



# 2019 Summer Research Symposium Abstract Booklet

**Thursday, August 15, 2019**

**Rush Summer Research Scholars Program  
Rush Medical College**



Excellence is just the beginning.

# **Rush Summer Research Scholars Program Abstracts**

## Contents

<b>Title:</b> Raman spectroscopy analysis of Titanium Nitride Films.....	2
Authors: Marquionna Gordon, Spencer Fullam, Markus A. Wimmer PhD .....	2
<b>TITLE:</b> Fine motor coordination outcome measures for efficacy of cyclodextrin treatment in Niemann-Pick Type C1.....	3
Harlem L. Murray, Jessica Joyce <sup>1</sup> , Bichun Ouyang <sup>2</sup> , Yuanqing Liu <sup>2</sup> , Elizabeth Berry-Kravis, MD, PhD <sup>2,3</sup> , Joan A. O’Keefe, PT, PhD <sup>1,2</sup> .....	3
<b>Title:</b> Loss of Measles Immunity in Pediatric Oncology Patients: Risk with the Rise of Under-vaccination .....	4
Francis Osei, Darrius Chambers, Paul Kent, MD .....	4
<b>Title:</b> A Pilot Study of a Lifestyle Intervention on the Metabolic Syndrome .....	5
<b>Presenter:</b> Aliya Rodriguez, RSRSP.....	5
<b>Title:</b> Physician knowledge of undocumented healthcare policy within Rush University Medical Center .....	6
Jose Rodriguez, David Ansell MD, MPH, Padraic Stanley LCSW, Osvaldo Palomares M2 RMC .....	6
<b>Title:</b> Implementation of the Bedside Discharge Rounds .....	7
Aliyah Smith, Christi Brown, Ben Schnieders, Christopher Bruti, MD, MPH .....	7
<b>Title:</b> Quantifying the relationship between adverse childhood experiences and maternal-infant health.....	8
Taylor Sullivan, Victoria Buckman, Gina Lowell, MD, MPH .....	8
<b>Title:</b> Risk factors for circadian rhythm disruption in patients with chronic rhinosinusitis.....	9
<b>Authors:</b> Mariah Tate, Mahboobeh Mahdavinia, MD, PhD .....	9
<b>Title:</b> The Brain-Gut Axis and its Link to Parkinson's Disease .....	10
Aldo Vivero, Aeja Jackson, Ali Keshavarzian, MD and Christopher Forsyth, Ph.D. ....	10
<b>Title:</b> Improving the Quality of Care Through Optimization of Referral Compliance at Franciscan Clinic .....	11
Christopher Washington Susan Mari and Steven Rothschild, MD.....	11

**Title:** Raman spectroscopy analysis of Titanium Nitride Films

**Authors:** Marquionna Gordon, Spencer Fullam, Markus A. Wimmer PhD

**Department:** Orthopedics / Tribology

**Introduction/Background:** Titanium Nitride (TiN) is a hard, inexpensive, biocompatible compound used in material that is useful to make of biomedical device [Kaisar etc.al]<sup>1</sup>. TiN have been used to coat cobalt chromium to reduce inflammation and wear of prosthesis. Studies show that under high temperatures these TiN coat begin to oxidize, and due to processing techniques and defects which can affect the wear of devices [Chen etc.al]<sup>2</sup>. In order to understand the composition and atom interaction of these thin film's devices such as Raman spectroscopy (figure 2) are used to provide a molecular fingerprint of these samples.

**Purpose/Aim:** The purpose of this study is to analyze the composition of titanium nitride thin films utilizing Raman spectroscopy.

**Methods:** Titanium Nitride coated films (figure1) where collected from a company and scanned using Raman spectroscopy. The noise reduction, acquisition time, and accumulations was optimized to obtain a good spectrum. A xylene standard and beam splitter were added to obtain a more accurate spectrum. The laser induced temperature increased was also minimized to avoid oxidation, burning, and potential altered peaks. Spectra's were then analyzed using KnowItAll, a spectroscopy database.

**Results:** Raman spectrums were obtained and labeled. Obtaining the composition and vibrational modes can lead to improving wear.

**Discussion:** Information on titanium nitride thin films is limited and the company is still unsure of the composition of the films. Therefore, Raman shift peak correlations was discovered using data obtained from other samples. These films are not heavily Raman active so the use of a standard is needed but the exposure should be minimized so that the sample do not overshadow the thin film samples.



