# Carilion Clinic/ Virginia Tech Carilion
# Research Day

## Poster Session

CARILION CLINIC

# Medicine

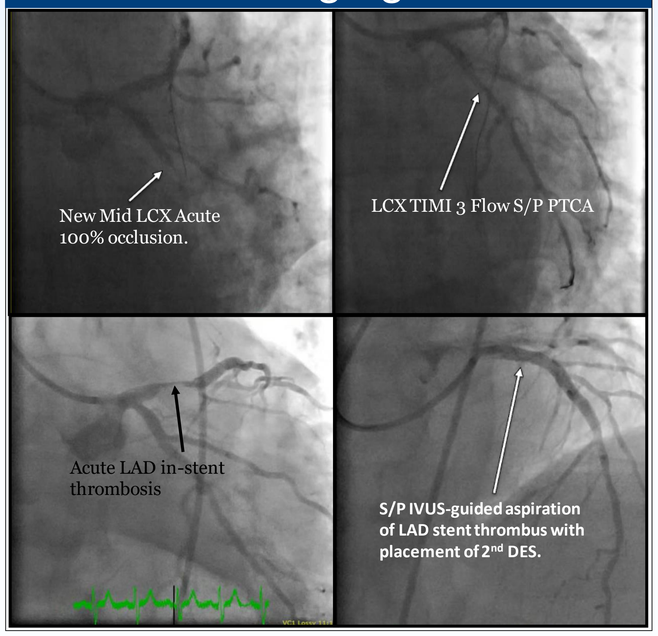
# *Case of Type I and Type III Kounis Syndrome in Patient Undergoing Cardiac Catheterization*

*Pranav Venkataraman, MD, Raj Patel, MD, Mohd Mirza, MD, Chalak Berzingi, MD*

## Background:

Kounis syndrome is defined as acute coronary syndrome caused by allergic or strong immune reaction to a drug or other substance. Mast cell activation and inflammatory cytokine release from the reaction leads to coronary vasospasm or acute thrombotic coronary occlusion. There are three recognized variants of Kounis syndrome. Type I is characterized by allergic coronary vasospasm due to endothelial dysfunction in patients without underlying coronary artery disease or predisposing factors. Type II involves allergic coronary artery spasm or plaque erosion in people with underlying coronary artery disease. Type III occurs in setting of coronary stent thrombosis or restenosis. We present unique case of simultaneous Type I & III Kounis syndromes.

## Imaging:




## Patient Presentation:

67-year-old male with history of hypertension, prediabetes, and prior smoking presented for outpatient left heart catheterization due to exertional angina and positive treadmill stress test. Coronary angiogram showed severe (90%) stenosis of proximal left anterior descending artery (LAD) which was revascularized with drug eluting stent (DES). Circumflex and right coronary arteries were free of severe stenosis. During the intervention, patient complained of generalized pruritus and warm sensation, and developed hypotension and respiratory distress requiring pressors and supplemental oxygen. He also developed generalized macular rash over his chest and arms consistent with an allergic reaction, most likely to contrast dye. He was treated with methylprednisolone, diphenhydramine, and epinephrine with hemodynamic and symptomatic improvement. Patient developed chest pain and further angiography revealed coronary artery spasm causing acute occlusion of the mid left circumflex artery extending into the first obtuse marginal branch. This was treated with nitroglycerin and low-pressure balloon angioplasty with restoration of TIMI 3 flow. There was no plaque or thrombus seen on intravascular ultrasound, suggesting this was most likely vasospasm.

## Further Course:

In the recovery unit, patient developed severe chest pain with ST segment elevations in AVL, V2, and V3 on EKG with reciprocal changes. He also developed hypotension requiring dopamine and phenylephrine infusions. Patient was emergently taken back for cardiac catheterization, and coronary angiography revealed acute thrombosis of the LAD stent. He underwent aspiration thrombectomy and required implantation of short drug eluting stent with restoration of TIMI 3 flow. Post procedure course was uneventful, echocardiogram showed preserved ejection fraction, and patient was discharged on dual antiplatelet therapy on the third hospital day.

## Conclusion:

Prior case reports have shown that anaphylactic/allergic coronary occlusion can occur in any setting, including contrast exposure. This unique case demonstrates simultaneous occurrence of Type I and III Kounis syndromes as life-threatening complications during PCI. Prompt anaphylaxis treatment and high level of suspicion for in-stent thrombosis played crucial role in ensuring successful recovery. Case highlights the importance of interventionalists being vigilant about this condition, which though rare, has potentially fatal consequences.

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# A Cat-Astrophic Infection: A Case of *Pasteurella Multocida* Peritonitis

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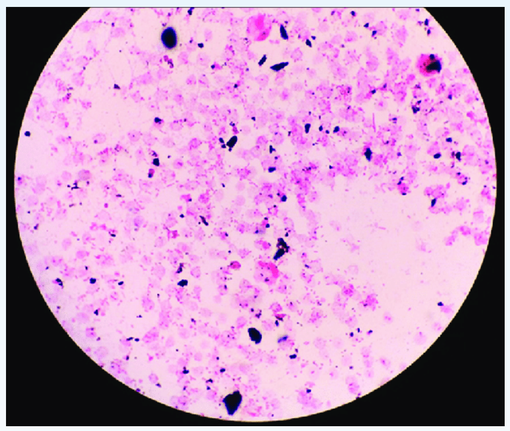
## INTRODUCTION

- The most common complications of peritoneal dialysis (PD) are infections such as peritonitis
- A common source of peritonitis is bacteria such as *Staph* which is found on human skin
- Bacteria contaminate the peritoneal fluid during handling of the PD catheter and its connections
- *Pasteurella Multocida* is a zoonotic pathogen found in the mouth of domestic cats and dogs
- *P Multocida* is a rare cause of PD associated peritonitis

## GRAM STAIN OF P MULTOCIDA



Pasteurella multocida pneumonia in an immunocompetent patient: Case report and systematic review of literature - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Gram-stain-of-Pasteurella-multocida-shown-as-Gram-negative-nonmotile-coccobacilli_fig3_324749056 [accessed 1 Apr, 2021]

## CASE PRESENTATION

- A 32 year old female presented to the hospital with abdominal pain, nausea and vomiting
- She had a history of end stage renal disease on home continuous cycling peritoneal dialysis (CCPD) secondary to polycystic kidney disease
- She was recently treated for PD associated peritonitis however peritoneal fluid cultures were not obtained
- Physical exam revealed a tender abdomen without catheter exit site infection

| Peritoneal Fluid Analysis | |
|---|---|
| Color | Yellow |
| Appearance | Cloudy |
| WBC, fluid | 13650/MM3 |
| Fluid differential | 98% Neutrophils |
| Gram Stain | 1+ Gram Negative Rods |
| Culture Result | 4+ Pasteurella Multocida |

- The patient was diagnosed with *P. Multocida* peritonitis
- She revealed that her cat slept in her bed overnight during her CCPD sessions
- The PD catheter was removed and she transitioned to hemodialysis
- She completed 14 days of Ceftazidime and recovered well

## DISCUSSION

- As *P Multocida* is found in the mouth of domestic cats, the source of this patient's peritonitis was deemed to be her cat
- The cat had access to the CCPD tubing and dialysis bags at nighttime and likely bit them, thereby transmitting the bacteria and contaminating the peritoneal fluid
- *P Multocida* peritonitis is rare and has been occasionally reported in case reports
- This case report suggests that household pets should be kept away from PD supplies at all times in order to reduce infectious transmission
- Clinicians should be aware of the potential communication of this pathogen from domestic cats to PD patients
- Providers should be comfortable counseling patients on how to minimize the risk of infections associated with PD

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# Successful Treatment of COVID-related STEMI with Anti-thrombotic Therapy

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## Background:

Novel coronavirus infection (COVID-19) can lead to life-threatening complications including thromboembolic disease. This case involves a critically ill patient presenting with embolic complication of COVID-19.

## Patient Presentation:

49-year-old African American male with recent diagnosis of COVID-19 presented to emergency department with dyspnea. He was admitted and on day 2 of hospitalization developed chest pain and ST segment elevation on EKG in leads V1 to V6 with reciprocal changes in inferior leads. Emergent coronary angiogram revealed a large non-occlusive saddle thrombus of the distal left main coronary artery extending into the left anterior descending and circumflex arteries. Antiplatelet and antithrombotic therapy with aspirin, clopidogrel, heparin and tirofiban infusion was initiated. The patient remained persistently hypotensive, and an intra-aortic balloon pump (IABP) was placed for cardiogenic shock. He was also intubated for acute respiratory failure. Echocardiogram revealed severely reduced left ventricular ejection fraction (LVEF) of 15%. The patient was transferred to our tertiary care facility for consideration of aspiration thrombectomy versus surgical revascularization. Repeat echocardiogram at the receiving facility showed ejection fraction of 20% and evidence of apical left ventricular thrombus.

## Imaging

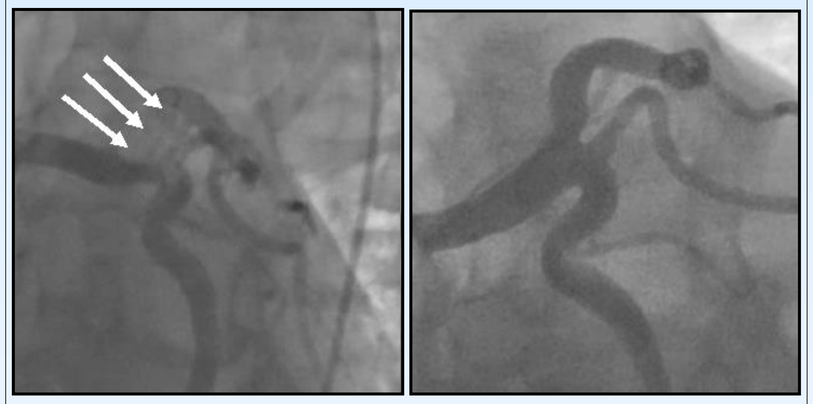

**Figure 1:** **Panel A** – Saddle thrombus extending from distal left main into LAD and LCX, **Panel B** – Repeat angiography showing resolution of thrombus.

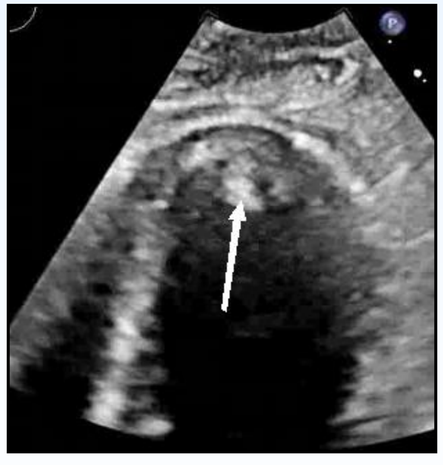

**Figure 2:** Echocardiogram showing apical LV thrombus.

## Decision Making:

The key treatment decision was medical management as opposed to thrombectomy or surgical revascularization. Given the risk of distal embolization with embolectomy of large and organized clot, it was decided that medical management was the best option. Surgery was not pursued due to non-atherosclerotic & non-occlusive lesion. Patient improved clinically on continued antithrombotic therapy. IABP was removed, and repeat echocardiogram showed LVEF 30% with persistent LV thrombus. Repeat angiogram revealed complete resolution of prior saddle thrombus. Patient continued to improve and was discharged on oral anticoagulation for LV thrombus. Out of concern for COVID-19 myocarditis, cardiac MRI was ordered on discharge.

## Conclusion:

This is a remarkable case of a patient surviving to discharge despite serious COVID-19 complications. We suspect that this patient developed systolic heart failure from COVID-19 myocarditis, which led to left ventricular thrombus formation and subsequent embolization to the coronary arteries. Early, aggressive, and sustained multi-agent antithrombotic therapy may have played an important role in the patient's overall survival, making it a promising treatment strategy meriting further investigation.

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# Late-Positive Troponin in the Setting of Hypertensive Emergency and STEMI

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## Introduction

•Acute coronary syndrome(ACS) involves decreased blood flow to the heart that may lead to infarction and most commonly occurs due to thrombosis within the coronary arteries.

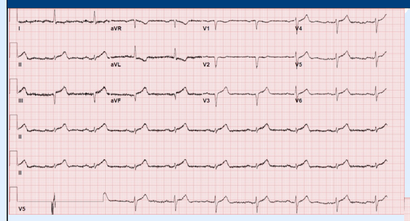
•A risk factor for ACS is hypertension.

•Hypertensive emergency involves systolic blood pressure greater than 180mmHg or a diastolic blood pressure greater than 120mmHg, with end organ damage.

## Case

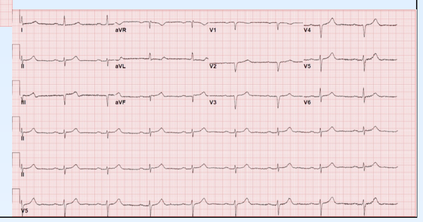
- 68-year-old man with hypertension, hyperlipidemia, but without known coronary artery disease
- Chest pain ongoing for 1.5 hours prior to presentation
- Blood pressure of 227/119 and ST elevations in leads II, III, aVF
- Troponin was negative.
- Serial EKGs showed persistent ST elevations.
- Patient was admitted for suspected hypertensive emergency with concern for ACS.

