overrepresented, while other races, ethnicities, and the female gender are underrepresented within the clinical trials conducted for this therapeutic area. Consequently, when representation is inadequate, the clinical trial may fail to accurately evaluate the risks and benefits associated with the drug products in real-world clinical practice. In the future, recruiters need to increase representation by improving patients' trust, providing more access to locations, and diversifying the recruitment efforts. In turn, ensuring diversification of each clinical trial will allow for the results to be more robust and a better representation of the true population.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Clinical Science
Status: Postdoctoral Fellow

Abstract 31

The Impact of COVID-19 on Influenza Cases and Vaccination Rates in the United States

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COVID-19 is characterized by its ability to spread quickly through droplets and cause respiratory symptoms. The COVID-19 pandemic has resulted in implementation of public health measures worldwide to mitigate the spread of the virus and has inadvertently impacted the rates of seasonal respiratory viruses, such as influenza. Influenza viruses and COVID-19 are likely to spread simultaneously, and flu vaccination could help prevent or reduce the severity of flu illness. Analyses of data looking at influenza cases as well as vaccination rates have been performed to better understand the broader impact the COVID-19 pandemic has had on flu illness. This review looks at positive influenza cases among all age groups from clinical laboratories on the national level from flu seasons 2015-16 to 2020-21 and influenza vaccination rates in adults ≥18 years from influenza seasons 2010-11 to 2020-21. The data on the influenza positive tests reported to the CDC by clinical laboratories was collected using FluView Interactive which presents influenza surveillance data from the U.S. World Health Organization and the National Respiratory and Enteric Virus Surveillance System (WHO/NREVSS) Collaborating Labs and the US Outpatient Influenza-like Illness Surveillance Network (ILINet). Data from the Behavioral Risk Factor Surveillance System (BRFSS) was used to estimate national influenza vaccination coverage. The percentage of total positive tests at the peak of positive tests reported (regardless of type A or B) are as follows (season (% positive)): 2015-16 (23.65%), 2016-17 (24.73%), 2017-18 (27.37%), 2018-19 (26.24%), 2019-20 (30.26%), and 2020-21 (0.39%). In regard to influenza vaccination rates, the 2019-20 and 2020-21 flu seasons had the highest percentages vaccinated compared to all seasons prior. The implementation of public health measures has likely contributed to these results. Future data should be collected to continue to observe these trends over time and limitations of this review should be taken into consideration.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Clinical Science
Status: Postdoctoral Fellow

Abstract 32

Alleviating Geriatric Inpatients' Medication-Related Iatrogenesis (AGING)

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Tabula Rasa HealthCare, Precision Pharmacotherapy Research & Development Institute;
RWJ Barnabas Health RWJ Somerset, Department of Pharmacy

Background: Pharmacists are uniquely positioned to intervene at transitions of care (TOC). Many models show improvement across many outcomes, but such efforts are often costly and labor intensive. Early identification of high-risk patients would help direct and prioritize limited healthcare resources. The MedWise Risk ScoreTM (MRS) quantifies the cumulative risk of pharmacotherapy regimens and offers insights to reduce risk. Our preliminary study supports an association between MRS and 30-day readmission and led us to hypothesize that the MRS is a valuable tool to identify and counsel high-risk patients at discharge from the acute care setting.

Methods: This multicenter, randomized controlled trial will compare an in-depth medication review and discharge counseling with MRS plus current standard versus standard of care alone. The primary outcome of the study is MRS reduction; secondary outcomes include 30-day readmission. At the time of discharge, the pharmacist will utilize MRS to reduce the overall score and subsequently counsel patients in the treatment group. Patients will be included if they are prescribed at least five medications, live within 20 miles of the facility, have a ≥48 hour admission, are ≥18 years of age, and are discharged home. Patients will follow up at 7 and 30 days for readmission and post-discharge healthcare utilization. Group sample sizes of 500 achieves greater than 80% power to detect a between-group net difference in 30-day readmission of at least 6%.

Discussion: Evaluating the effectiveness of MRS at discharge from the acute care setting will demonstrate the impact of innovative technology solutions to enhance the safe and effective use of medications. We anticipate that pharmacist-provided discharge counseling with the aid of MRS will identify patients at high risk of readmission and lead to a reduction in 30-day readmission. This study would provide critical data to influence high-quality, efficacious TOC programs.

Program: EMSOP Post-Doctoral Associate/ Clinical Pharmacology Fellow

Category: Clinical Science
Status: Postdoctoral Fellow

Abstract 33

Weight gain after integrase inhibitor initiation in people living with HIV: systematic review and meta-analysis

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Background: Integrase strand transfer inhibitors (INSTIs) are a newer class of antiretroviral medications that have become mainstays in antiretroviral therapy (ART) regimens against human immunodeficiency virus (HIV). Weight gain is a common phenomenon after ART initiation, and there is an increasing body of evidence that shows INSTI use results in greater weight gain compared to other ART regimens. There is an abundance of literature demonstrating the relationship between antiretroviral medications and weight gain, but no definitive conclusions on which specific classes or medications are the worst offenders. Furthermore, the existing studies measure weight gain in different ways. Therefore, we sought to aggregate the current data and conduct this meta-analysis to evaluate if there are significant differences in weight gain caused by the currently available ART classes.

Methods: We searched PubMed, Google Scholar, and utilized the “snowball method” to screen relevant literature on INSTI treatment of HIV/AIDS patients, extract the pertinent data on weight gain, and perform a meta-analysis using Comprehensive Meta-Analysis 3.0 (Englewood Cliffs, NJ).

Results: We identified over 122 results in our literature search, with over 60 publications, abstracts, and congress posters. After applying our selection criteria, we included 31 studies in our meta-analysis and found more weight gain with integrase inhibitors compared to other forms of ART; however, the results were dependent upon the weight metric reported in the available studies and will be recorded and presented.

Conclusion: According to our meta-analysis, INSTIs were found to cause higher weight gain than comparator ART regimens. There is heterogeneity in the way weight gain or body composition changes are measured. Standardization and measuring and reports metrics most relevant to risk of metabolic syndrome requires further investigation.

Program: Institute for Pharmaceutical Industry Fellowships

Category: Basic Science II
Status: Postdoctoral Fellow

Abstract 34

Social and demographic determinants of empiric sexually transmitted infection treatment among emergency department patients

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Objective: Gonorrhea and chlamydia are amongst the most common sexually transmitted infections (STI) in in the United States. With increasing numbers of emergency department (ED) visits that include an STI diagnosis, ED physicians play an important role in diagnosing and managing STIs and in improving health care outcomes for both patients and their partners. Studies have also shown that factors such as race, gender, likelihood of follow-up, and socioeconomic status are associated with significant differences in STI treatment in the ED. The layer of race often structures how groups of people face different access to resources, opportunities, and risks, making it a fundamental cause of health disparities. It is important for clinicians to recognize disparities in treatment of STIs and distinguish areas to improve. The primary objective of the study is to evaluate whether race/ethnicity is associated with initiation of empiric antibiotic treatment in patients tested for gonorrhea/chlamydia and discharged from the ED.

Methods: This single-center, retrospective, cohort study has been approved by the IRB. Patients were included if they were ≥18 years old, tested for gonorrhea/chlamydia using a Cobas CT/NG Assay nucleic acid amplification test (NAAT), and discharged from the ED between January 1, 2019 to December 31, 2019. Patients were identified based on a consecutive convenience sample of first episode per patient per this study period. De-identified data collected include demographics, insurance status, known primary care physician, primary diagnosis, documented presenting symptoms, history of previous STI treatment, if available. Specific STI treatment medications administered and gonorrhea/chlamydia test results will also be collected.

Results: Baseline characteristics will be collected and screened for confounding variables for STI treatment. The number and percentage of patients treated and not treated based on race/ethnicity will be recorded and results will be presented. Regression modeling will be used to control for confounding variables.

Conclusions: It is anticipated that this project will identify and characterize patient specific factors that influence STI treatment patterns in the ED in order to recognize disparities in empiric STI treatment and distinguish areas to improve practice and provide more equitable care.