Figure 1- Thin Film

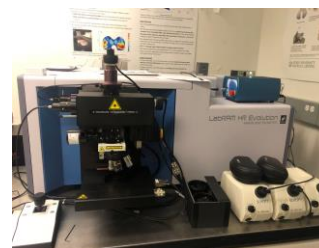


Figure 2- Raman Spectroscopy

---

<sup>1</sup> Kaisar, Nahid, et al. "Surface-Enhanced Raman Scattering Substrates of Flat and Wrinkly Titanium Nitride Thin Films by Sputter Deposition." *Surface and Coatings Technology*, vol. 337, 2018, pp. 434–438., doi:10.1016/j.surfcoat.2018.01.048.

<sup>2</sup> Chen, C. C., et al. "Raman Spectra of Titanium Nitride Thin Films." *Chinese Journal of Physics*, vol. 32, 1 Apr. 1994,

**TITLE:** Fine motor coordination outcome measures for efficacy of cyclodextrin treatment in Niemann-Pick Type C1

Harlem L. Murray, Jessica Joyce<sup>1</sup>, Bichun Ouyang<sup>2</sup>, Yuanqing Liu<sup>2</sup>, Elizabeth Berry-Kravis, MD, PhD<sup>2,3</sup>, Joan A. O’Keefe, PT, PhD<sup>1,2</sup>

1. Departments of Cell & Molecular Medicine, 2. Neurological Sciences, 3. Rush Medical College, 4. Pediatrics, Rush University Medical Center, Chicago, IL.

**BACKGROUND AND AIMS:** Niemann-Pick C (NPC) is a neurodegenerative disorder caused by lysosomal accumulation of cholesterol in brain and peripheral tissues. Cerebellar ataxia, tremor, dystonia, apraxia, and cognitive decline are seen in many NPC patients. 2-Hydroxypropyl- $\beta$ -cyclodextrin (HP- $\beta$ -CD/VTS-270) extends life and dramatically slows disease in NPC animal models.

**METHODS:** Twenty two patients with NPC were treated biweekly with HP- $\beta$ -CD intrathecally and followed up at Rush University Medical Center (RUMC). Eight were in a FDA approved Investigational New Drug protocol and 14 were enrolled in a RCT (VTS301); 8 patients were in the VT-301 treatment arm and 6 were in the sham control arm and after 12 months crossed over into the treatment arm. Disease course for fine motor function, coordination, and manual dexterity was tracked every 2 to 3 months (later changed to every 6 or 12 months depending on proximity to RUMC and/or treatment site) for 24 to 60 months with the 9-hole peg test (9HPT) and Purdue Pegboard test. Potential modification of disease course and longitudinal change of these fine motor measures was analyzed using linear mixed models.

**RESULTS:** Performance on the 9HPT and Purdue Pegboard test did not change from baseline in the dominant hand ( $p=0.77$ ;  $0.32$ ) or the nondominant hand ( $p=0.83$ ;  $0.35$ ).

**CONCLUSIONS:** These results suggest that HP- $\beta$ -CD/VTS-270 is effective in slowing the fine motor deterioration in NPC. Ongoing tracking with these measures will help quantify the chronic impact of HP- $\beta$ -CD on fine motor function in NPC and determine phenotypes that might best benefit from treatment.

**Title:** Loss of Measles Immunity in Pediatric Oncology Patients: Risk with the Rise of Under-vaccination

Francis Osei, Darrius Chambers, Paul Kent, MD  
Department of Pediatric Oncology

## **Background**

In the year 2000, only 86 cases of measles were reported as compared to 3.5 million people in 1963 in the US due to the development of the MMR vaccine. This, in addition to the achievement of herd immunity prompted the CDC to declare that the disease has been eliminated. Almost 2 decades later, the disease has reemerged and causing a lot of social, economic, environmental and political issues.

## **Purpose**

As the number of outbreaks are predicted to increase due to the ever-growing unvaccinated population, our goal is to proactively put measures in place to protect our patients whose immune system has already been compromised by cancer.