## Media




Initial EKG: Sinus bradycardia with 1st degree A-V block, old anteroseptal infarction, STE in inferior leads

Subsequent EKG: Sinus rhythm with 1st degree A-V block, old anteroseptal infarct, decrease in ST elevation in inferior leads




## Intervention

•Placed on a nicardipine infusion.

•Transthoracic echocardiogram showed left ventricular ejection fraction of 60-65% with severe hypokinesis in the basal inferolateral and basal inferior segments.

•Cardiac catheterization found a 99% thrombotic lesion of the distal right circumflex artery for which he received a drug-eluting stent.

•Troponin became positive more than 8.5 hours after symptom onset.

## Discussion

• ACS is a known complication of hypertensive emergencies.

•Electrocardiogram(EKG) changes suggestive of infarct should produce positive troponins within a few hours of onset to indicate myocardial damage.

•It is abnormal to see a troponin leak several hours after NSTEMI/STEMI.

## Conclusion

• In this patient, the concern for his concomitant hypertensive emergency and myocardial infarction led to further investigation.

•It is important to keep in mind the patient's risk factors and that when there is high clinical suspicion, even if there is a negative troponin(or late rise in troponin as in this case), further work-up with cardiac catheterization may be necessary.

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# In the guise of ST-Elevation Myocardial Infarction

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## Introduction

- Pericarditis involves inflammation of the pericardium, a sac-like layer that surrounds the heart.
- Due to infectious, infarction, iatrogenic, and idiopathic causes

## Case

- A 73-year-old man without known cardiac disease
- Chest pain and with an electrocardiogram (EKG) suspicious for anterolateral STEMI
- Negative troponin
- EKG from the outside hospital showed ST elevations in leads I, AVL, V4-V6. No obvious PR depressions were noted.
- Patient demonstrated lower substernal discomfort, worsened by deep inspiration.
- Laboratories were only notable for leukocytosis of 13.6.
- Patient denied any viral prodrome.

## Media

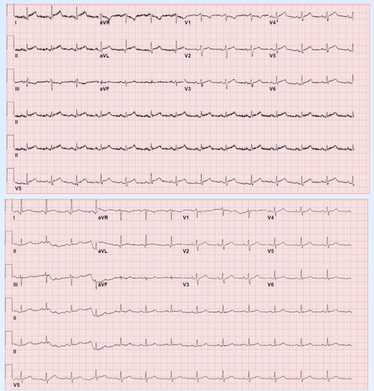

Figure1: EKG on admission, Normal sinus rhythm, ST-elevation in anterolateral leads
Figure 2: EKG at discharge, Normal sinus rhythm, resolved ST-Elevations

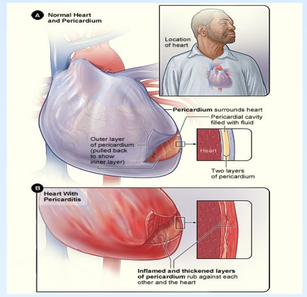


Figure 3: Normal pericardium(A) vs a pericardium inflicted with pericarditis(B)
(Courtesy of National Heart Lung and Blood Institute (NIH))

## Intervention

- High suspicion of underlying coronary artery disease (CAD)→cardiac catheterization
- Cardiac catheterization showed severe two-vessel disease (large ostial obtuse marginal 3 lesion at 95%, proximal-mid left anterior descending lesion at 80%).
- Patient was deemed appropriate for coronary artery bypass graft (CABG).
- Mild pericarditis changes were observed during CABG.
- Started on ibuprofen and colchicine(standard therapy for pericarditis).
- Troponin remained negative throughout hospitalization.

## Discussion

- Overall incidence of pericarditis is approximately 0.1 to 0.2% of hospitalized patients.
- Incidence of peri-infarction pericarditis in ST-elevation myocardial infarction (STEMI) is around 1.2%.
- Regional pericarditis figures outside of STEMI are elusive.

## Conclusion

- Regional pericarditis is a phenomenon that can present in the setting of acute coronary syndrome or be unrelated to CAD.
- One should be cognizant that a negative troponin assay with focal ST elevations and pleuritic chest pain does not preclude a new presentation of a severe underlying coronary disease that may warrant urgent intervention and treatment.

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# Endocarditis, Osteomyelitis and Cryptococcus Meningitis OH MY

**Jeremy J. Steinbruck MD, Tasaduq N. Fazili MD**

***Internal Medicine Resident at Carilion, Infectious Diseases VTC***

## Introduction:

*Cryptococcus neoformens* is most commonly seen in immunocompromised patients. It can still be present in patient's that are immunocompetent with no history of HIV, low CD4+ count or history of transplant. This case shows the complexities of this infection and how it should never be forgotten.

## Lab studies/ Cultures:

- Day 0: Positive blood culture for MRSA
- Day 2: Positive hip abscess culture for MRSA
- Day 3: Positive blood culture for *Cryptococcus (resulted day 6)*
- *Day 7: Positive CSF for Cryptococcus*
- Day 27: negative CSF

- CD4 = 38%
- CD4 = 968 cells/µl
- CD8 = 1303 cells/µl
- HIV ab = negative
- HIV viral load = negative

## Case:

Patient ME is 36-year-old female that was a trauma alert secondary to a fall three weeks prior to admission. Chief complaint for left hip pain and right elbow pain. ME had a history of polysubstance abuse, with her drug of choice being heroin. CT of the abdomen showed renal abscess with a left hip abscess. ME had blood cultures that where positive for MRSA. She was started on Vancomycin but had to be changed to Daptomycin due to poor vancomycin trough levels. Patient had a murmur on exam and then had a transesophageal echocardiogram that found multiple vegetations.

Therefore we have a patient with osteomyelitis, renal abscess and endocarditis. Even with proper antimicrobials ME was still spiking fevers and having headaches. Blood culture was drawn that showed buddying yeast. At first it was assumed to be *Candidema* and patient was started on anidulafungin. Once the culture resulted as *Cryptococcus neoformens* patient was starting on induction therapy (Amphotericin B & Flucytosine). ME's opening pressure was 27 cmH2O and CSF cultures was positive. Patient had to get a long course of induction therapy due to her opening pressure increasing with the switch to Fluconazole.

## Discussion

ME was not immunocompromised and at first it was surprising to see that blood culture positive. With no clear risk factors found. The working hypothesis is that ME's MRSA infection was sub-acute and long enough to make her immune system not function properly to fight off *Cryptococcus neoformens.* These type of case are important to discuss cause it can potential lead to better understand this infection.

## Acknowledgements & Refs

•Thanks has to go to the Faculty Medicine teams and to the Infectious Disease teams

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# Salmonella-related Mycotic Pseudoaneurysm Rupture with Bypass Graft Infection

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## Introduction

Mycotic aneurysm is an irreversible and localized dilation of an artery due to vessel wall injury caused by an infection. Depending on involvement of all or some layers of the arterial wall, it may be either a true aneurysm or a pseudoaneurysm. Salmonella aortitis with mycotic aneurysm formation is a rare but serious condition, due to the high risk of rupture.

## Case Presentation

A 57-year old African-American male presented to the emergency department with severe right groin pain after slipping on ice. He had a significant vascular history including right aorto-femoral bypass graft performed ten years ago. Five years later, he developed a 2.5 cm pseudoaneurysm which was repaired surgically and found to have an infected femoral graft which was excised, but graft cultures were negative at that time. CT angiography showed an enlarging saccular aneurysm at the aortic bifurcation with no leak. After admission, repeat CT angiography showed a fluid collection adjacent to the right aorto-femoral bypass graft with evidence of active extravasation.

He was taken to the operating room, where he was found to have a right femoral pseudoaneurysm with extensive scarring and a purulent ulcerative lesion through the femoral artery stent. He underwent repair of the pseudoaneurysm with replacement of the infected graft. The operative cultures grew non-typhoidal Salmonella spp. The patient recalled no specific exposures; however, he did remember experiencing severe vomiting near the time of his previous femoral graft infection. Antibiotic therapy was started with IV ceftriaxone daily for six weeks after removal of infected graft with step-down to fluoroquinolone for several weeks.

## Imaging

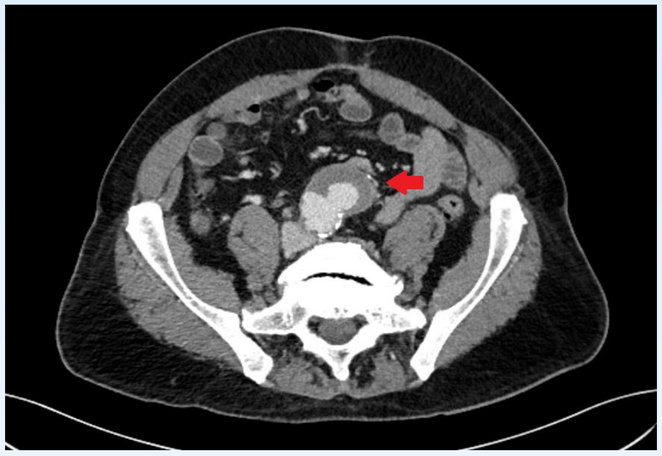

Image 1: CT abdomen/pelvis with contrast showing saccular aneurysm of abdominal aorta

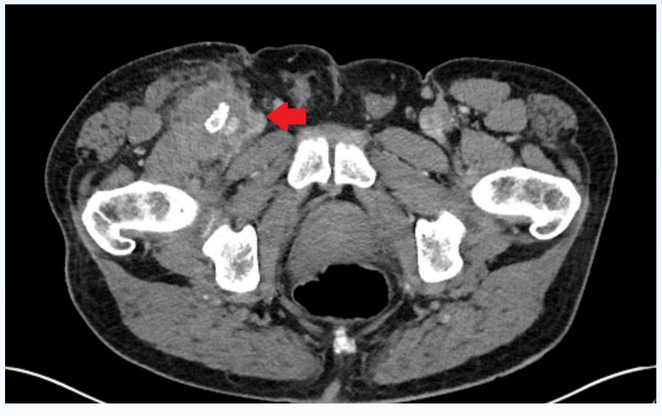

Image 2: CT abdomen/pelvis with contrast showing low attenuating fluid collection adjacent to stented portion of the right aortofemoral bypass graft, concerning for pseudoaneurysm formation

## Discussion

This case demonstrates the main features of a mycotic aneurysm. A mycotic aneurysm can develop from hematogenous seeding of an existing aneurysm or extension from a contiguous site of infection. Mycotic infections of the aorta show a preference for male patients already infected with Salmonella typhimurium. Computed tomography is the most useful imaging modality. Surgical interventions with parenteral antibiotic therapy, are required to confirm the diagnosis, reconstruct the arterial vasculature, manage the complications of sepsis, and start preventative measures.

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# A case of herpes zoster ophthalmicus with external ophthalmoplegia

**TJ O'Toole DO, Roshan Bhowansingh MD**

***Carilion Clinic – Virginia Tech School of Medicine, Department of Internal Medicine***

## Introduction

- Herpes zoster (HZ) ophthalmicus is the manifestation of the HZ virus within the structure of the eye.
- There are approximately one million cases of HZ every year and about 30% of these cases involve ocular structures, which can manifest as ophthalmoplegia. This is typically a transient complication but may become permanent if it is caused by ischemia related to HZ vasculopathy.
- Neuroimaging is critical in these patients to rule out the vascular complications associated with HZ.

## Case description

A 79-year-old male with a history of heart disease with angioplasty, paroxysmal atrial fibrillation, hypertension, and hyperlipidemia presented due to worsening diplopia. He was recently diagnosed with HZ of the right V1 distribution that had progressed to involve the eye and manifest as uveitis with a sixth cranial nerve palsy. He then developed palsy of the third and fourth cranial nerves without loss of visual acuity. Computed tomography (CT) and angiography (CTA) of the head were completed to evaluate for potential ischemic vascular complications caused by HZ vasculopathy. The patient was treated with intravenous acyclovir with complete recovery.

## Conclusion

HZ is relatively common and can manifest anywhere from the typical skin rash to the devastating neurologic insults associated with HZ vasculopathy. Worsening neurologic deficits in the setting of HZ should be evaluated with neurologic imaging and treated promptly with intravenous anti-viral medication.

## Discussion

HZ is a well-known cause of blindness but a much lesser-known cause of stroke. This occurs due to translocation of the virus from the trigeminal ganglia to the intracerebral vasculature. While the ocular palsies associated with HZ are typically transient, they always merit neurologic imaging to rule out ischemia or direct toxic effect caused by HZ. Fortunately, our patient did not have any ischemic complications from HZ and recovered quickly following initiation of treatment.

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# Nitrofurantoin Induced Interstitial Lung Disease: Urinary Tract Infection Prophylaxis Gone Wrong

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## Objectives

- Long term use of nitrofurantoin for urinary tract infection prophylaxis can come with adverse effects such a drug induced interstitial lung disease.
- This may present in various forms and should always be on the differential for patients with respiratory symptoms on long term use of nitrofurantoin.

## Introduction

- Nitrofurantoin is a rare cause of interstitial lung disease, although it is a common culprit for medication induced lung disease.
- Nitrofurantoin pulmonary toxicity can present in many forms including acute to chronic interstitial pneumonia.
- This case highlights an insidious presentation of nitrofurantoin induced interstitial lung disease that showed resolution with the discontinuation of the medication.