Program: Rutgers/RWJ New Brunswick PGY2 Pharmacy Residency Program

Category: Clinical Science
Status: Pharm.D. Resident

Abstract 35

Patient education on self-administration of insulin via pen: Assessment of nurses' knowledge and performance

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At our institution, insulin is administered by needle and syringe; however, patients may be prescribed insulin pens upon discharge. Adult general floors, at present, do not have formal nurse-led patient education on self-administration of insulin via pen. Therefore, patients being discharged with new prescriptions for insulin pens may not be aware of proper injection technique, which may lead to poor health outcomes. The purpose of this study is to evaluate a nursing education module for providing patient discharge education of insulin injection via pen. This is an interventional pre-post study piloted in one inpatient adult unit. Nursing staff were provided education on this subject through in-service presentation, hands-on demonstration, and distribution of a reference guide. The primary endpoint was change in nurses' knowledge and performance of patient education and technique of insulin self-administration via pen. Change in knowledge was evaluated through pre- and post-assessments, and performance was assessed through a standardized simulated patient education activity. Data from the pre- and post-assessment were collected using Qualtrics® and compared using the Wilcoxon signed-rank test. Performance from the simulation activity was measured with descriptive statistics.
A total of 31 nurses participated in the study. The pre- and post-assessments consisted of five questions assessing nurses' confidence on insulin pen patient education and five questions assessing knowledge. Questions evaluating confidence were measured using a Likert scale, and no statistically significant difference found between the pre- and post-assessments. Multiple-choice formatting was used for the questions evaluating knowledge. A statistically significant improvement was seen in the question regarding insulin pen priming ($p=0.002$) and storage ($p=0.039$). Seventeen of the 31 nurses participated in the simulated patient education activity.
The results of this study will be used to inform best practices in adult education on insulin self-administration via pen, which will be used to implement nursing staff education hospital-wide.

Category: Clinical Science
Status: Pharm.D. Resident

Abstract 36

Evaluation of Management and Outcomes in Patients Treated with Discordant Antibiotics for Cystitis in the Emergency Department

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Increasing antibiotic resistance limits the choice of antibiotic agents available to treat urinary tract infections (UTI's). When treating urinary infections, studies suggest that urinary antibiotic concentrations may be more predictive of clinical cure than serum concentrations. Clinical Laboratory and Standards Institute (CSLI) breakpoints are typically based on serum concentrations not urinary concentrations. Some studies have found that urine antibiotic concentrations were more likely to predict clinical cure compared to serum concentrations when treating urinary infections. The purpose of this study is to measure the incidence of clinical cure among individuals discharged from the emergency department (ED) on antibiotic therapy to which urinary isolates were later found to be resistant. Given that serum antibiotic concentrations may not reflect urinary concentrations the concept of treating drug resistant infections with resistant antimicrobial agents is intriguing. We predict that patients with cystitis who were empirically treated with discordant antibiotic therapy with high urine concentrations may demonstrate acceptable clinical cure rates.

To evaluate rates of clinical cure among patients treated with discordant antibiotic therapy, a list of urine cultures collected in the emergency department from January 1, 2015, to December 31, 2020, was evaluated. Patients with a discharge diagnosis of cystitis treated with antibiotic therapy to which urinary isolates were later found to be resistant (discordant therapy) were included. Patients were stratified into two groups based on the urine concentrations of the antibiotic prescribed at discharged. The primary outcome of clinical cure was defined as resolution of symptoms. Symptom resolution was evaluated via our institutions ED culture follow up program, where patients are contacted if antimicrobial intervention is to be made when culture results populate post ED discharge. In addition to analysis of the primary outcome, the rate of antibiotic therapy modification post culture follow up was also evaluated. Results are in progress.

Category: Clinical Science
Status: Pharm.D Resident

Abstract 37

Trends in prescribing preferences for antidiabetic medications among type 2 diabetes patients with and without chronic kidney disease, 2006-2020

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OBJECTIVES: To evaluate trends in antidiabetic medication initiation patterns among type-2 diabetes mellitus (T2DM) patients with and without chronic kidney disease (CKD).

RESEARCH DESIGN AND METHODS: Retrospective cohort study using Clinical Practice Research Datalink (2006-2020) was conducted to evaluate the overall, first- and second line (after metformin) medication initiation patterns among CKD (N=40,892) and non-CKD (N=238,960) patients with T2DM.

RESULTS: Metformin initiations declined overall but remained the treatment of choice as first-line therapy for both CKD and non-CKD patients. Sodium-glucose co-transporter-2 (SGLT2i) use increased modestly among CKD patients, but this increase was more pronounced among non-CKD patients; by 2020, non-CKD compared to CKD patients were three (28.5% vs 9.4%) and six (46.3% vs 7.9%) times more likely to initiate SGLT2i overall and as second-line therapy, respectively. Glucagon like peptide 1 receptor agonist (GLP-1RA) use was minimal regardless of CKD status (<5%), while both dipeptidyl peptidase-4 inhibitor (DPP4i) and sulfonylurea use remained high among CKD patients. For instance, by 2020 and among CKD patients, DPP4i and sulfonylureas comprised of 28.3% and 20.6% of all initiations, and 57.4% and 30.3% of second-line initiations, respectively.

CONCLUSIONS: SGLT2i use increased among T2DM patients, but this increase was largely driven by non-CKD patients. Future work identifying barriers associated with the uptake of therapies with proven cardiorenal benefits (e.g., SGLT2i, GLP-1RA) among CKD patients is needed.

Program: Pharm.D. Honors Research Program

Category: Clinical Science
Status: Pharm.D. Student

Abstract 38

Evaluation of Drug-Drug Interaction Screening Software for Psychotropic Medications in Hospital Pharmacy

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Penn Medicine Princeton Medical Center, Plainsboro, NJ;
Penn Medicine Princeton House Behavioral Health, Princeton, NJ

Purpose: The goal of this study is to identify the ten most common drug-drug interaction alerts encountered in the electronic medical system at an inpatient psychiatric hospital and characterize the action taken by the prescribers for each alert.

Methods: This IRB-approved retrospective study utilized a data analytics tool, Phrase Health, to quantify the number of alerts for drug-drug interactions that populated within the computerized provider order entry (CPOE) from May 1, 2021 to July 31, 2021. The ten most common drug interaction alerts were identified as the primary endpoint. Action taken in response to each alert was stratified by percentage. A report of all medication orders from the inpatient units of the psychiatric hospital over the same 3-month period was generated to calculate the percentage of alerts across all medication orders and the average number of alerts per patient.

Results: The ten most common alerts in descending order were for lorazepam/olanzapine, SSRIs/serotonergic non-opioid CNS depressants, ibuprofen/SSRIs, serotonergic agents/serotonergic non-opioid CNS depressants, quetiapine/QT-prolonging agents, valproic acid/quetiapine, trazodone/mirtazapine, trazodone/SNRIs, ondansetron/QT-prolonging agents, and lithium/NSAIDs. For these ten alerts, the average rate of discontinuation or removal of the causative medication was 2.4%. During the study period, 25.8% of all medication orders at the psychiatric hospital contained drug interaction alerts. There was an average of 15.87 (range 1-136) alerts per patient.

Conclusion: The CPOE with clinical decision support is a valuable medication safety tool, however, limitations still exist. Among the top ten most common alerts, the low rates of discontinuation or removal of the causative medications indicate that most of the time the alerts were overridden. Given the infrequency of alerts changing the course of therapy, user customizability and an evaluation of the clinical relevance of the alerts identified in this study should be considered to avoid further workflow inefficiencies and "alert fatigue."

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 39

Evaluation of post-discharge oral antibiotic prescriptions at an urban, community hospital

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Inpatient antimicrobial treatments often continue post-discharge for therapy completion with oral agents in the outpatient setting. Extending antimicrobial stewardship efforts to the outpatient setting are necessary to curb the development of multi-drug resistant organisms. Opportunities for improving antibiotic prescribing at discharge includes selection of a highly bioavailable agent at correct dose, frequency, and duration based on indication and patient-specific factors. The purpose was to evaluate appropriateness of discharge oral antibiotics at a community medical center. The electronic health record was queried for adult inpatients prescribed antibiotics at discharge between January 1, 2021 and March 31, 2021. Demographics, labs, cultures, indications, inpatient antibiotics were collected. The primary endpoint was prevalence of appropriate discharge antibiotic prescriptions, defined as correct drug, dose, frequency, and duration of therapy. Appropriateness was based on patient-specific factors, such as diagnosis, culture and sensitivity results, renal function, and hepatic function. Primary literature and institution-specific guidelines were used to determine the ideal duration of therapy for each indication and compared to total duration of inpatient and outpatient antibiotic therapy. Two hundred forty-four discharge antibiotic prescriptions met inclusion criteria and were evaluated. The most common indications were pneumonia, urinary tract infection and skin and soft tissue infection. The primary endpoint of appropriate drug choice, dose, frequency, and duration of therapy was met in 73 (29.9%) antibiotic orders. Of all prescriptions evaluated, 207 (84.8%) had appropriate agent prescribed, 188 (77.0%) had appropriate dose, 201 (82.4%) had appropriate frequency, and 114 (46.7%) had appropriate duration of therapy. Of the inappropriate antibiotic prescriptions (n=171), 114 (66.7%) were due to the duration being too short (n=10) or too long (n=104) compared to ideal duration of therapy. An opportunity exists to implement an antimicrobial stewardship program during transitions of care, as well as increasing prescriber education on patient-specific factors and evidence-based guidelines for antibiotics prescribing.