## **Methods**

Patients under 21 years of age receiving treatment between January 2015 - June 2017 at RUSH pediatric oncology department were included in this prospective study. Patients had measles antibody titer levels measured using standard techniques used by the institutional core lab. Loss of measles immunity according to titer lab results was defined as below 1.10.

## **Results**

Three (10.3%) out of the twenty-nine patients included in the study had non-protective measles antibodies. Also, a downtrend on titer levels were seen in almost all during treatment.

## **Discussion**

Increased preventative measures must be taken to protect our vulnerable population such as improved infection control practices. It should be a standard practice to verify measles immunity prior to the initiation and throughout the course of treatment since an encounter will be fatal to an individual with compromised immunity.

**Title:** A Pilot Study of a Lifestyle Intervention on the Metabolic Syndrome

**Presenter:** Aliya Rodriguez, RSRSP

**Mentor:** Dr. Rasa Kazlauskaitė

**Department:** Preventive Medicine

**Background:** The metabolic syndrome (MetS) is diagnosed by the co-occurrence of at least 3 of 5 risk factors: abdominal obesity, hypertension, fasting hyperglycemia, hypertriglyceridemia, and low high-density lipoprotein (HDL) cholesterol. Due to MetS being a precursor to serious and costly clinical conditions, our team developed a behavioral program called Eat, Love, Move (ELM) that utilizes a lifestyle approach to induce the remission of MetS. Preliminary testing of the ELM intervention in a proof-of-concept study resulted in achieving  $\geq 50\%$  remission among subjects after 2.5 years.

**Purpose:** The aim of this pilot study was to systematically evaluate the acceptability of two options for control groups.

**Methods:** 41 participants who met  $\geq 3$  MetS criteria were randomized to a 6-month intensive phase of ELM intervention (n=8) or two control groups- Attention Control (n=17) and Enhanced Usual Care (n=16). The Enhanced Usual Care arm received a packet of publically available information on MetS. In addition to the packet of information, the Attention Control arm received 18 in-person general health lectures.

**Results:** ELM intervention had an overall 74% attendance rate, whereas Attention Control only had 53%. Attention Control had an attrition rate of 18%, and ELM Intervention and Enhanced Usual Care had 12% and 13%, respectively. Attention Control had a remission rate of 14%, whereas ELM Intervention and Enhanced Usual Care had 57% and 31%, respectively.

**Discussion:** Enhanced Usual Care is a more credible and acceptable control group than Attention Control, and should be used as a comparison arm in a future efficacy trial.

**Title:** Physician knowledge of undocumented healthcare policy within Rush University Medical Center

Jose Rodriguez, David Ansell MD, MPH, Padraic Stanley LCSW, Osvaldo Palomares M2 RMC  
Background:

Undocumented immigrants face many barriers to healthcare which include lack of insurance options. Although there are many Chicagoland healthcare facilities that provide assistance to this population, access is hindered if staff isn't well trained to serve undocumented patients.

Purpose:

To collect what Rush physicians know about undocumented healthcare policy. This information will be used by the Immigrant Health Working Group to create educational modules to ensure physicians at RUMC are aligned in goals and best practices, enabling them to provide quality care to all patients.

Methods:

Online survey administered to physicians through SurveyMonkey in the following RUMC departments:

- Internal Medicine
- Pediatrics
- Family Medicine
- Emergency Medicine
- Obstetrics and Gynecology

The survey consists of 15 questions where 10 are predictors of undocumented healthcare policy knowledge, and 3 measure confidence in providing and advocating for this population through likert scale.

Results:

The survey received 182 responses from five departments at Rush. One question asked whether a patient needed a social security number for charity care and 38% of physicians responded "I don't know." One asked whether Rush University Medical Center provided primary care at Satellite clinics and 60% responded "I don't know."

Discussion:

We didn't meet the responses we wanted from each department because the number of staff in each department varied. If physicians don't know certain resources undocumented patients have then these patients won't receive the healthcare they need. Physicians are willing to advocate for undocumented patients so that they can give all patients quality care regardless of immigration status.

**Title:** Implementation of the Bedside Discharge Rounds

Aliyah Smith, Christi Brown, Ben Schnieders, Christopher Bruti, MD, MPH  
Department of Internal Medicine

**Introduction/Background:** The discharge process begins the day of admissions, however the discharge plans are finalized during the last days of a patient's stay in the hospital. First, the discharge order must be placed by the physicians. The physicians will then make the "After Visit Summary", found in the electronic medical record for the nurses to do final discharge teaching with patients at bedside. Currently, there is no standardized process of communication between the physicians, nurses, and patients.