## Case

- 74 year old female presented to pulmonary clinic for evaluation for unresolved pulmonary infiltrates.
- She had complaints of 4 months of cough and progressive dyspnea on exertion.

## Case Continued

- PCP treated her with 2 separate courses of antibiotics; without any resolution of symptoms.
- PMH pertinent only for recurrent UTIs for which she had been prophylaxis with nitrofurantoin the last 9 months
- Vitals: T 97.4°F HR 68 BP 141/73 RR 16 Spo2 92%
- Physical Exam: Bilateral Crackles
- CT scan without contrast showed patchy areas of ground glass opacity predominantly in the upper lobes in the central lung fields with a bronchovascular distribution (Fig 1).
- Nitrofurantoin was discontinued at time of consultation.
- Underwent bronchoscopy with no endobronchial lesions and negative cultures. bronchial alveolar lavage (BAL) cell counts: 6% neutrophils, and 53% lymphocytes.
- All cultures were negative.

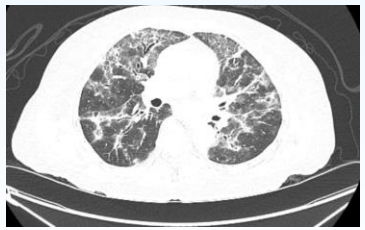

Figure 1: CT Scan wo Contrast Demonstrating Ground Glass Opacities

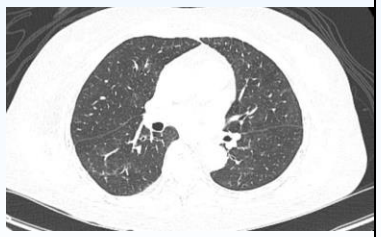

Figure 2: Repeat Imaging with Resolution of Infiltrates

## Case Continued

- The diagnosis of nitrofurantoin induced interstitial lung disease was made on the basis of the clinical impression and BAL cell counts.
- She was treated with a prednisone taper and supplemental oxygen due to the severity of her symptoms.
- Her repeat imaging one month later demonstrated the resolution of the infiltrates (Fig 2).

## Discussion

Nitrofurantoin has been prescribed for prophylaxis urinary tract infections in patients with predisposing factors. Nitrofurantoin is not a benign medication. It is a common medication to induce pulmonary toxicity, which can range from acute to chronic with a variety of radiologic patterns. Th pulmonary toxicity ranges in severity but can be fatal; and thus patients on prophylactic nitrofurantoin should routinely be assessed for possible lung toxicity.

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# Pneumocystis jirovecii pneumonia in Treatment Naive Chronic Lymphocytic Leukemia

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## Objectives

- Be aware of CLL as a state of immunosuppression and thus higher risk to develop opportunistic infections regardless of treatment.
- Consider pneumocystis jirovecii pneumonia (PJP) in a treatment naïve CLL patient with shortness of breath and pulmonary infiltrates on imaging.

## Introduction

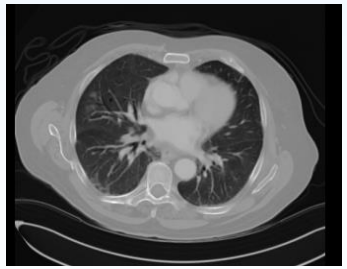
- PJP is a common opportunistic infection of immunocompromised hosts.
- CLL is a clonal malignancy of B lymphocytes and has inherent immune defects.
- CLL is not often considered a risk factor for developing PJP, but CLL treatment does increase the risk.
- This case demonstrates a PJP infection in a treatment naïve CLL patient.

## Case

- A 78 year old male presented to the pulmonary clinic for one month with cough and dyspnea on exertion; unable to perform his work as a farmer.

## Case Continued

- PMH: Hypothyroidism, CLL diagnosed 1 month prior
- Vitals:T 98.6°F HR 77 BP 109/69 SpO2 91%
- Physical Exam: Bibasilar Crackles
- Labs: WBC 72,000 (1 month prior 54,000)
- 6 minute walk test desaturated; given 2L O2
- PFTs Normal Spirometry and Lung Volumes; Decreased DLCO 54%
- CT scan showed patchy ground glass opacities predominantly on right side (Fig.1)
- He was empirically treated for community acquired pneumonia without improvement.
- He underwent bronchoscopy with bronchoalveolar lavage (BAL).
- GMS stain from right middle lobe BAL sample showed multiple Pneumocystis jirovecii cysts (Fig 2.)



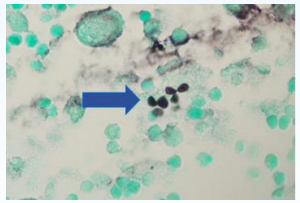


Figure 1 (left): CT scan of Chest showing ground glass opacities.
Figure 2 (above): showing pneumocystis jirovecii cysts.

## Case Continued

- Started on atovaquone (due to sulfa drug allergy) pending G6PD deficiency test.
- Atovaquone was changed to a clindamycin and primaquine once confirmed to not have G6PD deficiency and a prednisone taper.
- He completed a 21 day course. He no longer needed supplemental oxygen on follow up clinic.

## Discussion

PJP is common in immuncompromised hosts; it should be noted that the presentation of HIV versus non HIV patients is different. Non HIV related PJP is more acute; and has a higher mortality rate. (30-50% compared to 10-15%).

## Conclusion

This case demonstrates the importance of understanding CLL to be an immunosuppressed state even prior to treatment and thus to keep PJP pneumonia on the differential for an untreated CLL patient with dyspnea and pulmonary infiltrates.

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# Risk Factors for the Development of Neuropsychiatric Lupus in a Single Center Systemic Lupus Erythematosus Cohort

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## Background

Systemic Lupus Erythematosus (SLE) is a chronic inflammatory autoimmune disease that can affect multiple organs. When SLE affects the autonomic, peripheral, or central nervous system, this constellation of symptoms is referred to as neuropsychiatric lupus (NPL). NPL is particularly difficult to diagnose and treat due to many varied presentations and lack of specific biomarkers. It is estimated that 30% of all neuropsychiatric events can be related to NPL in patients diagnosed with SLE.

## Purpose/Methods

The purpose of this study was to examine the relationship between patient specific characteristics, socioeconomic factors, and SLE related autoantibodies in the development of NPL in our patient cohort.

This was a single center, retrospective chart review study at Carilion Clinic. Patients 18 and above meeting the ACR 1997 SLE criteria and seen between June 1st, 2015 and June 1st, 2019 were included in this study. 629 charts were identified and 263 patients with SLE were enrolled.

Continuous variables were analyzed using T-test or Mann-Whitney U test. Categorical variables were analyzed using Chi-square Tests or Fisher's exact tests. Statistical analysis was performed using SAS9.4, and p value <0.05 was considered statistically significant.

## Results

- There was no relationship between age, sex, race, and median household income (MHI) and the diagnosis of NPL. We found no relationship between SLE specific autoantibodies and NPL.
- There was a significant association between the presence of antiphospholipid antibodies (aPL) and NPL (<0.01), regardless of ethnicity, sex, and MHI.
- There was a trend towards significance between low levels of complement component 4 (C4) and NPL.
- There was a significant relationship between aPL positivity and patient demographics of race, sex, age or MHI.
- We did find a relationship between glucocorticoid use and NPL.

**Patient Characteristic and The Diagnosis of Neuropsychiatric Lupus**

| | No (n=166) | Yes (n=82) | p-value |
|---|---|---|---|
| **Age (mean ± sd)** | 36.6 ± 13.4 | 36.1 ± 13.5 | 0.83 |
| **Female** | 83.7% | 86.4% | 0.58 |
| **Race** | | | 0.22 |
| **Caucasian** | 54.9% | 65.0% | |
| **Black** | 37.2% | 32.5% | |
| **Hispanic** | 3.0% | | |
| **Other** | 4.9% | 2.5% | |

**Serology and Neuropsychiatric Lupus**

| | | NPL | | Total | | | |
|---|---|---|---|---|---|---|---|
| | | No | Yes | | Sensitivity | Specificity | p-value |
| **Antiphospholipid Antibody** | No | 145 | 53 | 198 | | | |
| | Yes | 15 | 23 | 38 | | | |
| **Total** | | 160 | 76 | 236 | 30% | 91% | <0.01 |
| **Complement Component 4** | No | 100 | 38 | 193 | | | |
| | Yes | 64 | 39 | 103 | | | |
| **Total** | | 164 | 77 | 241 | 51% | 61% | 0.09 |

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## Conclusions

In our cohort, there was no relationship between patient characteristics, socioeconomic factors, and NPL. There was a relationship between aPL antibodies, glucocorticoid use, and NPL. Although not statistically significant, there was a trend towards significance between Compliment 4 (C4) levels and the diagnosis of NPL.

Although our cohort included several SLE patients, one of the weaknesses of our study was its retrospective nature. In addition, there are still questions that need to be answered including how exactly aPL is associated with NPL.

NPL can be a devastating condition for patients as it is both difficult to diagnose and treat. Expanding our understanding of this disease process is crucial in improving patient outcomes. Much research remains to be done in understanding NPL, specifically regarding diagnosis, associated biomarkers and the management of this disease.

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# COVID-19 Vaccine Hesitancy Among Healthcare Workers

Mandy Swann, Alexis Johnson, Jesse Bendetson, Elizabeth Nowak, Maimuna Jatta, Charles Schleupner, Anthony Baffoe-Bonnie

*Carilion Clinic Infection Prevention and Control*

## Background

- Carilion Clinic began offering the COVID-19 vaccine to all staff in December 2020
- As of March 2021, COVID-19 vaccine uptake among Carilion Clinic staff was 60%
- Evidence on vaccine hesitancy in this context is limited
- The study aimed to understand drivers of vaccine hesitancy and acceptance to design communication to improve uptake

## Methods

- A cross sectional quantitative survey was anonymously and electronically self-administered between March 15-29, 2021
- We encouraged participation by all staff working at Carilion Clinic
- The survey examined 1) experience with COVID-19 and the vaccine, 2) vaccine perceptions, 3) trusted sources of health information, and 4) demographic/work characteristics
- Participants were dichotomized; those who had gotten one or more dose of the vaccine were considered acceptant and all others were considered hesitant
- Frequencies were tabulated and chi-squared tests were done to assess correlations between demographic factors, vaccine perceptions, and vaccine hesitancy

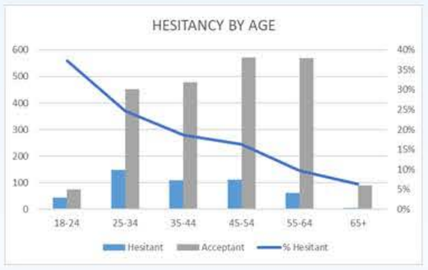
## Discussion

- Survey was not representative of employee population; relied on convenience sampling
- Need to address concerns around vaccine safety given newness and fast-tracked development
- Opportunities to improve understanding of vaccine effectiveness
- Drivers of acceptance suggest messaging around protecting family and “doing your part” may be effective
- Overcoming sense that there is not enough information will be a challenge
- Opportunities for messaging through personal physicians and Carilion Management

## Results

**Table 1 - Demographics**

| Characteristic | Vaccine Hesitancy: Yes n | Yes % | No n | No % | χ2 p-value |
|---|---|---|---|---|---|
| Total | 482 | 17.7% | 2,238 | 82.3% | |
| Age | | | | | <0.0001 |
| 18-24 | 44 | 37.3% | 74 | 62.7% | |
| 25-34 | 148 | 24.7% | 452 | 75.3% | |
| 35-44 | 110 | 18.7% | 478 | 81.3% | |
| 45-54 | 111 | 16.3% | 571 | 83.7% | |
| 55-64 | 61 | 9.7% | 568 | 90.3% | |
| 65+ | 6 | 6.3% | 89 | 93.7% | |
| Gender | | | | | 0.0659 |
| Female | 411 | 18.5% | 1,812 | 81.5% | |
| Male | 61 | 12.9% | 412 | 87.1% | |
| Race/Ethnicity | | | | | 0.0003 |
| African American/Black | 37 | 24.7% | 113 | 75.3% | |
| American Indian/Alaska Native | 5 | 20.8% | 19 | 79.2% | |
| Asian or Pacific Islander | 8 | 13.3% | 52 | 86.7% | |
| Caucasian/White | 404 | 16.8% | 2,001 | 83.2% | |
| Hispanic/Latino | 8 | 22.2% | 28 | 77.8% | |
| Other | 12 | 50.0% | 12 | 50.0% | |
| Role at Carilion | | | | | <0.0001 |
| Provider | 15 | 7.1% | 196 | 92.9% | |
| Nursing Staff | 182 | 19.7% | 742 | 80.3% | |
| Management | 34 | 11.0% | 276 | 89.0% | |
| Other (Patient-Care) | 116 | 17.5% | 547 | 82.5% | |
| Other (Non-Patient Care) | 134 | 22.1% | 473 | 77.9% | |