Program: Doctor of Pharmacy

Category: Clinical Science
Status: Pharm.D. Student

Abstract 40

Efficacy of Non-insulin Therapies for the Inpatient Management of Type II Diabetes in General Medical Patients

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In hospitalized patients, hypoglycemia, hyperglycemia, and blood glucose (BG) variability have been associated with increased mortality. While current inpatient diabetes management guidelines recommend insulin for treatment of hyperglycemia, recent trials have shown reduced rates of hypoglycemia and hyperglycemia and lower mean BG variability for patients managed with non-insulin antihyperglycemics.

This was an IRB approved, retrospective chart review conducted on medical patients with type 2 diabetes, who had 1 or more home antihyperglycemics, and who were admitted to Cooperman Barnabas Medical Center from June 30, 2020-June 30, 2021. The purpose of this study was to evaluate differences in blood glucose variability in those managed solely on insulin versus those who were restarted on at least one of their non-insulin home antihyperglycemics.

The primary outcome was mean BG variability. Secondary outcomes were rates of hypoglycemia and hyperglycemia, length of stay, and total daily dose of insulin. A total of 80 patients were included out of 302 screened, comprising 54 patients in the insulin group and 26 patients in the home medication group. The mean BG was 178 mg/dL in the insulin group and 172 mg/dL in the home group (p=0.661). The mean BG standard deviation was 49.77 in the insulin group and 53.59 in the home group (p=0.444). The average LOS was 7.09 days in the insulin group and 5.65 in the home group (p=0.157). The average rate of hyperglycemia per LOS in days was 1.45 in the insulin group and 1.29 in the home group (p=0.518). The average rate of hypoglycemia per LOS in days was 0.06 in the insulin group and 0.11 in the home group (p=0.258).

This single-center, retrospective chart review supports the conclusions of prior literature and furthers the hypothesis that hospitalized patients with type 2 diabetes managed with non-insulin antihyperglycemics have similar outcomes as those managed with insulin only, although prospective controlled data is needed.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 41

Ethanol Content and the Effect on Blood Alcohol Concentration in Pediatric Medications: A Single Center Observational Study

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Exposure to ethanol is primarily affected by dose volume and patient weight. Consequently, younger patients may be more affected by medications with higher alcohol content. Reporting of ethanol content is also not standardized. The purpose of this study was to evaluate the presence of ethanol in medications dispensed to pediatric patients and determine the subsequent effects on blood alcohol concentration (BAC). A list of products used in the PICU and General Pediatrics units was screened to exclude all non-relevant dosage forms. The remaining medications were evaluated for ethanol content via individual package inserts obtained from the DailyMed database for all packagers of each drug product. Medications found to contain ethanol were then used to calculate BAC in patients weighing 10 kg, 20 kg, and 40 kg, respectively. The primary endpoint was medications with potentially significant effects on BAC in pediatric patients, noted to occur at ethanol exposure ≥15 mg/kg/dose. Out of 796 medications, 329 met inclusion criteria and were reviewed for ethanol content. A total of 33 drug products were found to have at least one formulation containing alcohol. However, 6 of these products did not report the amount of alcohol used in the formulation. Following calculation of ethanol exposure and predicted rise in BAC, it was noted that 7 medications would cause ethanol exposure ≥15 mg/kg/dose for pediatric patients. Overall, most medications dispensed to pediatric patients at this institution were found to be alcohol-free. However, several products still contained alcohol at doses that may potentially cause more harm in younger patients, most of which did not have alcohol-free alternatives. Other products did not report the exact ethanol content at all. Lack of consistency and transparency in the reporting of ethanol content in medications remains an issue that needs to be addressed to allow for better patient safety.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 42

Retrospective Analysis of the Incidence of Liver Function Test Elevations in Subarachnoid Hemorrhage Patients on Nimodipine

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Nimodipine is recommended for vasospasm prophylaxis following aneurysmal subarachnoid hemorrhage (SAH). The package insert reports rare hepatobiliary effects. However, clinical trial safety data is lacking, and patients with SAH routinely receive other potentially hepatotoxic agents. The purpose of this IRB-approved, retrospective cohort study is to quantify the incidence of hepatobiliary effects with nimodipine use to determine a potential clinically-relevant correlation. Adult patients admitted to the intensive care unit, diagnosed with SAH, and administered nimodipine were included. Patients with preexisting hepatic insufficiency and baseline liver function tests (LFT) elevations were excluded. The control group consisted of patients receiving less than two grams of acetaminophen per day for two consecutive days and less than two hepatotoxic medications. Other patients comprised the study group. The primary composite outcome was incidence of LFT elevations defined as elevation of aspartate transaminase (AST), alanine transaminase (ALT), and/or alkaline phosphatase (ALP) greater than three times the upper limit of normal and/or elevation of bilirubin greater than the upper limit of normal. Secondary outcomes included incidence of nimodipine-associated adverse events, degree of LFT elevation, and incidence of vasospasm. Fisher exact tests and t-tests were used with a significance level of 0.05. Out of 109 patients screened, 79 met inclusion criteria. There were no differences in incidence of LFT elevations (4 (36.4%) vs. 19 (27.9%) p=0.72) or peak LFT values for the control (n=11) and study (n=68) groups, respectively. ALT was the most frequently elevated LFT (n= 15). No patients experienced hepatitis, and one study group patient experienced jaundice. Twelve study group patients experienced vasospasm. Nimodipine use alone or with concomitant hepatotoxic agents resulted in similar incidences of LFT elevations, which may be associated with nimodipine use. More studies are needed regarding the incidence of LFT elevations in patients taking nimodipine without concomitant hepatotoxic agents.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 43

Evaluation of Sodium-Glucose Cotransporter-2 (SGLT-2) Inhibitor Prescribing Practices Among Discharged Heart Failure Patients

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Appropriate management of heart failure with a reduced ejection fraction (HFrEF) demands a number of chronic oral medications. SGLT-2 inhibitors are now guideline-recommended for patients with New York Heart Association (NYHA) class II–IV heart failure and an ejection fraction (EF) ≤40%. Landmark trials have confirmed the mortality benefit of dapagliflozin and empagliflozin. Due to the recent nature of these publications, current prescribing patterns are likely sub-optimal.

A retrospective analysis was conducted on patients discharged from Jersey Shore University Medical Center over a four month period from April to July of 2021. Data were collected on the percentage of HFrEF patients in accordance with the Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment. The primary objective was to determine the percentage of eligible patients prescribed SGLT-2 inhibitors at discharge.

Overall, 47 patients were included in this study; Of those indicated for SGLT-2 inhibitor therapy, only 7% of patients were discharged on this medication class. Prescription of other oral GDMT agents also appeared lower than anticipated. The frequency of prescription of RAS agents were 9%, 6%, and 34% for ACEI/ARB/ARNI, respectively. Beta-blockers were the most common oral agent utilized for the management of heart failure, with carvedilol and metoprolol succinate being the most prevalent; 94% of patients were discharged in a beta-blocker and 30% on an MRA. No significant differences were seen amongst comorbidities such as diabetes, obesity, chronic kidney disease, hypertension, and hyperlipidemia.

There is significant room for improvement in adherence to the updated Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment. SGLT-2 inhibitors were markedly underprescribed in this setting currently. With proper utilization of these agents, patients' lives can be improved and healthcare costs can be decreased by reducing the risk of cardiovascular death and hospitalization for heart failure.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Ph.D. Student

Abstract 44

Comparison of 23.4% Sodium Chloride and 3% Sodium Chloride in Rates of Sodium Correction in Cerebral Edema

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Purpose: Hypertonic saline is commonly used as a hyperosmolar agent in patients with cerebral edema to increase serum osmolality and pull fluid out of the brain in order to control cerebral edema and intracranial pressure. Current guidelines do not state specific recommendations on which concentration of hypertonic saline should be used. The purpose of this retrospective study is to compare the effectiveness of 23.4% sodium chloride and 3% sodium chloride in rates of sodium correction in patients with cerebral edema.

Methods: This is a retrospective cohort study comparing patients with cerebral edema who received either 3% or 23.4% sodium chloride. Patients who received either concentration of hypertonic saline since 2016 were collected and reviewed for eligibility. Data collected included sodium, chloride, and serum creatinine levels at the time of administration and 24 hours after. Primary outcomes included percentage of patients achieving goal serum sodium levels (8 mEq higher than the initial level on administration) within 24 hours from the first dose given and time to goal serum sodium levels.