**Purpose/aims:** To utilize interprofessional communication and teamwork by an analysis of qualitative and quantitative data from the current discharge process in order to create a standardized discharge communication.

**Methods:** The methods used for the project are separated into two phases; Phase 1 consists of a qualitative assessment (online survey) to view current attitudes about discharge communication, self-reported confidence of discharge understanding, and suggestions for improvement of the current process. Phase 2 is comprised of observations of nurse-patient discharge education and interviewing nursing, physicians, and APPs on the floors. This data is used to develop a standardized interprofessional, patient-centered discharge process. Phase 3 includes piloting the new standardized process and obtaining feedback from physicians, nurses, and patients.

**Results/Outcomes:** The resulting comments from the surveys and interviews consist of majority of the physicians rating the communication of the discharge process average and majority of the nurses rating the communication poor. Further data suggested the nurses feeling out of the loop. In person communication with physician, RN, and patient was suggested but considered difficult to implement without geolocation. This strategy will be implemented for further investigation.



**Title:** Quantifying the relationship between adverse childhood experiences and maternal-infant health

Taylor Sullivan, Victoria Buckman, Gina Lowell, MD, MPH  
Department of Pediatrics, Rush Maternal Child Health Team

**Background** Maternal health outcomes are known to be impacted by social determinants of health, such as socioeconomic, racial, physical and mental factors. Maternal morbidity and mortality are two important outcomes that are examined due to their relationship with these factors. In 2018, the Illinois Department of Public Health found that non-Hispanic black women are about six times more likely to have a pregnancy-related death than non-Hispanic white women. Related risk factors identified included obesity, maternal age and Medicaid insurance. Maternal adverse childhood experience (ACE) scores, quantifications of issues that arise before the age of 18 that contribute to poor physical and emotional health, may have a mediating relationship with adverse maternal and infant health outcomes.

**Purpose** This study aims to identify the correlation between ACE scores and infant health, maternal mental and physical health, and morbidity/mortality outcomes.

**Methods** Electronic medical records of 609 women were reviewed for information on the target health outcomes. Variables collected for analysis included: maternal ACE score, preterm birth, low birth weight, perinatal mood disorders, preeclampsia, and pre-pregnancy BMI.

**Results** Due to time constraints, only 60 records were reviewed. Obstacles that impacted data collection included missing data, inconsistent documentation and variable patient follow-up.

**Discussion** Data collection through chart review proved difficult, with consistent data acquisition for some but not all desired variables. Completing the retrospective review in the face of missing data will provide more insight into the mediating factors of maternal morbidity and mortality.

**Title:** Risk factors for circadian rhythm disruption in patients with chronic rhinosinusitis

**Authors:** Mariah Tate, Mahboobeh Mahdavinia, MD, PhD

<sup>1</sup>Department of Internal Medicine, Allergy/Immunology Division, Rush University Medical Center, Chicago, IL, USA

## ***Background***

Chronic rhinosinusitis (CRS) is an inflammatory condition of the sinonasal mucosa and affects 5-15% percent of the general population. CRS patients have increased sleep disruption. Sleep disruption and sleep cycle disturbance can significantly impact the individual's' health and quality of life. Specifically, disturbance in sleep cycle can result in circadian rhythm disruption and has many side effects including—cognitive impairment, weakened immunity, and impaired metabolism.

## ***Objective***

This study aims to assess risk factors of sleep cycle disturbance and circadian disruption in CRS.

## ***Methods***

Data was collected from CRS patients and healthy controls from Rush University Medical Center allergy clinic via standard surveys. Additional patient information obtained from medical records includes— demographic and comorbidities.

## ***Results***

349 cases including 100 controls and 249 CRS patients were enrolled. CRS patients had lower sleep quality and increased sleep latency compared with healthy controls. The incidence of sleep disruption in African American in CRS patients was higher (88%) compared to whites (72%), Hispanic (72%), and Asians (38%);  $p < 0.05$ . Gender was associated with poor sleep quality (79.8% vs 58% in males and females respectively;  $p < 0.05$ ). Gastroesophageal reflux disease (GERD) was associated with increased sleep disruption. Nasal polyp, asthma, atopy, and smell loss were not significantly associated with sleep quality. Patients with poor sleep had significantly higher SNOT22 scores.