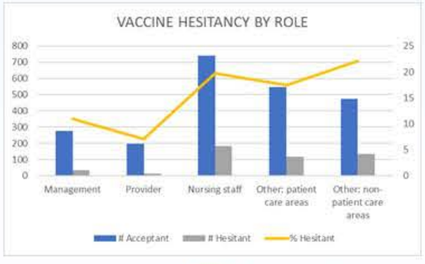




**Table 2 - Survey Responses**

| Survey Item | Vaccine Hesitancy: Yes n | Yes % | No n | No % | χ2 p-value |
|---|---|---|---|---|---|
| I am concerned about information I have seen that the vaccine is very harmful | | | | | <0.0001 |
| Agree | 117 | 43.2% | 154 | 56.8% | |
| Unsure | 185 | 33.4% | 369 | 66.6% | |
| Disagree | 179 | 9.5% | 1,699 | 90.5% | |
| I feel that COVID-19 vaccine development was rushed without sufficient quality control | | | | | <0.0001 |
| Agree | 300 | 54.1% | 255 | 45.9% | |
| Unsure | 11 | 1.8% | 592 | 98.2% | |
| Disagree | 71 | 4.9% | 1,388 | 95.1% | |
| I am worried about the known/reported short-term side effects from the COVID-19 vaccine (e.g., fever, fatigue, headache) | | | | | <0.0001 |
| Agree | 221 | 45.9% | 261 | 54.1% | |
| Unsure | 127 | 25.0% | 380 | 75.0% | |
| Disagree | 132 | 7.7% | 1,582 | 92.3% | |
| I am worried about potential (unknown) long-term side-effects of the COVID-19 vaccine | | | | | <0.0001 |
| Agree | 398 | 35.9% | 711 | 64.1% | |
| Unsure | 59 | 9.1% | 589 | 90.9% | |
| Disagree | 22 | 2.3% | 920 | 97.7% | |
| I am worried the vaccine will negatively affect a current pregnancy or my future ability to have children | | | | | <0.0001 |
| Agree | 151 | 57.4% | 112 | 42.6% | |
| Unsure | 134 | 19.8% | 542 | 80.2% | |
| Disagree | 192 | 11.1% | 1,543 | 88.9% | |
| COVID-19 is not that dangerous so I do not need a vaccine | | | | | <0.0001 |
| Agree | 53 | 52.5% | 48 | 47.5% | |
| Unsure | 143 | 56.7% | 109 | 43.3% | |
| Disagree | 285 | 12.1% | 2,071 | 87.9% | |
| I believe natural immunity from getting COVID-19 is more protective than a vaccine | | | | | <0.0001 |
| Agree | 170 | 51.1% | 163 | 48.9% | |
| Unsure | 200 | 24.0% | 635 | 76.0% | |
| Disagree | 110 | 7.2% | 1,426 | 92.8% | |
| In general, I try to avoid vaccinations | | | | | <0.0001 |
| Agree | 110 | 46.6% | 126 | 53.4% | |
| Unsure | 96 | 40.7% | 140 | 59.3% | |
| Disagree | 274 | 12.3% | 1,945 | 87.7% | |
| I am worried that the vaccine will give me COVID-19 | | | | | <0.0001 |
| Agree | 26 | 38.8% | 41 | 61.2% | |
| Unsure | 74 | 49.7% | 75 | 50.3% | |
| Disagree | 376 | 15.2% | 2,097 | 84.8% | |

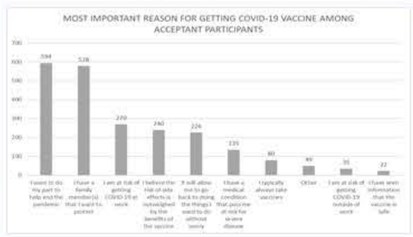
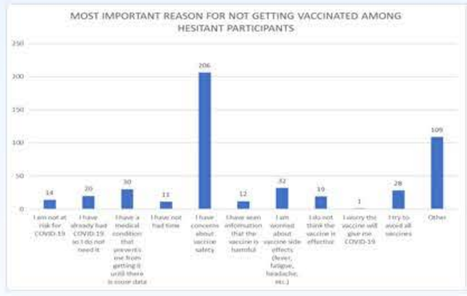
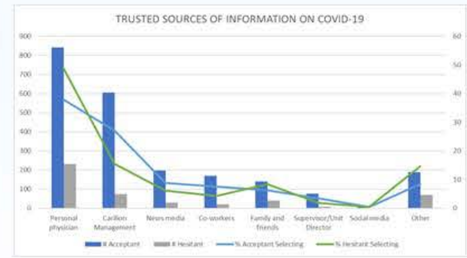



**Table 2 - Survey Responses (Continued)**

| Survey Item | Vaccine Hesitancy: Yes N | Yes % | No n | No % | χ2 p-value |
|---|---|---|---|---|---|
| I believe the COVID-19 vaccine is safe | | | | | <0.0001 |
| Agree | 81 | 4.5% | 1,703 | 95.5% | |
| Unsure | 155 | 28.1% | 396 | 71.9% | |
| Disagree | 242 | 66.5% | 122 | 33.5% | |
| I believe the COVID-19 vaccine is effective in preventing COVID-19 | | | | | <0.0001 |
| Agree | 109 | 6.2% | 1,660 | 93.8% | |
| Unsure | 215 | 32.0% | 457 | 68.0% | |
| Disagree | 154 | 60.4% | 101 | 39.6% | |
| I believe the COVID-19 vaccine will help stop the pandemic | | | | | <0.0001 |
| Agree | 143 | 7.5% | 1,759 | 92.5% | |
| Unsure | 176 | 34.6% | 332 | 65.4% | |
| Disagree | 163 | 57.2% | 122 | 42.8% | |
| I feel there is enough information/data about the COVID-19 vaccine to make an informed decision | | | | | <0.0001 |
| Agree | 96 | 6.1% | 1,468 | 93.9% | |
| Unsure | 109 | 17.6% | 511 | 82.4% | |
| Disagree | 277 | 52.1% | 255 | 47.9% | |

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# Vitamin B12 Deficiency: A New Risk Factor for Venous Thromboembolism

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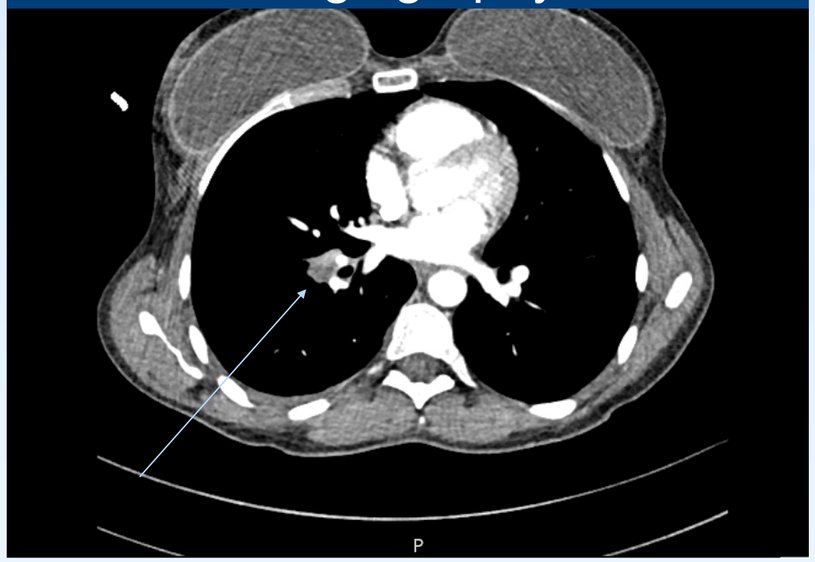
## Objectives

- Realize the biochemical mechanisms of Vitamin B 12 deficiency potentially leading to venous thromboembolism(VTE).
- Understand the clinical impact of hyperhomocysteinemia.

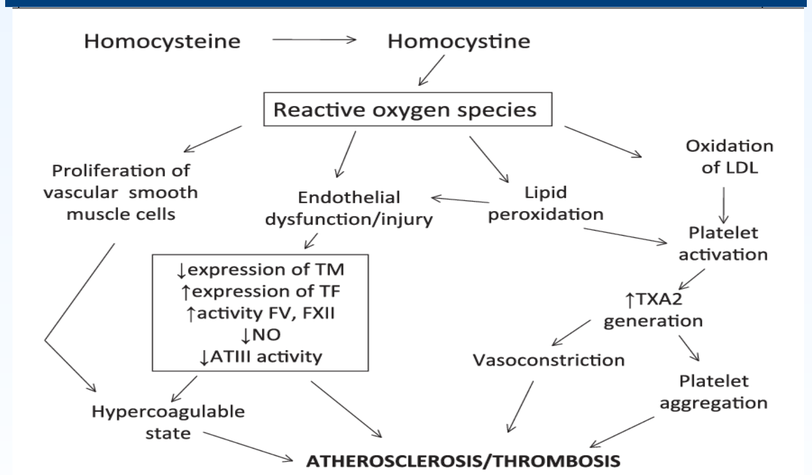
## Case

A 41-year-old female with medical history of anemia and no defined risks for VTE or Vitamin B12 deficiency presented to ED with sudden onset shortness of breath, right chest pain, and right shoulder pain. VS: BMI 22, BP 110/60, HR 109, Afebrile, RR 16, and RA oxygen 98%. PE: Uncomfortable, dullness at the right lung base. CBC: hemoglobin 8 g/dL and MCV 81. Anemia workup included an undetectable Vitamin B12 <150pg/mL, Methylmalonic acid (MMA) 1570 nmol/L(87-318), homocysteine 32.7 umol/L (<10). She was found to have two right-sided lobar pulmonary emboli as well as a deep venous thrombus of the left common femoral vein and a superficial thrombus in left great saphenous vein. She was hemodynamically stable throughout admission and was discharged on apixaban and Vitamin B12 supplementation.

## Computed Tomography Angiography




## Mechanism




Boushey CJ, Beresford SA, Omenn GS, Motulsky AG. A quantitative assessment of plasma homocysteine as a risk factor for vascular disease. Probable benefits of increasing folic acid intakes. *J. Am. Med. Assoc.* 1995;74:1049–57.
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## Associations

- Vitamin B 12 is required for the conversion of homocysteine to methionine. In the absence of Vitamin B 12 homocysteine will be increased.
- Elevated homocysteine has known associations with coronary artery disease (CAD), myocardial infarction, stroke, venous thromboembolism, and peripheral vascular disease.

## Implications

•Obtaining Vitamin B12 and homocysteine levels in patients with thrombotic events may provide an etiology for increased thrombosis in patients without typically identified causes such as in our case. Once detected these present a treatable condition that can potentially prevent or slow the progression of many vascular diseases.

•A meta-analysis that included 27 studies of patients with hyperhomocysteinemia and CAD reported that 10% of the patients' CAD risks were due to their homocysteine levels and that up to 50,000 deaths could be prevented yearly by reducing homocysteine levels.

•This case points to the importance of evaluating for Vitamin B12 and homocysteine in patients with VTE as a method for etiology determination and alteration in treatment approach.

# Case of Vision Loss due to Embolization of Caseous Mitral Annular Calcification

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***Carilion Clinic-Virginia Tech School of Medicine, Department of [1]Internal Medicine and [2]Cardiology***

## Introduction

- Caseous mitral annular calcification (CMAC) is a rare and unfamiliar variant of mitral annular calcification (MAC).[a-b]
- The prevalence of MAC is about 10.6% with CMAC occurring in 0.63-0.64% of these cases.[c-d]
- Clinical context and multimodality imaging are effective in differentiating CMAC from other cardiac lesions.

## Case

A 75-year-old male with a history of peritoneal dialysis for end-stage renal disease, pacemaker placement for complete heart block, hypertension, and hyperlipidemia presented with sudden, painless, right eye vision loss. Visual acuity was 20/40, and the fundoscopic exam showed a branch retinal artery occlusion on the right. Electrocardiogram and telemetry monitoring did not identify any arrhythmias. Carotid duplex showed moderate left internal carotid artery stenosis. A suboptimal transthoracic echocardiogram revealed mild mitral regurgitation. Transesophageal echocardiogram (TEE) showed a 15 x 10 mm immobile cystic structure on the posterior mitral annulus not enhancing with Definity contrast or having any blood flow with Doppler flow mapping. Computed tomography angiography (CTA) of the heart showed a 13.8 x 21.7 x 20.4 mm mitral periannular lesion with peripheral calcification and central hypodensity consistent with CMAC and extensive MAC.