Results: The 23.4% group included 36 patients with a mean age of 58 years while the 3% group included 50 patients with a mean age of 61 years. Only 50% of patients in the 23.4% group achieved goal serum sodium levels compared to 84% in the 3% group. The mean time to goal in the 3% group was 13.7 hours while the 23.4% group had a mean time to goal of 16 hours.

Conclusion: Among patients with cerebral edema, treatment with 3% sodium chloride appeared to be more effective in achieving goal serum sodium levels. Patients in the 3% group also experienced faster rates of sodium correction. Acute kidney injury and death were more commonly seen in patients administered 23.4% sodium chloride.

Program: KNIGHT ScholaRx

Category: Clinical and Translational Science I
Status: Pharm.D. Student

Abstract 45

Comparison of Nimodipine 30 mg Every 2 Hours with Nimodipine 60 mg Every 4 Hours on Neurologic Outcomes

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Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway NJ; Capital Health, Trenton, NJ

Oral nimodipine is recommended by AHA guidelines to be administered to all aneurysmal subarachnoid hemorrhage patients. According to recommendations, standard dosing is oral nimodipine 60 mg every 4 hours for 21 days, but clinically, a variety of nimodipine dosing strategies have been used to treat subarachnoid hemorrhage. The purpose of this study is to identify if there is any neurologic benefit from using nimodipine 30 mg every 2 hours compared to nimodipine 60 mg every 4 hours in patients with aneurysmal subarachnoid hemorrhages. This study was performed as a retrospective chart review. Patients were first identified by creating a list by pulling any patient who received nimodipine since 2015. Then, patient charts were reviewed to identify patients who qualified according to the inclusion and exclusion criteria. A total of 91 patients were identified, 41 in the nimodipine 60 mg only group and 50 in the nimodipine 30 mg group. The primary outcome measure was difference in neurologic outcome at 90 days using the modified Rankin scale. Secondary outcomes included incidence of vasospasm and differences in mortality. After data collection was completed, data analysis was performed. 91 patients were included in the data analysis from both groups. The change in modified Rankin scale score at follow-up was -2.42 for the 30 mg group and -3 for the 60 mg group. Mortality was higher in the 30 mg group (22%) compared to the 60 mg group. Although there were limited patients on record that followed up at 90 days, those with follow up modified Rankin scale were similar between the two dosing groups. This may suggest that empiric dose reductions for nimodipine may not have consequential effects on outcomes, although larger randomized trials are needed to confirm this hypothesis generating conclusion.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: PharmD Student

Abstract 46

Utilization of Proper Medication Reconciliation to Monitor Errors, Improve Transitions of Care, and Enhance Therapeutic Outcomes: A Prospective Study

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Robert Wood Johnson University Hospital Hamilton

Background: The Medication History Technician (MHT) is an established program at RWJ Hamilton, providing thorough medication history reviews in the Emergency Department for patients admitted from 12PM-10:30PM. Although a decrease in transition of care (TOC) errors was observed, errors persisted in patients admitted outside the MHT's service hours. The Knight Scholars (KS) conducted medication reconciliations at admission as well as at each transition of care on patients admitted outside MHTs service hours to reduce and analyze medication errors ("prescribing", "omission", and "documentation"). Analysis of the data collected serves to prove the importance of medication reconciliation as it reduces errors and enhances outcomes.

Objective: To identify, analyze, and eliminate errors that occur due to incomplete medication reconciliation throughout a patient's admission as well as to emphasize the necessity of a dedicated medication reconciliation pharmacy personnel to reduce medication errors.

Method: KS conducted thorough reconciliation at admission and across each transition of care for patients admitted outside of MHT service hours. Reconciliation methods included a combination of patient/caregiver interviews, previous admission/discharge records, and Dr. First (outpatient pharmacy database). Discrepancies revealed were promptly addressed through collaboration with the patient's providers.

Result: The KS conducted 88 successful interviews, of which 34 outpatient medication lists required adjustment to accurately reflect the medication history. Twenty eight of the 88 patients had at least one medication error, totaling 51 medications involved. The most common type of error was prescribing, followed by omission and documenting.

Conclusion: Transitions of care errors are common, preventable errors that can be improved through complete medication reconciliation. MHT services reduce preventable errors at admission, creating higher risk for those admitted outside of MHT service hours as well as transitions which lack MHT evaluation. An around-the-clock pharmacy personnel dedicated to robust transitions of care can help reduce medication errors and enhance therapeutic outcomes.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 47

Impact of an Interdisciplinary Patient Care Model and Routine Screening on Clinical Outcomes in Patients with Hepatitis Cs

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Testing for hepatitis C in hospital emergency departments (ED) and linkage to care to clinics have been reported to provide the most opportunity for screening patients and facilitating continuum of care. Treatment model initiatives have expanded to include telehealth services and open treatment capacity to non-physician providers, such as pharmacists. This study's objective is to assess the impact of implementing routine screening for hepatitis C virus (HCV) and a clinical pharmacist into the interdisciplinary care model on HCV diagnosis and treatment outcomes.

This retrospective cohort study compared outcomes in a pre-intervention (June 2018-June 2019) and post-intervention (June 2020-June 2021) group. Patients were screened and diagnosed with HCV at Jersey City Medical Center and completed linkage to care at JCMC Center for Comprehensive Care. Interventions were the implementation of routine HCV screening in the ED and addition of a clinical pharmacist to the interdisciplinary patient care model. Primary Endpoints analyzed patients who completed treatment for hepatitis C with no reported record of sustained virologic response after 12 weeks of treatment (SVR12) and patients who achieved SVR12. Secondary Endpoints analyzed patients lost to follow up, appointment type, time spent in appointments, and clinical pharmacist specialist interventions. Data was collected as categorical variables and chi-squared tests assessed if there were differences between the two samples.

Data was collected from 46 patients in the pre-intervention group and 37 patients in the post-intervention group. Patients consisted of mostly males. Ages ranged from 27 to 83 years old. Race and ethnicities included Black, White, Asian (e.g. Indian and Vietnamese), and Other (e.g. Egyptian).

This study's results show the positive impact on implementation of routine screening, telehealth services, and an interdisciplinary team approach to HCV diagnosis and management. Given the timeframe, it also shows the potential positive impact on these interventions in the midst of a pandemic.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 48

Pharmacist-led Interventions in the Management of Patients with Type 2 Diabetes: A Literature Review

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Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy

Diabetes is a global health crisis that has been on the rise in the past 20 years. Blood glucose control among diabetic patients can reduce the risk of further complications. Allowing pharmacists to serve as a larger part of the care team can improve medication adherence. Pharmacists can provide diabetes education, optimize patients' medications, recommend non-pharmacological methods, and develop an overall care-plan to manage diabetes. The purpose of this review is to elucidate the various pharmacist-led interventions that can affect the management of diabetic patients in improving patient care.

The objective of this literature review is to analyze the advantages of pharmacists-led interventions in the care of Type 2 diabetic patients resulting in changes in HbA1c and secondary outcomes including medication adherence, fasting blood glucose and other cost savings.

A literature search was performed on PubMed and EBSCOhost with search terms/MeSH terms relating to type 2 diabetes, and pharmacist interventions. Pharmacist-led interventions in both inpatient and outpatient settings were utilized. Articles from the past 10 years and data from prospective/retrospective studies, systematic reviews, and meta-analyses evaluating pharmacists' role in lowering HbA1c as the primary outcomes were used. The secondary outcomes analyzed included effects on medication adherence, fasting blood glucose, and cost savings. We hypothesize patients are expected to have a reduction in HbA1c values with the involvement of pharmacists managing their diabetes.
Pharmacists-led interventions such as education and counseling on topics, including lifestyle changes and medication adherence, have shown to improve management of various disease states. We expect greater reduction in HbA1c to occur with a pharmacist involved in management of patients with Type 2 diabetes. With the help of pharmacists in inpatient and outpatient settings, patients are able to better control their diabetes, which can lead to better future outcomes.

Program: Doctor of Pharmacy

Category: Clinical Science
Status: Pharm.D. Student

Abstract 49

Impact of Antimicrobial Surgical Prophylaxis on Surgical Site Infection-Related Readmission Rates in Patients with Reported Beta-Lactam Allergies

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Purpose: First and second generation cephalosporins are preferred for antimicrobial surgical prophylaxis given their mild adverse effect profile and targeted activity against skin flora and limited gram-negative rods. Cefazolin is relatively safe even in patients with beta-lactam allergies due to its unique R-group side chain and low probability for cross-reactivity. However, in the presence of reported beta-lactam allergies, clinicians often prescribe alternative antibiotics with unnecessarily broad coverage and growing antimicrobial resistance rates. The objective of this study is to observe antimicrobial prescribing patterns among patients with reported beta-lactam allergies and their implication on surgical site infection (SSI)-related readmission rates.