## ***Discussion***

Our results indicate that CRS patients especially male and African Americans are at increased risk for sleep disruption. Screening strategies are needed in at-risk groups to identify and treat the sleep related problem in a timely manner.

**Title:** The Brain-Gut Axis and its Link to Parkinson's Disease

Aldo Vivero, Aeja Jackson, Ali Keshavarzian, MD and Christopher Forsyth, Ph.D.

Department of Internal Medicine: Division of Digestive Diseases Research Lab

**Introduction/Background**

Parkinson's disease (PD) is a neurodegenerative disorder that affects a specific part of the brain called the substantia nigra. PD in the brain is associated with the aging process usually around 60. The major symptoms are motor-related like body tremors. Although not all symptoms are motor-related like gastrointestinal dysfunction. To elaborate on the GI aspect, there is a theory called the Brain-Gut Axis which shows the microbiome communicates with the brain. The lining of the intestines are covered with cells, which help absorb nutrients into the bloodstream and in between them, there is a tight junction which helps prevent the gut leakage. If this junction leaks the person will develop intestinal permeability making toxins to flow through the bloodstream to the brain affecting the substantia nigra leading to PD.

**Purpose/Aim(s)**

Aim 1: Use the genetic mouse model of PD and dextran sodium sulfate treatment to investigate the role of gut leakiness in PD progression.

Aim 2: Establish a role for Notch1 regulation of the Nlrp3 inflammasome activation in microglial cells.

**Methods**

- Use transgenic mice who are predisposed to develop PD
- Split mice off by sex keeping males because the PD gene is sex-linked and use females for breeding
- Check mice every 3 weeks for weigh-ins, DSS cycles, tail snips for PCR
- Run PCR on tail snips for genotyping
- Sacrifice mice
- Collect colon for later use after 15 weeks

**Results**

Gut-derived microbiome products promote dopamine cell death and PD progression

**Discussion**

These findings matter because it is the first analysis into a new field of medicine

**Title:** Improving the Quality of Care Through Optimization of Referral Compliance at Franciscan Clinic

Christopher Washington Susan Mari and Steven Rothschild, MD  
Department of Family Medicine

**Introduction**

Every Tuesday, a small cohort of Rush health students and an attending physician travel to the Franciscan House of Mary and Joseph to hand out medications and provide health care for residents experiencing homelessness. Nonetheless, historical data suggest that when given referrals to see a physician, many of these patients fail to follow through with scheduling their appointments. This project is meant to identify and examine the barriers to obtaining follow-up care through the use of interview data collected at this clinic. The overall goal of this endeavor is to increase the rate of referral compliance.

**Purpose**

Identify and investigate the barriers to obtaining follow-up care amongst homeless patients at Rush's weekly clinic at Franciscan. These barriers will then be addressed by employing the systematic quality improvement approach to propose small scale interventions with the intention of increasing the rate of completed referrals.

**Methods**

Patients Interview data was obtained over a one month period. Participants met the following inclusion criteria: at least 18 years of age, seen by a Rush provider at Franciscan at least once in the past, and able to give an informed consent in English. Questions asked were determined by relevance to whether or not the participant was given a referral, and all responses were audio recorded before eventually being coded into a dataset. Patients given a referral are given a sheet with instructions about the referral process.

**Results**

A total of 9 individuals were successfully interviewed. Most participants self identified as African American (6/9), but there was an even distribution of both gender (M- 5, F- 4) and age group (2 of 18-40, 3 of 40-60, 4 of 60+). Many identified communication complications (4) and transportation (5) as barriers to referral compliance.

**Discussion**

Common reasons why people were not interviewed include: not meeting the inclusion criteria and individuals simply declining to participate. The preceding were major contributors to our inherently low sample size. Interviews will continue until N=30 is reached at least. Based on these preliminary interview results, two interventions were made including improving both the patient instruction sheet and communication between Rush and Franciscan case managers. Additional interventions will be proposed based on subsequent interview data. These interventions will be evaluated by measuring any difference in this past month's referral completion rates.