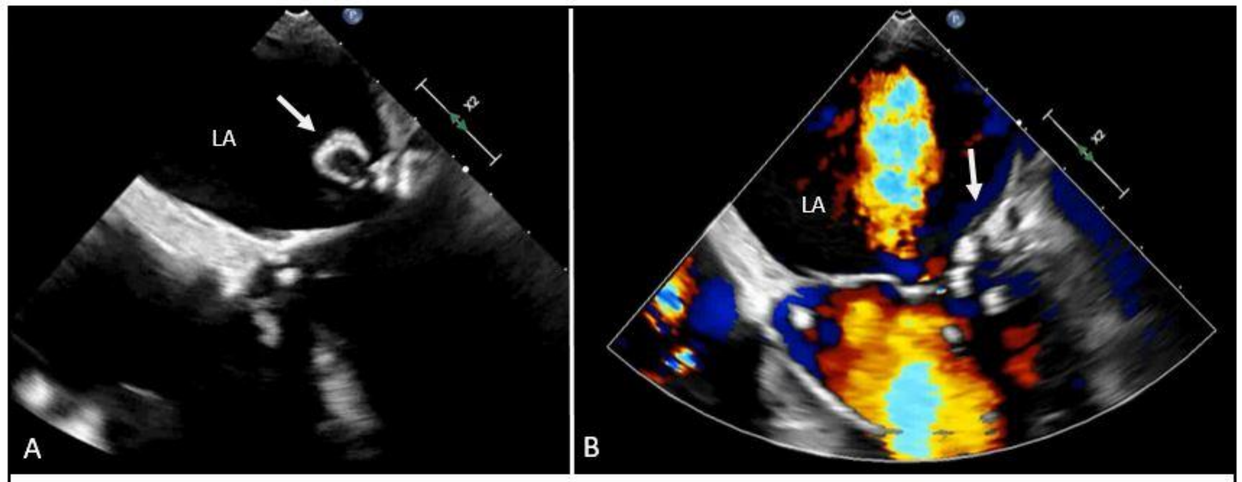


Figure 1A. TEE showing 15 x 10 mm immobile cystic structure on the posterior mitral annulus (white arrow) in the left atrium (LA). Figure 1B. TEE with Doppler color flow mapping showing no blood flow to the cyst (white arrow) and moderate to severe mitral regurgitation.

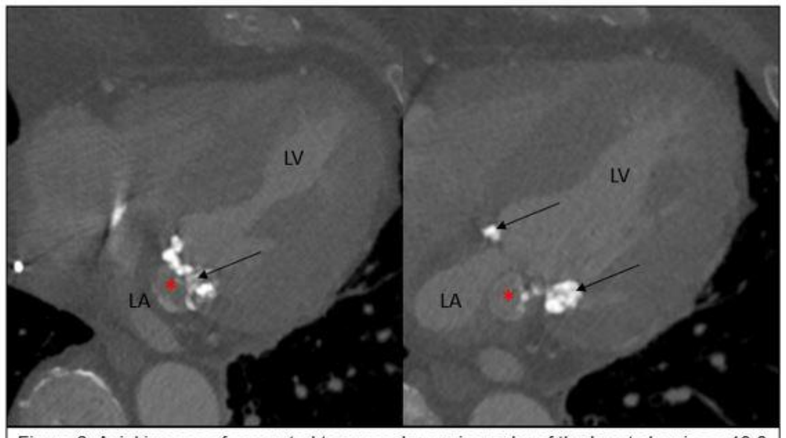


Figure 2. Axial images of computed tomography angiography of the heart showing a 13.8 x 21.7 x 20.4 mm mitral periannular lesion (*) with peripheral calcifications and relative central hypodensity at the junction between the left atrium (LA) and left ventricle (LV)/atrioventricular groove bulging into the left atrial cavity and extensive mitral annulus calcification (arrow).

## Discussion

- TEE was essential in identifying the cystic lesion.
- CTA further differentiated the lesion into CMAC due to the presence of peripheral calcification, necrotic/hypodense center, and lack of systemic blood flow.
- CMAC is typically benign but when it is associated with systemic embolization surgical intervention and anticoagulation therapy is recommended.[a-c]

## Conclusion

- CMAC is rare but has been associated with embolic events.
- Surgical intervention and anticoagulation should be considered in patients whose CMAC is the most likely cause of embolization.

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CARILION CLINIC

# The Cultured Patient: Lactobacillus Bacteremia After Eating Greek Yogurt

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The authors have no conflicts of interest or financial ties to disclose

## Introduction

Lactobacilli are gram-positive rod-shaped bacteria that colonize the gastrointestinal tract and are used in fermented foods or probiotics. They are difficult to culture and speciate and typically regarded as contaminants. Lactobacilli infections are exceedingly uncommon and are considered opportunistic infections. We present the case of a 55-year-old female who developed lactobacillus bacteremia secondary to eating yogurt with an unknown ruptured esophagus.

## History of Presenting Illness

A 55-year-old female with refractory Double-Hit B-Cell Lymphoma presented to the ED with a two-day history of fevers. She had recently been admitted to the hospital and found to have lactobacillus bacteremia. She was discharged on a prolonged course of meropenem. She also developed new diarrhea with as many as 6-7 watery bowel movements per day. She also endorsed DOE, palpitations, and fatigue, but she denied any evidence of significant bleeding.

## Physical Exam

Vitals – BP 108/58, HR 118, RR 18, $SpO_2$ 91% on Room Air, T 99.4ºF
General - Frail appearing white female in no apparent distress
HEENT - Anicteric sclerae. PERRLA, EOMI. Dry mucous membranes.
Neck - Supple, nontender. No thyromegaly or lymphadenopathy.
CV - Tachycardic, regular rhythm. No murmurs/rubs. 2+ peripheral pulses bilaterally, no lower extremity edema
Lungs – Clear to auscultation bilaterally. No crackles or wheezes.
Abdomen - Normoactive, high-pitched bowel sounds. Soft but distended. Non-tender to palpation.
Neuro - Alert, conversant. Sensation intact to light touch.
Skin - No rashes, jaundice, or petechiae.

## Admission Labs

| | | | | | | |
|---|---|---|---|---|---|---|
| **WBC 17.4** | **Hgb/Hct 6.6/20.8** | **PLT 12** | Sodium 138 | Potassium 3.7 | Chloride 105 | $CO_2$ 22 |
| BUN 14 | Creatinine 0.51 | Calcium 8.5 | Albumin 3.4 | Total Bilirubin 0.3 | AST 29 | ALT 42 |

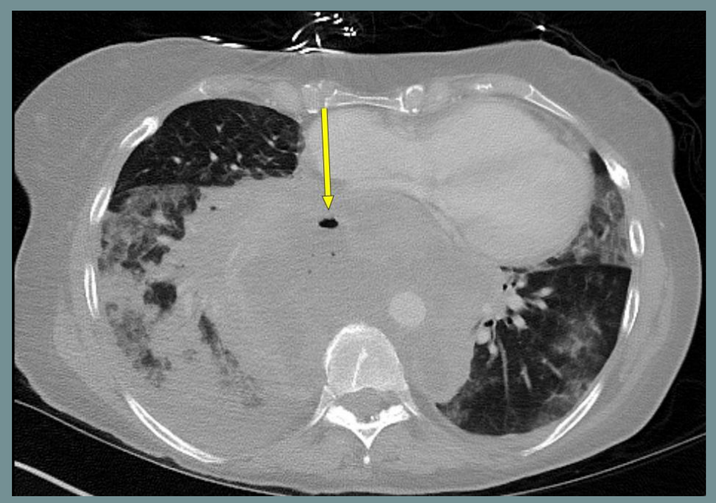

Figure A: Mediastinal mass with non-anatomic air (yellow arrow) which is suggestive of infected tumor possibly related to erosion into the esophagus with perforation. Bibasilar consolidations consistent with aspiration pneumonitis

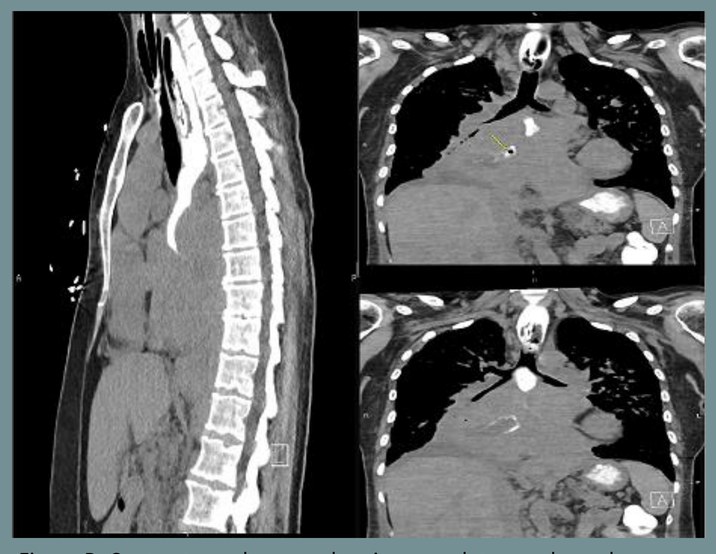

Figure B: Contrast esophagram showing complete esophageal occlusion as evidenced by the sharp point with no contrast entering the stomach(left). Redemonstration of mediastinal free air with surrounding contrast which represents esophageal rupture (top right) and associated contrast within the mediastinum (bottom right).

## Hospital Course

The patient was admitted for further antimicrobial therapy Blood cultures again returned positive for *Lactobacillus fermentum* in addition to new *Lactobacillus casei*. The patient's husband reported that before admission the patient exclusively ate Greek yogurt which contained these lactobacillus species.

She had a rapid response called for respiratory distress which eventually required intubation. She became acutely hypotensive and required pressor administration.

CT chest, abdomen, pelvis was obtained which showed a tumor encircling the esophagus with evidence of a new perforation, new mediastinal abscess, and chemical pneumonitis.

Her condition deteriorated despite aggressive antibiotics, mechanical ventilation, and vasopressors. A multi-disciplinary meeting determined she was not a candidate for further treatment of her lymphoma or mediastinal abscess. Subsequently, her family elected to pursue terminal extubation and palliative measures.

## Discussion

True lactobacillus bacteremia accounts for 0.1% of all positive blood cultures and is usually considered contaminants when isolated. Our patient could not receive standard therapy of penicillin and aminoglycosides due to severe allergies. We hypothesize that her lactobacillus bacteremia came directly from seeding into the mediastinum, which is supported by her bacteremia persisting despite antimicrobial therapy because the infectious source was not addressed due to her severe disease. There are no guidelines regarding immunocompromised patients and probiotics, but we believe that they should have counseling on the risk factors of consuming exogenous bacteria.

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# Pharmacy

CARILION CLINIC

# Evaluation of a rapid aspirin desensitization protocol

**Jonathan Zalman, PharmD, Matthew Hornsby, PharmD, BCPS, Meghan Kamrada, PharmD, BCPS, Hasan Kazmi, PharmD, BCPS, BCCP**

Carilion Clinic
Department of Pharmacy Services

## Background

- Reported hypersensitivity to aspirin can be a barrier to optimal treatment. A review of 9565 patients with coronary artery disease revealed that 1.5% of patients had reported a prior aspirin reaction.
- Many hypersensitivities are mediated by COX-1 inhibition and are generally class-wide to NSAIDs. IgE mediated reactions occur as well and are agent specific.
- Historically, aspirin desensitization was a long process requiring close inpatient monitoring over 2-3 days. More recent evidence suggests the safety of quicker desensitization which can be performed in a matter of hours.
- At Carilion Roanoke Memorial Hospital, a standardized order set for aspirin desensitization was implemented in 2018. This study was done to evaluate its safety.

## Methods

**Primary Outcome**

- The primary outcome was successful aspirin desensitization without experiencing a reaction, defined as requiring administration of a rescue medication

**Study Design**

- Single center, retrospective, observational cohort

**Setting and Population**

- This study included all adult patients who were initiated on the aspirin desensitization protocol from July 2018–July 2020
- An abbreviated version of the protocol is shown in Figure 1

**Data Collection**

- Data was extracted from the electronic medical record using a standardized instrument

**Data Analysis**

- Analysis was done using descriptive statistics

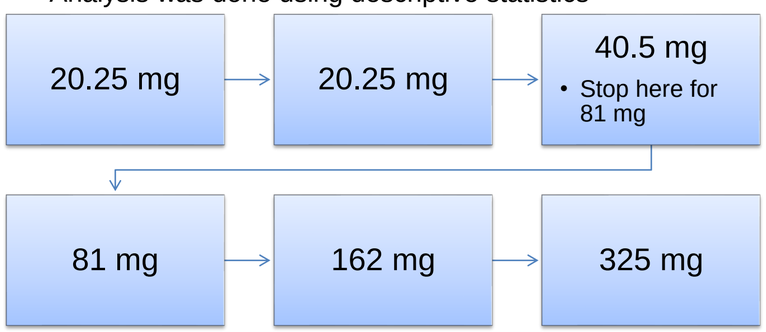


Figure 1: Aspirin desensitization doses, each dose is to be separated by 2 hours unless the reaction history is AERD, which would be 3 hours. Any dose provoking a reaction is to be repeated.