Methods: The institutional review board approved this retrospective cohort study. Participants were identified as receiving either recommended or alternative prophylaxis (as defined by the 2013 American Society of Health-System Pharmacists [ASHP]/Infectious Diseases Society of America [IDSA] clinical practice guidelines for antimicrobial prophylaxis in surgery) for the assessment of effectiveness and safety outcomes.

Results: The primary outcome measured was 30-day SSI-related readmission rate. Secondary outcomes included adverse effects, length of inpatient stay, and cost of antibiotic drug therapy. Of the 70 patients included in the study, 32 (45.7%) received prophylaxis in accordance with guideline recommendations. None of the patients that received recommended therapy were readmitted with an SSI diagnosis within 30 days of discharge. There was a 5.3% (2 out of 38) 30-day SSI-related readmission rate among patients that received an alternative antibiotic regimen. Cefazolin and vancomycin were the two most utilized antibiotics among the recommended prophylaxis group compared to vancomycin and clindamycin in the alternative prophylaxis group.

Conclusion: While a 5.3% difference was observed in the 30-day SSI-related readmission rate, both study groups demonstrated a high utilization of vancomycin. Further evaluation with larger prospective studies is necessary to assess the clinical impact of prophylaxis variance among patients with beta-lactam allergies.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 50

Evaluation of Steroid Prescribing Variability in Patients Hospitalized with COVID-19

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PURPOSE: Coronavirus disease 2019 (COVID-19) is a severe respiratory disease that can lead to inflammatory organ injury and diffuse lung damage. Corticosteroids have potent anti-inflammatory effects that may mitigate the inflammatory response that can lead to multisystem organ dysfunction in patients with COVID-19, and have also been shown to reduce mortality. While corticosteroids display beneficial effects in patients with COVID-19, there has been wide variability in prescribing patterns despite guidelines with specific dosing recommendations. The purpose of this study is to evaluate the impact of prescribing variability of corticosteroids on hospitalized patients with COVID-19 at St. Joseph's University Medical Center (SJUMC).

METHODS: This single-center, retrospective chart review of patients hospitalized with COVID-19 at SJUMC between August 1, 2020 to January 31, 2021 was approved by the IRB. Patients were included if they were ≥18 years old, had a primary diagnosis of COVID-19, and received corticosteroid therapy. Patients were excluded if on corticosteroids prior to admission, died within 24 hours of admission, had a hospital length of stay (LOS) of less than 10 days, or were discharged less than 10 days after corticosteroids were started. The primary outcome was the compliance of corticosteroid ordering with the approved SJUMC COVID-19 steroid guidelines. The SJUMC guidelines allowed for COVID-19 corticosteroid initiation if patients were diagnosed with COVID-19 and oxygen saturation was ≤94% and/or requiring supplemental oxygen. The recommended regimen was dexamethasone 6 mg IV or PO for 10 days. Alternative therapies include methylprednisolone 40 mg IV for 10 days, methylprednisolone 32 mg PO for 10 days, or prednisone 40 mg PO for 10 days. The secondary outcomes included admission to the intensive care unit (ICU), ICU length of stay, use of mechanical ventilation (MV), days until MV initiated, days on MV, hospital LOS, in-hospital 28-day mortality, and the incidence of hyperglycemia, hypertension, and hypokalemia. Descriptive statistics were utilized to analyze the baseline characteristics, primary outcomes and secondary outcomes.

RESULTS: A total of 373 patients were screened. Of these patients, 249 patients were included for analysis. Among those included, 9.64% (n=24) of patients were compliant to guidelines versus 90.36% (n=225) were non-compliant. The compliant versus noncompliant cohort had lower ICU admission rates (12.5% (n=3) vs. 34.2%(n=77)), a shorter ICU length of stay (8.3 days vs. 30.2 days), and overall shorter hospital length of stay (12.13 days vs. 20.43 days), respectively. The compliant versus noncompliant cohort were also less likely to receive mechanical ventilation (8.3% (n=2) vs. 30.2% (n=68)). Of those who were mechanically ventilated, the compliant cohort spent fewer days on mechanical ventilation (n=9 days vs. n=13.7 days, compliant versus noncompliant cohort). However, the mean days until mechanical ventilation was initiated was lower in the noncompliant versus compliant cohort (1.5 days vs. 11.3 days). The compliant cohort versus noncompliant cohort was found to have a lower incidence of hyperglycemia (45.8% vs. 74.7%), hypertension (37.5% vs. 60.4%), hypokalemia (4.2% vs. 13.3%), and overall in-hospital 28-day mortality (4.2% vs. 26.7%).

CONCLUSION: Our findings suggest that patients receiving corticosteroid therapy in accordance with SJUMC guidelines had better outcomes, including less ICU admissions, lower hospital LOS, less in-hospital mortality, and lower incidence of hyperglycemia, hypertension and hypokalemia. Though limited by a small sample size in the compliant cohort, this data supports the dosing strategy used in the RECOVERY trial and recent publications that found that alternative dosing did not improve outcomes in patients. This study also supports the importance of analyzing compliance to established institution guidelines, as deviation from protocol was associated with less than optimal outcomes.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 51

Evaluation of Procalcitonin's Utility to Predict Concomitant Bacterial Pneumonia in Critically Ill COVID-19 Patients

Nandini Patel, Christopher Adams, Luigi Brunetti, Rachel L. Choron

The purpose of this study was to determine the utility of procalcitonin in predicting secondary bacterial pneumonia co-infection in critically ill intensive care unit patients with COVID-19. The study included 144 patients with COVID-19 admitted to a community hospital intensive care unit in New Jersey from March 11, 2020 to February 05, 2021. Patients who met inclusion criteria were 18 years of age or older and had a positive nasopharyngeal swab polymerase chain reaction test for SARS-CoV-19. Patients were excluded if they lacked a procalcitonin level within 72 hours of presenting to the emergency department and/or had a baseline serum creatinine of 1.5 mg/dL or greater. Low procalcitonin was defined as <0.5 ng/mL whereas high procalcitonin was defined as 0.5 ng/mL. The primary outcome was whether those with high procalcitonin had bacterial pneumonia co-infection significantly more than those with low procalcitonin. The sensitivity and specificity of procalcitonin in diagnosing bacterial pneumonia co-infection were determined. Other outcomes included ventilator days, hospital and intensive care unit length of stay, and mortality. Of the 144 patients, 108 (75%) had a low procalcitonin and 36 (25%) had a high procalcitonin. 11 patients (30.6%) developed bacterial pneumonia in the low procalcitonin group versus 34 patients (31.5%) in the high procalcitonin group (p=0.917); this equated to a 24.4% sensitivity and 74.7% specificity of procalcitonin in diagnosing bacterial pneumonia co-infection in COVID-19 patients. There was no difference in mortality among patients with low versus high procalcitonin (49.1% versus 55.6%, p=0.501). There was no difference in mean hospital length of stay (20.1 versus 18.8 days, p=0.801) or intensive care unit length of stay (12.8 versus 12.5 days, p=0.111) in the low versus high procalcitonin groups. The mean number of ventilator days was 12.7 in the low procalcitonin group versus 11.5 in the high procalcitonin group (p=0.478).

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 52

Retrospective Evaluation of Ketamine for the Management of Acute Agitation in the Emergency Department

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Although ketamine has the potential to produce quicker sedation due to its rapid onset of action, it has various adverse effects including blood pressure fluctuation, respiratory depression, and emergence reactions that often limit its use. This study was designed to evaluate the safety and efficacy of ketamine for the management of acute agitation in the emergency department (ED). This study included patients at least 18 years of age who received one or more doses of ketamine for the management of acute agitation in the ED between January 1, 2019 and December 31, 2020. Patients were excluded if they received ketamine for non-psychiatric indications or were pregnant or incarcerated. The primary endpoint was the incidence of adverse effects (blood pressure deviation of 20 mm Hg or more, respiratory secretions, intubation, and emergence reactions) within 3 hours of ketamine administration. The secondary endpoints were time from ketamine administration to restraint removal and the use of other parenteral medications to control acute agitation. Descriptive statistics were used to analyze the primary and secondary endpoints. Out of 107 patients screened, 27 were eligible for inclusion in the study. These 27 patients received a total of 33 doses of ketamine. Nine patients (33.3%) had a blood pressure deviation of at least 20 mm Hg. No patients experienced respiratory secretions, intubation, or emergence reactions. The mean time from ketamine administration to restraint removal was 2.4 hours. Fifteen patients (55.6%) received ketamine as the first agent to manage acute agitation. The remaining 12 patients (44.4%) received ketamine after other parenteral medications failed. Based on these results, ketamine is a safe option for patients presenting to the ED with acute agitation. Additional prospective studies comparing ketamine to the current standard of care are necessary to further evaluate its place in therapy.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 53

Literature Review of Prominent Challenges and Different Perspectives Facing Oncology Clinical Pathways

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Oncology clinical pathways (OCPs) are developed to control rising cancer therapy costs and improve quality of life. OCPs are detailed evidence-based protocols which provide care for specific types and stages of cancer created by various payers and used by providers. Since different payers develop different pathways, it creates variability in treatment for same types of cancer. There are varying perspectives about OCPs, and many limitations associated with pathway development. It is important to address these to ensure optimal health outcomes for patients treated following OCPs.The purpose of this research is to review challenges associated with oncology clinical pathways development, execution, and varying perspectives of OCPs among patients, providers, and healthcare stakeholders.