## Results

| Table 1: Baseline Demographics (n=20) | |
|---|---|
| **Female, n (%)** | 9 (45) |
| **Median Age, yr (IQR)** | 62 (52-72) |
| **Median BMI, kg/m$^2$ (IQR)** | 27 (24-30) |
| **Asthma, n (%)** | 4 (20) |
| **Chronic urticaria, n (%)** | 0 (0) |
| **Chronic rhinosinusitis, n (%)** | 1 (5) |
| **Allergy History, n** | NSAID induced urticaria/angioedema: 11<br>IgE mediated reaction/anaphylaxis: 3<br>AERD*: 2<br>Other/unspecified: 4 |

*AERD = Aspirin exacerbated respiratory disease

| Table 2: Desensitization (n=20) | |
|---|---|
| **Indication, n (%)** | ACS: 18 (90)<br>TAVR: 2 (10) |
| **Target Dose, n (%)** | 81 mg: 16 (80)<br>325 mg: 4 (20) |
| **Median time to desensitization, hh:mm** | All groups: 5:01<br>81 mg: 4:13<br>325 mg: 12:23 |
| **Premedication Given, n (%)** | Yes: 11 (55)<br>Montelukast 10 mg: 9 (45)<br>IV diphenhydramine 25 mg: 11 (55)<br>Prednisone 60 mg: 2 (10) |
| **Reaction requiring rescue medication, n (%)** | Yes: 2 (10)<br>No: 18 (90) |
| **Rescue medication given, n** | IV diphenhydramine 25 mg: 2 |
| **Reaction provoking dose, n** | First dose (20.25 mg): 1<br>Second dose (20.25 mg): 1 |
| **Primary Outcome, n (%)** | Yes: 18 (90)<br>No: 2 (10) |
| **Completed desensitization, n (%)** | Yes: 20 (100)<br>No: 0 (0) |

## Summary

- 2 of 20 patients received IV diphenhydramine after administration of aspirin. In one patient, there was no documentation of reaction. The other patient experienced asymptomatic bradycardia; it was unclear if this was a reaction to aspirin or not. Both patients were able to continue the protocol and complete desensitization.
- All 20 patients included were able to complete the desensitization process.
- Most prescribers targeted aspirin 81 mg. The median time to desensitization was approximately 4 hours, demonstrating a rapid and safe approach to desensitization that avoids complicated compounding of serial dilutions as suggested in other reported protocols.
- Only 2 patients had a history of AERD, this population may be at higher risk of experiencing a reaction during desensitization, especially a respiratory reaction, and was not able to be effectively evaluated here.
- Most patients were desensitized to 81 mg, these results may not reflect desensitization to 325 mg.
- Premedication is optional in this protocol; allowing montelukast, diphenhydramine, and/or prednisone. There was variability among patients in terms of this making it difficult to assess its benefit.
- These results support the safety of rapid aspirin desensitization, specifically in individuals with acute coronary syndrome.
- Limitations to this evaluation include its retrospective design, its small sample size, and lack of variability in allergy history and indication.

**Disclosure**
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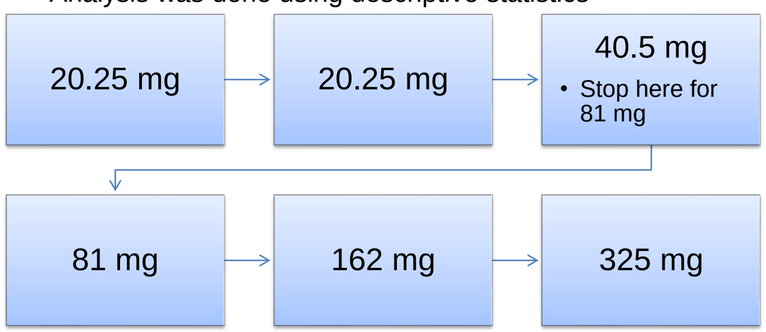


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# Evaluation of QTc Prolongation and Other Adverse Events Associated With Droperidol Use

Casey Bardsley, PharmD; Kelly McAllister, PharmD, MBA, BCPS; Patrick Allen, PharmD; Jessica Schad, PharmD, BCPS

Carilion Clinic
Department of Pharmacy Services

## Background

- Droperidol is a dopamine antagonist approved for post-operative nausea and vomiting (PONV) and is used off-label for acute agitation and migraines
- It has been associated with adverse events (ADEs) including QTc prolongation, significant sedation, and extrapyramidal symptoms (EPS)
- In 2001, the FDA mandated a “black box” warning requiring an electrocardiogram (EKG) prior to administration to assess QTc prolongation
- Despite recent evidence suggesting appropriate droperidol doses are likely safe, concern still exists
- Based on these data, institutional guidelines were revised to allow doses ≤1.25 mg without an EKG
- This review evaluated droperidol use at Carilion and associated adverse events

## Methods

**Study Design:** Quality Assurance/Quality Improvement (QA/QI), retrospective, single-center, descriptive review

**Endpoints**

- Primary: Composite of droperidol ADEs (QTc prolongation, over sedation, EPS)
- Secondary: Individual incidence of droperidol ADEs, dose based on indication and route, concomitant QTc prolonging agents, and EKG ordered prior to droperidol doses >1.25 mg

**Population:** Patients admitted January 2019-September 2020, received >1.25 mg of droperidol, other doses randomly selected to N=100

**Data Analysis:** Descriptive statistics

**Definition**: QTc prolongation ≥500 msec

## Results

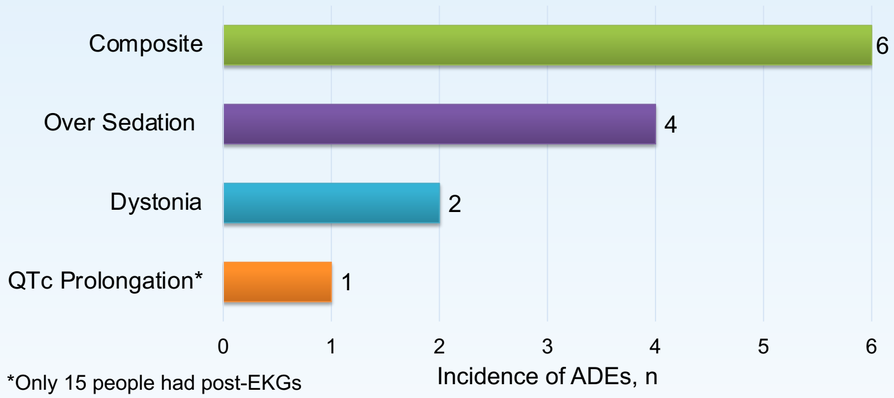
**Table 1. Baseline Demographics (N=100)**

| | |
|---|---|
| Age, years, median (IQR) | 46.7 (31.9-59.4) |
| Baseline QTc, n=57, median (IQR) | 443 (425-463) |
| RFs QTc prolongation, n | |
| Female | 69 |
| Hepatic dysfunction | 27 |
| PTA QTc prolonging medications, n | |
| Antiemetics | 38 |
| Antidepressants | 15 |
| Antipsychotics | 8 |
| Other | 5 |

RF: Risk Factors PTA: Prior to arrival

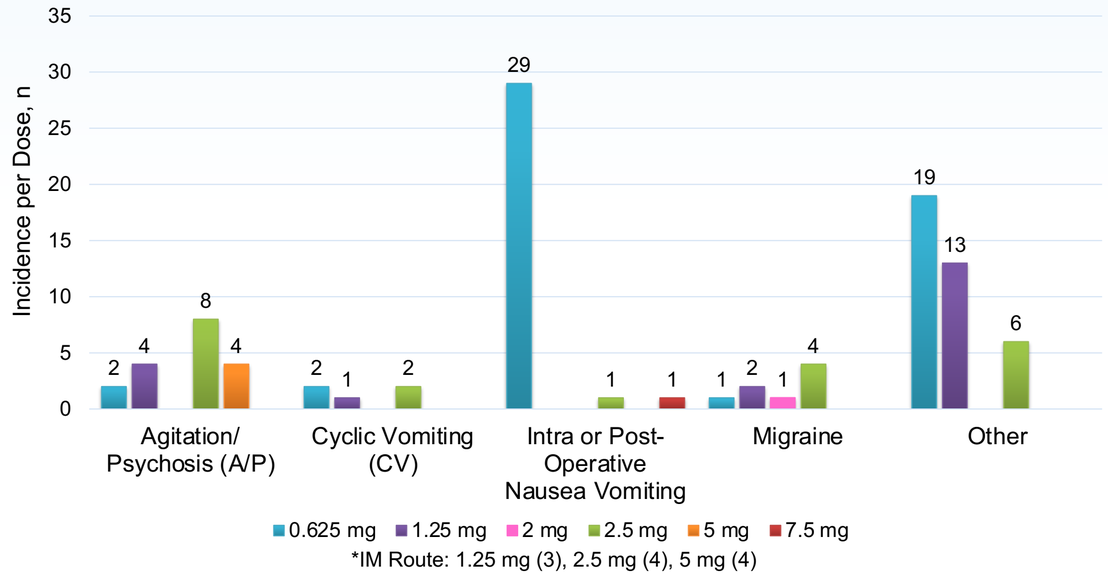
## Results

**Figure 1. Adverse Events (N=100)**



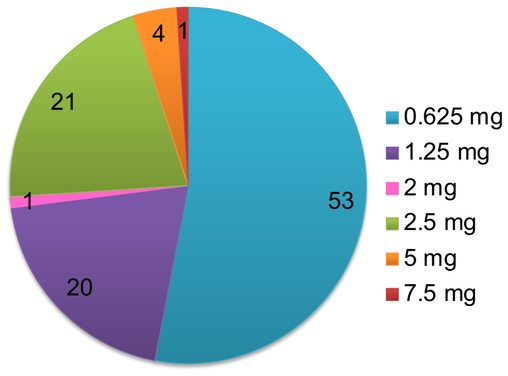

*Only 15 people had post-EKGs

**Figure 2. Dose Based on Indication and Route (N=100)**




*IM Route: 1.25 mg (3), 2.5 mg (4), 5 mg (4)

**Figure 3. Incidence of Doses (N=100)**




*A total of 17 repeat doses ranging from 0.625-2.5 mg were given to 9 patients

**Table 2. Electronic Medical Record (EMR) Questions Answered Correctly, n (%) (n=19)**

| | ≤1.25 mg (n=14) | >1.25 mg (n=5) |
|---|---|---|
| 1. Dose >1.25 mg? | 11 (78.6) | 4 (80) |
| 2. EKG prior to droperidol? | - | 2 (40) |
| 3. QTc >440 males or >450 females? | - | 2/2 (100) |
| 4. Rationale provided? | - | 2/2 (100) |

**Table 3. Concomitant QTc Prolonging Agents (N=100)**

| | |
|---|---|
| Concomitant QTc Prolonging Agents, n | |
| Antiemetics | 49 |
| Antipsychotics | 10 |

**Table 4. ADEs Based off Cumulative Dose (n=7)**

| | Over Sedation | Dystonia | QTc Prolongation |
|---|---|---|---|
| <1.25 mg | 3 | 0 | 0 |
| 1.25-2.5 mg | 0 | 2 | 1 |
| >2.5 mg | 1 | 0 | 0 |

## Conclusions

- Low overall incidence of ADEs, the most common was over sedation
- Most low dose (<1.25 mg) droperidol was used for intra-operative nausea vomiting, medium dose (1.25-2.5 mg) for general nausea and vomiting, and high dose (>2.5 mg) for A/P
- 9 patients received repeat doses
  - Most common dose was 1.25 mg
  - No ADEs were seen in these patients
- Most common concomitant QTc prolonging agents were other antiemetics
- 52.6% of EKGs were ordered prior to droperidol administration and only 1 patient experienced QTc prolongation
  - The patient was administered 2 antiemetics and 2 doses of droperidol 10 hours apart
- Limitations: Retrospective chart review, single hospital data source, small patient population, EMR order update later than anticipated
- Current practices seem to be safe, therefore the alert minimum for requiring an EKG with doses >1.25 mg will be increased to >2.5 mg

## References

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**Disclosure:** Authors of this presentation have no conflicts of interest to disclose

# Comparison of protocols for prophylaxis of atrial fibrillation post-cardiac surgery

Vanessa Pellegrino, PharmD; Jonathan Zalman, PharmD; Chase Barnes, PharmD; Meghan Kamrada, PharmD, BCPS; Robert Andrews, PA-C; Ashley Milkovits, PharmD, BCCCP

*Department of Pharmacy, Carilion Roanoke Memorial Hospital*

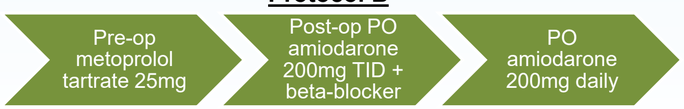
CARILION CLINIC
*Department of Pharmacy Services*

## Background

- Postoperative atrial fibrillation (POAF) is a common complication after cardiac surgery that can lead to unfavorable outcomes.[1]
- To minimize occurrence of POAF, CRMH developed a protocol for prophylaxis in cardiac surgery patients (Protocol A).
- All eligible patients were placed on the protocol for a 21-day duration. This protocol led to discontinuation in many patients due to the side effects caused by the amiodarone infusion.
- The POAF prophylaxis protocol was updated in June 2020 (Protocol B), omitting the amiodarone infusion in anticipation of lower rates of protocol discontinuation, and subsequently, lower rates of POAF.