A literature search was conducted using secondary literature sources, including Pubmed and Google Scholar, to analyze prominent challenges and stakeholder perspectives for the use of OCPs. Out of 6,175 articles reviewed, 260 met the eligibility criteria and overall 12 publications were implemented in research.

OCPs have proven utility in combining scattered information together to lower the cost of oncology therapies. However, there are multifaceted issues on three levels, regarding patients, oncologists, and payers. Current value based care models measure survival as a primary endpoint. However, post-inpatient quality of life should be assessed. There is a clear shortage of published data on OCPs' ability to improve patient outcomes. Overall, the lack of transparency with OCPs must be addressed as provider feedback confirms that the use of care pathways remains mostly undisclosed to patients.

This literature review represented the unmet need facing the implementation of OCPs. Further research is needed to address the cost benefit of OCPs to stakeholders of the healthcare system and the value of clinical pathways on patient outcomes. Overall, there is a need for implementation of patient defined value in the development of OCPs.

Program: AMCP

Category: Clinical Science
Status: Pharm.D. Student

Abstract 54

Impact of Long-acting Injectable Antipsychotics on Clinical Relapse and Hospitalization: A Mirror Image Study

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Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway, NJ; Monmouth Medical Center, Long Branch, New Jersey

Antipsychotic medications are a mainstay of therapy for controlling symptoms of many psychotic disorders. Yet nonadherence to these medications remains a concern for most patients. Nonadherence has been linked to increased hospitalization and poor long-term prognosis. With advances in new formulations, long-acting injectable antipsychotics (LAIs) have emerged as an alternative to oral antipsychotics. This study evaluated the clinical relapse rates of patients on two emergent formulations, aripiprazole lauroxil 2-month (AL) and paliperidone palmitate 3-month (PP3M).

Purpose: Determine if there is a statistically significant difference in the number of psychiatric inpatient admissions, the number of psychiatric emergency room (ER) visits, and bed days after initiation of LAI.

Methods: This study utilized a retrospective observational mirror-image design to determine differences in hospital and ER admissions for patients prescribed LAIs for a period of two years before and two years after initiation of therapy. Adult patients who received at least 6 months of either PP3M or AL during an admission from May 01, 2015-January 31, 2019 were included. The date of initiation of either PP3M or AL served as the mirror point for the study. Paired t-tests were conducted to evaluate for statistically significant changes in hospitalization, emergency room admissions, and bed days.

Outcomes: A total of 50 patients were identified that met eligibility criteria. Among these patients, 4 were eventually lost to follow-up. Excluding these patients from analysis, both the number of inpatient psychiatric admissions (p-value 0.0006, mean decrease 0.76 admissions) and the number of hospital bed days (p-value 0.0032, mean decrease 9.17 bed days) were significantly reduced post-administration of LAI. Psychiatric ER visits demonstrated a non-significant decrease of 0.5 visits (p-value 0.123).

Conclusion: Administration of either PP3M or AL was associated with decreased inpatient healthcare resource utilization and suggests decreased severity or frequency of relapses.

Program: Pharm.D. Honors Research Program, Rutgers Honors College

Category: Clinical Science
Status: Pharm.D. Student

Abstract 55

Improving Anticoagulation Therapy Management in A Federally Qualified Health Center

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Background: Deficiencies in endogenous proteins C/S, as well as other coagulopathies, may increase the risk of thrombosis. Due to the low prevalence of protein C/S deficiency, very few treatment trials have been conducted and limited clinical evidence is available for management. Warfarin is a widely used anticoagulant used for a variety of coagulopathic disorders; however, due to its narrow therapeutic index and high interpatient variability, warfarin requires vigilant monitoring and dosage adjustments. Despite adherence to complex warfarin therapy protocols, it is often challenging to maintain the international normalized ratio (INR) within the therapeutic range. Anticoagulation therapy management can be improved through a clinical pharmacist-led intervention, which focuses on optimizing pharmacotherapeutic outcomes, providing appropriate patient counseling, and assessing social determinants of health (SDOH).

Purpose: Existing anticoagulation protocols at Henry J. Austin Health Center (HJAHC) do not provide specific information on anticoagulation management in the context of protein C/S deficiency and other coagulopathic disorders. This project's objective was to assess the clinical outcomes of patients of HJAHC who are receiving warfarin for coagulopathic disorders, revise HJAHC's existing anticoagulation guidelines, and then create a process for pharmacist-led anticoagulation management.

Methodology: The HJAHC quality improvement department created a report of patients who received ≥1 prescription for warfarin or a direct oral anticoagulant (DOAC). A pharmacist filtered the report to isolate those receiving warfarin, worked with Advanced Pharmacy Practice Experience students to evaluate the success of warfarin therapy based on INR and the indication for warfarin, and then determined if they are eligible for safer alternatives such as DOACs delivered in a more structured approach. The Protocol for Responding to and Assessing Patients' Assets, Risks & Experiences (PRAPARE) score was calculated to measure SDOH that patients were impacted by after change in therapy from warfarin to a DOAC.

Program: Doctor of Pharmacy

Category: Clinical Science
Status: Pharm.D. Student

Abstract 56

Initial Sedation Depth in Mechanically Ventilated Patients Admitted to Intensive Care

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Sedatives are used as both premedication to rapid sequence intubation (RSI) and when indicated in mechanically ventilation (MV). While current guidelines recommend light sedation over deep sedation in the critically ill, MV patients in the intensive care unit (ICU), there is limited data on the depth of sedation during ICU transfer and its impact on clinical outcomes. The purpose of this study is to evaluate the depth of sedation in critically ill MV patients admitted to the ICU from the emergency department (ED) and the impact of initial sedation depth on clinical outcomes.
This is an institutional review board-approved, single-center, retrospective study. Patients > 18 years of age requiring endotracheal intubation in the ED who received sedatives prior to ICU transfer at Saint Joseph's University Medical Center between January 1st 2021 and June 30th 2021 were included. The primary outcome was initial sedation depth using the Richmond-Agitation Sedation Scale (RASS) following ICU transfer. Secondary outcomes were mean sedation depth (RASS) during the first 24 hours of ICU admission, ICU length of stay (LOS), hospital LOS, duration of MV, incidence of delirium, and in-hospital mortality.
Of 418 patients assessed,116 patients were included. The mean age was 58± 17.8 years, 61.2% were males, 32.1% were Hispanic, and 35.3% were admitted with a cardiac-related primary diagnosis. The mean initial ICU RASS was -2.56±1.1. Half of patients (53.4%) were deeply sedated with an initial ICU RASS of -5 to -3. The mean 24-hour ICU admission RASS was -2.25±1.7. Deeper initial sedation depth is statistically correlated with a deeper 24 hours mean RASS compared to a lighter sedation depth (-3.04±1.36 vs -1.45±1.07, p = 0.00001). Of the 43.9% of patients who had delirium, the majority were those with an initial RASS of -5 to -3 (53.2% vs 31.8%, p = 0.0279).

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 57

The Safety and Efficacy of Oral Anticoagulation After COVID-19 Hospitalization

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Literature suggests that there is a correlation between hypercoagulability and COVID-19 outcomes. Nonetheless, current guidelines advise against thromboprophylaxis after hospital discharge for patients with COVID-19 in the absence of other indications. Despite these guidelines, some institutions initiate anticoagulation in patients post-discharge in an effort to prevent readmissions due to thromboembolic complications. Currently, it is unclear if patients benefit from anticoagulation post-discharge. The objective of this study is to determine the risk versus benefit of orally anticoagulating patients upon discharge.

This IRB-approved retrospective cohort study included patients with COVID-19 admitted to an academic community hospital. The data set included all patients (n = 3065) who were admitted with COVID-19 from March 2020 to April 2021. ICD-10 codes were extracted using the electronic medical record (EMR) and validated through chart review. Patients were included if they tested positive for COVID-19 and lived within 25 miles of the hospital. Exclusion criteria included a length of stay less than 48 hours and previous anticoagulation. Patients with conditions including artificial heart valves, valvular/non- valvular atrial fibrillation, systemic embolism, and stroke were excluded upon the assumption that they were already on anticoagulation or had a compelling indication unrelated to COVID-19. After inclusion/exclusion criteria were applied, a random sample was selected and additional exclusion criteria were applied during chart review. At this time, patients who expired during their stay, were discharged on warfarin or enoxaparin, or transferred to a different hospital were excluded. Each patient's discharge medication list was reviewed for any anticoagulants and/or antiplatelet agents. The primary outcome was the number of patients readmitted with a major or clinically relevant bleed through 30 days from discharge. The secondary outcome was patients readmitted with a systemic embolism or stroke within 30 days of discharge. All data were summarized using descriptive statistics and the study groups were compared. Chi square test or student t test were used to evaluate binary and continuous outcomes, respectively.

In total, 3065 patients were screened, 1312 of which met initial inclusion and exclusion criteria. A random sample of 500 was selected and the final analytic sample was 414. There were 280 (67.6%) patients over the age of 55 and 232 (56%) that were male. A total of 262 patients received anticoagulation post-discharge and 152 patients did not. A commonly prescribed regimen was apixaban 2.5 mg two times a day; 187/262 (71.4%) patients received this regimen upon discharge. There were no readmissions with bleeds for the patients reviewed. There was 1 (0.2%) patient that was not discharged on anticoagulation and was readmitted for a stroke/systemic embolism while there were zero patients with discharge anticoagulation that were readmitted for a stroke/systemic embolism (p = 0.367). There was no difference in the mean Charlson Comorbidity Index between patients that received anticoagulation on discharge and those that did not (0.99 and 1.26, respectively; p = 0.106). A total of 16 out of 414 patients (3.9%) who were admitted with COVID-19 had an extracranial bleed, 8 (50%) of whom received anticoagulation upon discharge and 8 (50%) did not (p = 0.261).

In conclusion, while there was no harm with anticoagulant post-discharge in individuals with COVID-19, there was no benefit observed. Further research is required to unify the constantly evolving guidelines.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 58

Retrospective Analysis of Heparin Protocol Use at a Community Hospital

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This retrospective chart review evaluated the appropriateness of a heparin protocol utilizing activated partial thromboplastin time (aPTT) monitoring to improve anticoagulation associated clinical outcomes at the community teaching hospital. Primary objectives include mean time to therapeutic aPTT and time to two consecutive aPTT. Secondary objectives include percent who achieve therapeutic aPTT and two consecutive aPTT, appropriate heparin dose adjustments, appropriate conversion to direct oral anticoagulants (DOAC), and anticoagulant-related bleeding events. Data collected from March-May 2021 included patients ≥18 years old with a protocol driven heparin drip (fixed dose heparin infusion protocols were excluded). Documentation included time from order to administration, indications, doses and protocol documentation by providers and nurses, prothrombin time, aPTT, hemoglobin, hematocrit, platelets, patient weight, DOAC, and reported adverse events.136 out of 145 patients were evaluated (nine patients were excluded). Baseline aPTT was measured in 85% of patients. 109 patients (80%) reached therapeutic aPTT (average time: 13.88 hours), and 79 patients (58%) reached two consecutive therapeutic aPTT (average time: 28.07 hours). Appropriate heparin dose adjustments were made in 76% of patients. 50 out of 64 patients had an appropriate conversion to a DOAC. Reported adverse events included hematuria (4), GI bleed (2), hematoma (2), pseudoaneurysm (1), intraparenchymal bleed/hemorrhage (1), hemoccult positive (1), unspecified bleed (1). One patient experienced a hematoma, and was noted to have possible heparin-induced-thrombocytopenia, however, was never confirmed. Based on patient platelet values, 15 patients experienced new onset thrombocytopenia (<150,000 platelets) at the time of heparin administration. Approximately 75% of patients had appropriate heparin dose adjustments. The majority had labs drawn at incorrect times per protocol, highlighting the need for additional education. When adjusting dosing, it is important to begin with the correct weight-based protocol, and follow it based on lab values to achieve therapeutic aPTT, optimize therapeutic goals and reduce anticoagulant-related bleeding events.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 59

Comparison of an institution-specific nutrition screening tool and the mNUTRIC score on outcomes in the critically ill

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Robert Wood Johnson University Hospital – Somerset

Most current nutrition screening tools for hospital use were developed for the general inpatient setting and score all critical care patients as high-risk. The critical care-specific modified NUTRIC (mNUTRIC) score demonstrates that critically ill patients should have individualized goals but is not widely implemented. The purpose of our study is to validate if the mNUTRIC scoring tool is superior to our current hospital nutrition screening tool and would identify critically ill patients who may benefit from early nutritional interventions.

This single center, retrospective, cohort study was approved by the institutional review board and conducted at an academic community hospital between January 1st, 2021 and July 31st, 2021. All patients who were admitted to the critical care service and classified as low-risk on the hospital nutrition screening tool were included. Pregnant patients, patients under 18 years of age, and patients with no arterial blood gas (ABG) levels within 24 hours of admission were excluded. Data such as age, gender, vital signs, lab values, and nutrition orders were extracted from the electronic health record. Acute Physiology and Chronic Health Evaluation (APACHE) II scores and Sequential Organ Failure Assessment (SOFA) scores were calculated for each patient and used to determine mNUTRIC scores. The primary outcome was to evaluate the difference in mortality between mNUTRIC-defined high- and low-risk patients, all of whom were originally classified as low-risk by the hospital screening tool. Secondary outcomes included differences in hospital and critical care length of stay (LOS) as well as 30-day readmission rates. Data collected were summarized with descriptive statistics. A sensitivity and specificity analysis will be conducted for the mNUTRIC score. Outcomes will be compared using t test for continuous variables with mean differences (MD) and Chi-squared test for categorical variables with odds ratios (OR). Data are expressed as 95% confidence intervals (CI).

A total of 109 patients was included in this study. Of these 109 hospital-screened low-risk patients, 25 (22.9%) patients had a high-risk mNUTRIC score. The average mNUTRIC score was 3.23 ± 1.7. Between the low- and high-risk mNUTRIC score groups, there was a significant difference in mortality [3.035, (1.075 to 8.45), $p = 0.036$] and hospital LOS [5.297, (1.532 to 9.062), $p = 0.006$], However, there was no difference in critical care LOS [3.2, (-3.758 to 10.158), $p = 0.36$] or 30-day readmission rates [1.292, (0.2582 to 5.173), $p = 0.706$]. The sensitivity and specificity for the mNUTRIC score as a predictor for mortality was 40.9% and 81.6% respectively.

Almost one-quarter of patients were misclassified by the hospital nutrition screening tool as low-risk even though they had high-risk mNUTRIC scores. Better nutrition screening tools are needed in the critical care setting to identify patients at high risk of malnutrition.

Program: KNIGHT ScholaRx

Category: Clinical Science
Status: Pharm.D. Student

Abstract 60

Evaluating Statin Treatment in Hispanic/Latino populations at a Federally Qualified Health Center

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Hispanic/Latinos are at a higher risk to experience social determinants of health care and are less likely to be screened for, treated for, and achieve control of dyslipidemia compared to non-Hispanic whites in the US. Dyslipidemia is characterized by an imbalance of cholesterol which puts patients at a higher risk for developing cardiovascular events such as heart attacks and strokes. At Henry J Austin (HJA) Health Center, patients who qualify for statins, a lipid lowering drug, were screened for in the "Statin Therapy for the prevention and Treatment of Cardiovascular Disease" Uniform Data Systems (UDS) report. Utilizing data from pharmacists' interventions in 2021, we aim to determine if those who identify as Hispanic/Latino or Spanish speaking receive disproportionately low rates of statin therapy from their primary care provider (PCP).
The UDS data report was collected using patient medical data as well as information regarding race, ethnicity, and language. Pharmacists evaluated the UDS data and sent recommendations for statin initiation to qualifying patients. Information regarding the result of the recommendations was also collected and categorized. 113 patients were missing statin therapy, with 41 (36.28%) of the patients being Hispanic/Latino and 32 (28.32%) being Spanish speaking. Recommendations to start a statin were given in 109/113 patients, with 39 (35.78%) being Hispanic/Latino. This was lower than the percentage of Hispanic/Latino patients that HJA serves (47.80%). A higher proportion of statin recommendations were not followed up on by the PCP in Spanish speaking groups vs English speaking (89% vs 56%). This could be due to lack of access to the patient, language barriers or difficulty getting in contact with the patient. Given this finding, it is important to follow up and employ multi-modal approaches to ensure patients who would benefit from statins are given them, especially in Hispanic populations.