**Protocol A**


**Protocol B**




## Methods

**Objective**
- Compare rates of POAF between the two protocols

**Study Design**
- Single-center, retrospective, quasi-experimental study
- Time period: July 1, 2019 – October 31, 2019 (Protocol A) and July 1, 2020 – October 21, 2020 (Protocol B)
- Location: Carilion Roanoke Memorial Hospital, a 763-bed tertiary care facility located in Roanoke, VA

**Population**
- Adult patients initiated on the POAF prophylaxis protocol, both an intention-to-treat (ITT) and per-protocol population
- The per-protocol definition included initiation of the protocol by post-op day 1 and continuation through at least post-op day 5, as well as use of IV amiodarone in Protocol A

**Endpoints**
- 1º endpoint: POAF in the ITT population
- 2º endpoints: POAF in the per protocol population, % meeting per protocol definition, CABG only patients with POAF, LOS post-surgery, 30-day readmission with POAF, in-hospital CVA, in-hospital mortality, and safety outcomes

**Data Collection/Analysis**
- Data was extracted from the Epic electronic medical record using a standardized instrument
- Descriptive and inferential statistics were used to analyze data. Analysis of nominal variables was done using Chi-Square/Fisher's Exact text and continuous variables were analyzed using a t-test. Analysis was performed through Microsoft Excel and SAS Studio

## Results

**Protocol A: July-October 2019**

n=151 patients underwent cardiac surgery

n=58 (38.4%) were initiated on the POAF prophylaxis protocol

n=11 (19.0%) met the per protocol definition

p<0.01

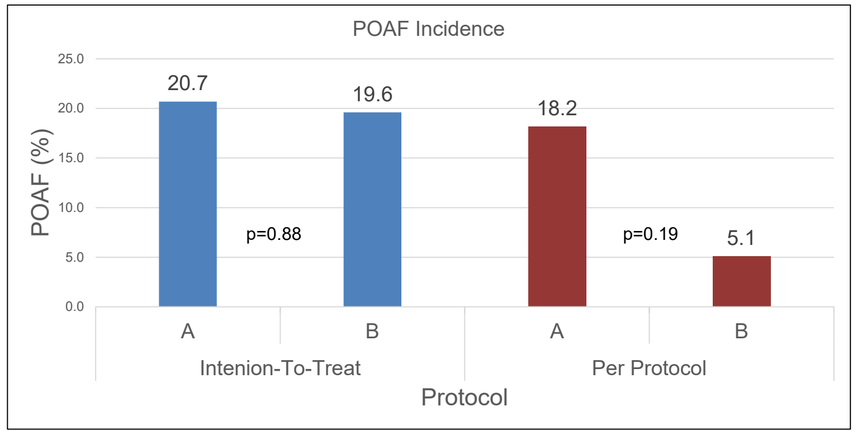
**Protocol B: July-October 2020**

n=113 patients underwent cardiac surgery

n=51 (45.1%) were initiated on the POAF prophylaxis protocol

n=41 (80.3%) met the per protocol definition

| Baseline Characteristics | Protocol A N=58 | Protocol B N=51 | P-Value |
|---|---|---|---|
| Age, mean ±SD | 61.8 ± 11.3 | 64.9 ± 10.5 | 0.14 |
| Male sex, n (%) | 53 (91.4%) | 31 (72.5%) | 0.01 |
| Elective Surgery, n (%) | 35 (60.3%) | 18 (35.3%) | <0.01 |
| CAD, n (%)<br>Stable<br>UA/NSTEMI<br>STEMI | <br>30 (51.7%)<br>19 (32.8%)<br>3 (5.2%) | <br>24 (47.1%)<br>15 (29.4%)<br>11 (21.6%) | 0.03 |
| Type of Surgery, n (%)<br>CABG<br>Valve<br>Combo | <br>49 (84.5%)<br>6 (10.3%)<br>3 (5.2%) | <br>46 (90.2%)<br>3 (5.9%)<br>2 (3.9%) | 0.68 |




- Post-hoc analysis showed that a sample size of n=41,746 would have been needed to detect a statistically significant difference in the intention-to-treat population.

| Secondary Endpoints | Protocol A | Protocol B | P-Value |
|---|---|---|---|
| Subgroup of CABG only patients with atrial fibrillation | 12/49 (24.5%) | 9/46 (19.6%) | 0.56 |
| LOS post-surgery (days), mean ± SD | 6.67 ± 6.9 | 6.47 ± 2.7 | 0.838 |
| 30-day readmission with atrial fibrillation, n (%) | 2 (3.4%) | 1 (2.0%) | 1.00 |
| In-hospital CVA | 0 | 0 | - |
| In-hospital mortality | 0 | 0 | - |
| Safety Outcomes, n (%)<br>Bradycardia<br>Hypotension<br>Qtc ≥500 ms<br>Torsades | <br>3 (5.2%)<br>21 (36.2%)<br>7 (12.1%)<br>0 | <br>2 (3.9%)<br>29 (56.9%)<br>11 (21.6%)<br>0 | <br>1<br>0.073<br>0.183<br>- |

**Definitions**: Bradycardia, <55 bpm; Hypotension, <100 mmHg SBP or <60 mmHg MAP

## Conclusions

- A higher percentage of patients were initiated on Protocol B versus Protocol A
- There was a significantly higher number of patients in Protocol B that met the per protocol definition. This is mainly due to most patients in Protocol A not receiving IV amiodarone infusion
- There was not a statistically significant difference in incidence of atrial fibrillation in the intention-to-treat population
- In the per protocol population, there was a large difference in incidence of atrial fibrillation, although not statistically significant. This is likely due to only 11 patients in Protocol A meeting the per protocol definition
- There was no difference between the two groups in other secondary outcomes
- One major limitation is that this study was significantly underpowered to detect a statistically significant difference
- Overall, due to the higher amount of protocol compliance with Protocol B and numerically lower rates of POAF in the per protocol population, our results favor using this protocol for prophylaxis of POAF

## References

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**Disclosure**
Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
All authors: Nothing to disclose

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# Evaluation of discharge antibiotic prescribing patterns in urinary tract infections and pneumonia

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Carilion Clinic
Department of Pharmacy Services

## Background

- Inappropriate antibiotic use includes not only non-indicated use, but also inappropriate antibiotic selection, duration, and dose.[1]
- Inappropriate antibiotic use has been associated with infection recurrence, adverse effects, antibiotic resistance, and collateral damage such as *Clostridioides difficile* infection.
- Previous single center studies have shown that despite inpatient antimicrobial stewardship programs, inappropriate antibiotic use still occurs at higher than anticipated rates.[2,3]
- Carilion Roanoke Memorial Hospital (CRMH) has both a robust inpatient antimicrobial stewardship program as well as several internal treatment guidelines.

## Methods

**Objective**

- Evaluate the rate of appropriateness of discharge antibiotic regimens for pneumonia and urinary tract infections (UTI)

**Design**

- The study was a retrospective cross-sectional study conducted at Carilion Clinic: Roanoke Memorial Hospital
- The study was determined by the Carilion Clinic Institutional Review Board not to qualify as human research.

| Inclusion | Exclusion |
|---|---|
| • Adults > 18 years of age<br>• Discharged from select progressive care and medical surgical units<br>• Prescription for an antibiotic for either pneumonia or UTI from June 1, 2019 through February 29, 2020 | • Concurrent bacteremia, endocarditis, osteomyelitis, prostatitis, candiduria, aspiration pneumonia<br>• Discharged on chronic or suppressive antibiotics<br>• Discharged against medical advice |

**Outcomes**

- Our primary outcome was rate of appropriateness of discharge antibiotic selection, dose and duration for pneumonia and urinary tract infections
- Appropriateness of antimicrobial therapy was considered selection of an agent at a dose, frequency and duration specified in Carilion guidelines or one that was susceptible to the organism if Carilion guideline options were not able to be used based on patient specific factors.

**Analysis**

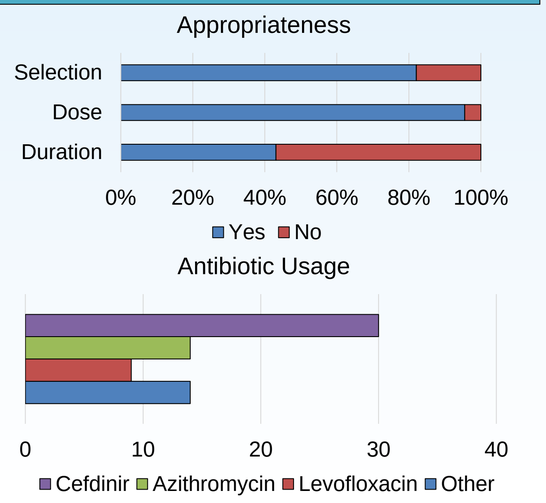
- Objectives were analyzed descriptively using frequencies or median with inter-quartile range (IQR) as indicated

## Results

### Pneumonia n=50

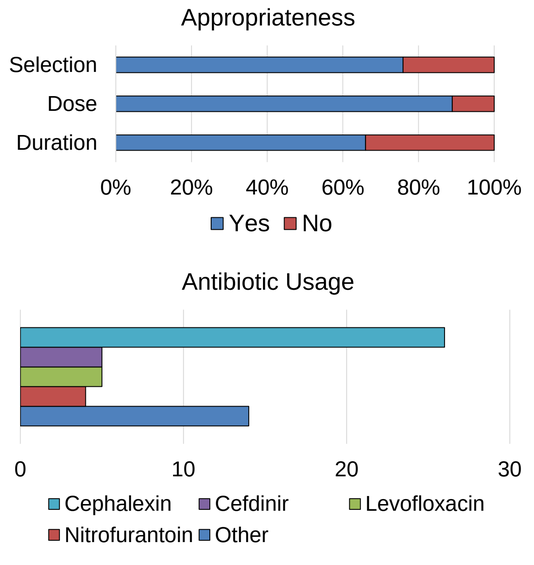
| | |
|---|---|
| Age, median (IQR) | 70 (60-79) |
| Male, n (%) | 20 (40) |
| Chronic Pulmonary Disease, n (%) | 19 (38) |
| CURB-65, median (IQR) | 1 (1-2) |
| Hospital Length of Stay, days, median (IQR) | 4 (4-6) |
| Discharge Disposition, n (%) | |
| Home | 40 (80) |
| SNF/LTC | 7 (14) |
| Other | 3 (6) |
| Pneumonia, n (%) | |
| Community Acquired | 38 (76) |
| Hospital/Ventilator Associated | 12 (24) |

Definitions:
CURB-65 - 1 point for each of: Confusion, Uremia ≥ 20 mg/dL, Respiratory Rate ≥ 30 breaths/minute, systolic blood pressure ≤ 90 mmHg or diastolic blood pressure ≤ 60 mmHg, and age ≥ 65 years
SNF – Skilled Nursing Facility
LTC – Long Term Care Facility



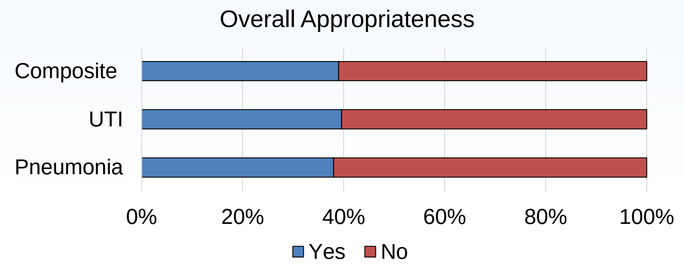

### Urinary Tract Infection n=50

| | |
|---|---|
| Age, median (IQR) | 73 (56-79) |
| Male, n (%) | 13 (26) |
| Foley Catheter, n (%) | 5 (10) |
| Nephrostomy Tube, n (%) | 2 (4) |
| Hospital Length of Stay, days, median (IQR) | 4 (3-5) |
| Discharge Disposition, n (%) | |
| Home | 38 (76) |
| SNF/LTC | 12 (24) |
| Urinary Tract Infection, n (%) | |
| Uncomplicated Cystitis | 19 (38) |
| Complicated Cystitis | 19 (38) |
| Pyelonephritis | 12 (24) |
| Organism Isolated, n (%) | |
| Total Isolates | 61 (100) |
| *Escherichia coli* | 21 (34.4) |
| *Klebsiella pneumoniae* | 8 (13.1) |
| *Proteus mirabilis* | 5 (8.2) |
| Other | 27 (44.3) |




### Outcomes

| | Pneumonia | Uncomp. Cystitis | Comp. Cystitis | Pyelo-nephritis |
|---|---|---|---|---|
| Hospital Antibiotic Duration, days, median (IQR) | 4 (3-5) | 3 (1.1-3) | 3.5 (2.3-4) | 3.5 (3-4.8) |
| Discharge Antibiotic Duration, days, median (IQR) | 3 (2-5) | 6 (2.6-4) | 4 (3-6) | 10 (5.5-13.3) |




## Summary

- Overall, >**60%** of reviewed prescriptions were inappropriate in some way
- The most common cause of an inappropriate prescription was an inappropriate duration of therapy
- Limitations to our study include sufficiently determining appropriateness retrospectively and from an electronical medical record
- Pharmacists are now reviewing appropriateness of discharge prescriptions
- Future antimicrobial stewardship efforts should target these areas of discharge prescription prescribing

**Disclosure**
All authors have no relevant disclosures

## References

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# EVALUATION OF A NURSING DRIVEN ELECTROLYTE REPLETION PROTOCOL IN THE CRITICAL CARE SETTING

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## Background

- In the critical care setting, protocol driven interventions have been proven to decrease morbidity, mortality, and improve physician workflow.[1,2]
- Effective repletion of potassium, phosphorous and magnesium may lead to a decrease in cardiac arrhythmias, improved ventilation weaning and better prognosis.[1,3,4]
- Studies show that nursing and/or multidisciplinary team electrolyte repletion leads to significant improvement in appropriate and effective electrolyte replacement.[2]

## Objectives

- To analyze the safety and efficacy of Carilion's nursing driven electrolyte repletion protocol.
- Evaluate if pharmacy intervention is needed to improve the safety or efficacy of the current nursing driven electrolyte replacement protocol.