Program: Pharm.D./M.D. Program, Henry J Austin Medical Center

Category: Clinical Science
Status: PharmD/MD Student

Abstract 61

Interpatient Variability in Levetiracetam Effect and Exposure

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Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Center of Excellence in Pharmaceutical Translational Research and Education, Piscataway, NJ

Background: Levetiracetam (LEV) is a broad-spectrum antiepileptic drug (AED) used as monotherapy or adjunct to treat a variety of seizures. It is an ideal AED due to its favorable pharmacokinetic and pharmacodynamic profile and lack of interactions with other AEDs.

Methods: This retrospective cohort study was designed to identify covariates that affect LEV clearance and volume of distribution and utilize these data to create a population PK model. Adults (≥ 18 years of age) with seizures who have received LEV after admission and have at least one serum LEV concentration post-admission available were included in the study. Covariates were analyzed using MONOLIX Suite 2020R1 (Lixoft, France).

Results: A total of 162 serum concentrations were collected from 143 patients (77 male). Covariates that were evaluated include age, obesity status defined by BMI ≥30, sex, body weight, height, body mass index (BMI), body surface area (BSA), adjusted body weight (AdjBW), ideal body weight (IBW), lean body weight (LBW), free fat mass, serum creatinine, creatinine clearance (CrCL), serum albumin, AST, ALT, and total bilirubin. BSA was found to be a significant covariate for V/F. The exclusion of BSA as a covariate of V/F increased OFV 5.6. CrCL was a significant covariate of CL/F. The exclusion of CrCL increased the OFV by 18.16 and significantly decreased the RSE% of fixed parameters.

Conclusion: LEV clearance is an effective predictor of therapeutic drug monitoring. CrCL was found to be a significant covariate influencing clearance and BSA was found to have influence over volume of distribution. Further studies are needed to determine the effect of body weight descriptors on LEV clearance and ultimately outcomes.

Program: Pharm.D. Honors Research Program

Category: Translational Science
Status: Pharm.D. Student

Abstract 62

Mitigation of Nitrogen Mustard-Induced Lung Injury, Oxidative Stress, and Inflammation by N-Acetylcysteine

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Nitrogen mustard (NM) is a blistering agent originally developed for use in chemical warfare. It is known to cause severe lung injury that can progress to fibrosis. Currently, there are no approved treatments for mustard-induced lung injuries. NM induces oxidative stress in the lung, which is thought to be key in its pathophysiological actions. N-acetylcysteine (NAC), a precursor to L-cysteine, is an antioxidant that reduces oxidative stress by replenishing glutathione. These studies aimed to elucidate the therapeutic potential of NAC in NM-induced lung injury. Male Wistar rats were exposed intratracheally to NM (0.125 mg/kg) or PBS control. This was followed by daily administration of NAC (150 mg/kg/day, i.p.) or vehicle control beginning 30 min after exposure and continuing for 3 days; rats were euthanized 24 h after the last treatment. NM exposure resulted in increased levels of immunoglobulin M (IgM), protein, and total cells in bronchoalveolar lavage fluid (BAL), indicating lung injury and inflammation. This was associated with increases in expression of markers of oxidative stress including heme oxygenase 1 (HO-1) and YM-1 in the lung as measured by immuno-histochemistry. Gene expression of proinflammatory cytokines including interleukin (IL)-6 and IL-12 were also increased in the lung following NM exposure, along with inflammatory proteins, cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS). Treatment of rats with NAC reduced NM-induced lung injury and oxidative stress. Thus, increases in IgM, cell, and protein levels in BAL were reduced and macrophage expression of HO-1 and YM-1 down-regulated. Additionally, NAC administration reduced NM-induced increases in IL-6, IL-12, COX-2, and iNOS mRNA, indicating blunted inflammation. These findings suggest that NAC treatment is an effective approach to control acute lung injury, oxidative stress and inflammation induced by mustard vesicants.

Program: Joint Graduate Program in Toxicology, Pharm.D. Honors Research Program, Summer Undergraduate Research Fellowship, Aresty Research Program, Pharm.D./Ph.D. Program
Funding: NIH Grants U54AR055073, R01ES004738, and P30ES005022.

Category: Translational Science
Status: Pharm.D. Student

Abstract 63

Critical Role of the NKG2D System in the Control of Breast Cancer Metastasis

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Rutgers Cancer Institute of New Jersey, New Brunswick, New Jersey

Metastatic breast cancer (BC) is still an important clinical need. The life of patients with metastatic BC is highly dependent on the degree of cancer spreading and tumor biology. Although some treatment options are currently available for this advanced cancer, treated-patients often relapse. Therefore, novel therapeutic strategies are urgently needed. Currently immunotherapy, based on immune checkpoint blockades (PD1/PD-L1 or CTL-4) has shown unprecedented success for many cancer types. However, in metastatic BC, the benefit of this kind of therapy has been found very modest. One of the main reasons for immunotherapy failure in BC is the low immunogenicity of BC cells, leading to reduced tumor killing by effector T cells. In contrast, we and others have found that NK cells, the leading innate anti-tumor cells, are very active in eradicating BC cells. However, BC cells often develop key features, allowing them to escape NK cells-immune surveillance and spread to distal organs such as the lung, liver and brain. In order to address the mechanisms of NK cells-tumor immune escape, we have used both human and mouse models of BC metastasis. We have found that the ligands of NKG2D are down regulated in BC cells during the metastatic process. NKG2D is one of leading activator receptors expressed on NK cells, involved in NK cells activation and tumor cytotoxicity. Furthermore, we have demonstrated that IFN-lambda, the newly discovered type III interferon is able to downregulate NKG2D ligands and dump NK cells tumoricidal activity. Therefore, our findings may open new avenues in building more effective therapeutic strategies for BC metastasis.

Program: Pharm.D. Program

Category: Translational Science
Status: Pharm.D. Student

Abstract 64

Transdermal Drug Delivery of Donepezil Hydrochloride Using Iontophoresis

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The use of donepezil hydrochloride is often limited by its significant gastrointestinal side effects when taken orally; however, there is currently no transdermal formulation that is marketed which could minimize the aforementioned side effects. The purpose of this study was to investigate novel devices that utilize iontophoresis, an active transport technique that enhances skin penetration of ionizable drugs, to improve the transdermal permeation of donepezil hydrochloride. Topical gels of different concentrations of donepezil hydrochloride were prepared in hydroxypropyl methylcellulose (HPMC) and applied to human cadaver skin samples (skin bank #LS031621, no. 7, grade B) in vitro using a Franz diffusion cell apparatus. Iontophoretic devices were used to apply a constant current to one of the groups for 7 hours, which was compared to a control group which only utilized passive permeation. Iontophoresis significantly increased the permeation of donepezil hydrochloride through the skin; when using a gel with a concentration of 30 mg/mL, a cumulative amount permeated of 40.1 µg and 555.2 µg were obtained with the control group and 0.3 mA iontophoresis group respectively. The intensity of the current was also related to the permeation of the drug, with a higher intensity of current enhancing permeation more when using a gel of lower concentration, but the opposite being seen at higher concentrations of gel, where a lower current is more favorable to permeation. The results suggest that there is promise in the use of iontophoresis for enhancing the transdermal delivery of donepezil hydrochloride, especially for a high concentration gel with low intensity current.

Program: Pharm.D. Honors Research Program
Funding: Changzhou Huajia Medical Device Ltd.

Category: Translational Science
Status: Pharm.D. Student

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For more information about research opportunities in pharmacy at Rutgers, the following references have been included:

Pharm.D. Honors Research Program
https://pharmacy.rutgers.edu/programs/professional-degree-program-doctor-of-pharmacy-pharmd/pharmd-honors-research-program/

Summer Research Programs
https://surf.rutgers.edu

Post-Graduate Clinical Residency Programs
https://pharmacy.rutgers.edu/programs/post-graduate-professional-programs/residencies/

Institute for Pharmaceutical Industry Fellowships
https://pharmafellows.rutgers.edu/index.php

Graduate Programs
Pharmaceutical Science: https://pharmacy.rutgers.edu/programs/graduate-programs/pharmaceutical-science-home-2/

Joint Graduate Program in Toxicology:
http://jgpt.rutgers.eduMedicinal Chemistry: http://medchem.rutgers.edu/gpmc.shtml

Pharm.D./Ph.D. Program:
https://pharmacy.rutgers.edu/wp-content/uploads/PharmD-Phd-Program-Description.pdf