## Methods

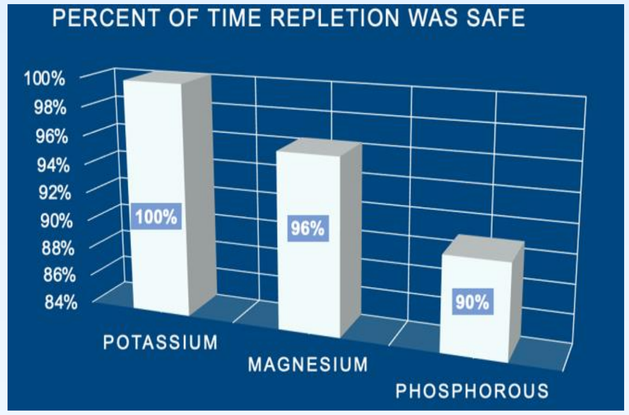
- Multicenter retrospective chart review
- Inclusion Criteria
  - Adults ordered the medical ICU nursing electrolyte replacement protocol
  - Admitted to an ICU in CNRV or Carilion Roanoke Memorial Hospital (CRMH) between August 2017 and 2020
- Primary Outcome
  - Safety of electrolyte repletion. Electrolyte administration was considered safe if patients met all safety parameters established by the protocol, including:
    - Serum creatinine ≤1.5 mg/dL
    - No increase in serum creatinine of 0.5 mg/dL in the previous 24 hours
    - >40 kg in body weight
    - No end stage renal disease or on continuous renal replacement therapy
    - Urine output must not be <30 mL/hr
- Secondary Outcome:
  - Efficacy of electrolyte repletion. Electrolyte repletion was considered efficacious if the correct electrolyte dose was administered according to the protocol.

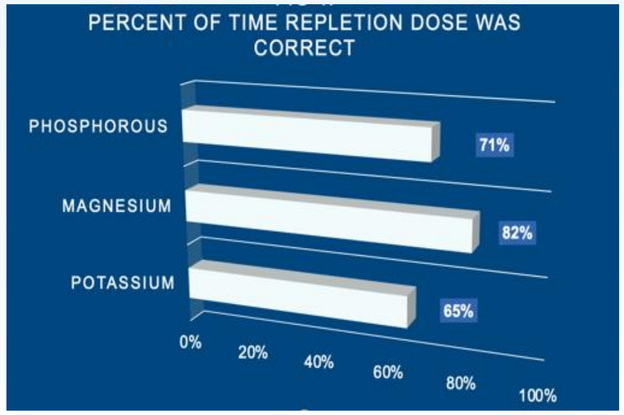
## Results

**Comparison Between Hospitals**

| Outcome | CNRV n (%) | CRMH n (%) |
|---|---|---|
| Total Electrolyte Administrations | 152 (80) | 37 (20) |
| Safe Administrations (Met Safety Parameters) | 148 (97.4) | 27 (73) |
| Efficacious Administrations (Correct Dose) | 109 (71.7) | 23 (62.2) |

**Results at Carilion New River Valley Medical Center**




## Conclusions

- Trends with the medical ICU nursing driven electrolyte replacement protocol varied tremendously between facilities.

CNRV

- Accounted for 80% of the datapoints.
- Electrolytes were safely repleted 97.4% of the time.
  - The nursing driven electrolyte replacement protocol is safe for medical ICU patients at CNRV.
- The correct replacement dose was administered 71.7% of the time.
  - Overall efficacy of electrolyte replacement by nursing staff has room for improvement.
- Average time to electrolyte repletion was 3 hours and 39 minutes.
- There is opportunity to improve time to repletion.

CRMH

- Accounted for 20% of datapoints.
- Electrolytes were safely replaced 73% of the time.
- The correct replacement dose was administered 62.2% of the time.
- Small sample size may have skewed the results at CRMH.

## Future Considerations

CNRV: No change to protocol needed at this time. Confirm nurses know where to locate the protocol.
CRMH: Consider further evaluation of electrolyte protocol use in the ICU.

## References

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Disclosure
•The authors of this presentation have nothing to disclose.

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CARILION CLINIC

# Evaluation of Adherence to E.A.S.E. ENTEREG REMS Program in Colorectal Enhanced Recovery After Surgery

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## Background

Post-operative ileus is impaired gastrointestinal motility occurring after surgery. Alvimopan is a peripherally acting mu-receptor antagonist that allows for faster GI recovery without affecting the analgesic properties of opioids administered for post-operative pain.[1] It is currently a part of the order set for colorectal enhanced recovery after surgery (ERAS) at Carilion Roanoke Memorial Hospital (CRMH). The first dose is to be administered preoperatively, then continued post-operatively until discharge or return of bowel function for a maximum of 15 doses.[2] It is contraindicated in patients who have taken therapeutic opioid doses for the past week. To receive the medication for use, hospitals must enroll in and follow the E.A.S.E. ENTEREG REMS Program, which was established due to increased incidence of ischemic cardiovascular events in long-term alvimopan use.[3]

## Methods

**Project Design**: Retrospective chart review

**Objectives**

- **Primary**: Percentage compliance with E.A.S.E.® ENTEREG REMS Program
- **Secondary:** Efficacy tracking endpoints and evaluation of short courses (therapy length less than 15 doses)

**Setting and Population**

- The project was conducted at CRMH and determined to be exempt from Institutional Review Board oversight
- All adult patients 18 years of age and older who received at least one post-operative dose of alvimopan were included

**Data Collection:** A report was generated based on the ERX codes for alvimopan administration between January 1st, 2019 through December 31st, 2019, and a random number generator was used to select a portion of these patients for inclusion. Medical chart review was conducted for qualifying patients

**Analytical Plan:** Descriptive statistics were used for data analysis and Excel version 16.19 was used to run statistical testing

## Results

- All patients were ordered and administered less than 15 doses of alvimopan
- There was no documentation of opioid use in the past 7 days to indicate that alvimopan would be contraindicated
- 20% of patients did not receive their pre-operative dose of alvimopan
- Short courses were mainly due to meeting the clinical goal of return of bowel function or due to hospital discharge (62% and 22%, respectively)
- 23 patients missed at least one post-operative dose

**Table 1: Baseline Patient Characteristics (N=50)**

| | |
|---|---|
| Age, mean ±SD | 61 ±17 |
| Sex, female, n (%) | 30 (60%) |
| Height, mean ±SD (cm) | 169.7 ±11 |
| Weight, mean ±SD (kg) | 89.5 ±26 |
| BMI, mean ±SD (kg/m$^2$) | 30.9 ±7 |
| Race, n (%) | |
| White | 47 (94%) |
| Black or African American | 3 (6%) |
| ESRD, n (%) | 0 (0%) |
| Child-Pugh C, n (%) | 0 (0%) |
| Surgery Type, n (%) | |
| Large Bowel Resection | 1 (2%) |
| Colectomy** | 11 (22%) |
| Sigmoid colectomy** | 9 (18%) |
| Rectopexy | 2 (4%) |
| Multiple | 9 (18%) |
| Other | 18 (36%) |
| Case Type, n (%) | |
| Laparoscopic | 36 (72%) |
| Converted to Open | 2 (4%) |

**Full or partial

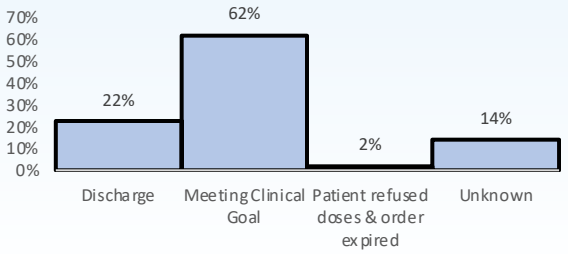


**Figure 1: Short Course Cause**
(N=50)

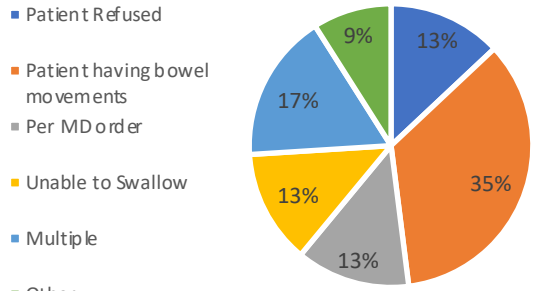


**Figure 2: Missed Dose Cause**
(N=23)

**Table 2: Efficacy Endpoints**

| | |
|---|---|
| Time to Solid Food* | 31.0 hours |
| Time to Post-op Bowel Function* | 43.4 hours |
| Time to hospital discharge* | 70.8 hours |

*Mean

**Table 3: Short Course Evaluation**

| | |
|---|---|
| Patients with 1 pre-op dose administered | 80% |
| Number of post-op doses administered* | 3±2 |
| Percentage of ordered doses administered** | 19% |

*Median±SD **Mean

## Summary

- Alvimopan was consistently ordered for appropriate duration through the ERAS order set
- Although the current order instructions limit use to laparoscopic cases, approximately one-quarter of doses were administered to patients after open surgical cases
- There was no documentation of opioid use in the past 7 days to indicate that alvimopan would be contraindicated. However, 19% of patients were dispensed an opioid in the month prior to admission for surgery
- Most patients had a short course of alvimopan less than 15 doses that was appropriate based on their clinical course
- The most common causes of missed doses indicate that orders are not discontinued after the first bowel movement as per the order instructions

**Recommendations:** As recent studies provide evidence that alvimopan is safe and effective for open surgical cases, the phrasing to not order or administer to open cases should be removed from the order instructions. There would be benefit from updated education on the process for alvimopan order discontinuation after the first bowel movement and including adding questions about opioid use during presurgical testing.

## References

1. Chamie K, Golla V, Lenis AT, et al. Peripherally Acting μ-Opioid Receptor Antagonists in the Management of Postoperative Ileus: a Clinical Review. J Gastrointest Surg. 2020.
2. Alvimopan [package insert]. Whitehouse Station, NJ: Merck & Co., Inc; 2019
3. E.A.S.E. ENTEREG REMS Program Overview. Whitehouse Station, NJ: Merck & Co., Inc; 2015.

**Disclosure:** Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
All Authors: Nothing to disclose

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# Evaluation of a Pharmacist-Driven Pediatric Dose Rounding Protocol

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**Carilion Clinic - Roanoke Memorial Hospital and Carilion Children's Hospital**

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## Background

- Medication errors are three times more likely to occur in pediatric populations due to calculation and rounding errors associated with weight-based dosing and the misplacement of decimal places.[1]
- Beginning on June 30, 2020, Carilion Medical Center implemented a pharmacist-driven dose rounding protocol for pediatric patients. This protocol allows pharmacists to round medications meeting protocol criteria to enhance accuracy and convenience of administration or to achieve a commercial package size or dosage strength.

## Methods

- **Purpose**: to determine the impact of a pharmacist-driven pediatric dose rounding protocol on the rounding of medications, measurable dosing of inpatient and discharge prescriptions, and potential cost savings
- **Design**: single center, quasi experimental study
- **Population**: included patients ≤18 years of age prescribed intravenous (IV) or oral liquid medications during an inpatient, observation, or emergency department encounter at Carilion Medical Center during August 1-31, 2019 (pre-group) or August 1-31, 2020 (post-group)
- **Data collection**: patient characteristics, medication, dose, volume, package size, number of administrations, cost, and discharge prescription details
- **Primary endpoint**: rate of measurable dose volumes for IV and oral liquid medications
- **Secondary endpoints**: number of discharge prescriptions impacted by pharmacist dose rounding, an evaluation of protocol impact (number of patients with medications dose rounded per protocol, number of medications dose rounded per protocol, and pharmacist adherence with protocol exclusions), and medications dose rounded to limit the number of packages per dose were assessed using a cross sectional analysis of the post study group

## Results

**Table 1. Baseline Patient Characteristics (n = 477)**

| | Pre-Group (n = 273) | Post-Group (n = 204) |
|---|---|---|
| **Age:** years, median (range) | 9 (0-18) | 4 (0-18) |
| **Sex:** female, n (%) | 95 (47) | 150 (55) |
| **Hospital Unit**, n (%) | | |
| • Pediatric Medical/Surgical | 244 (43) | 207 (43) |
| • Pediatric Intensive Care | 32 (5) | 51 (10) |
| • Neonatal Intensive Care | 68 (12) | 64 (13) |
| • Emergency Department | 187 (33) | 143 (29) |
| • Perioperative Units | 38 (6) | 5 (1) |
| • Wellborn Nursery | 3 (1) | 18 (4) |
| **Common Medications**, n (%) | | |
| • Analgesics | 191 (39) | 180 (33) |
| • Antibiotics | 136 (28) | 154 (27) |
| • Antiemetics | 94 (19) | 39 (7) |

**Figure 1: Primary Outcome, Rate of Measurable Dose Volumes**

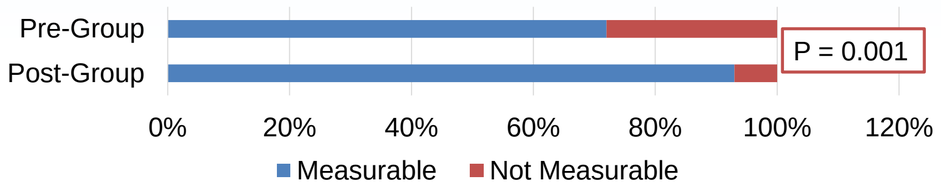



**Figure 2: Secondary Outcome, Discharge Prescriptions**

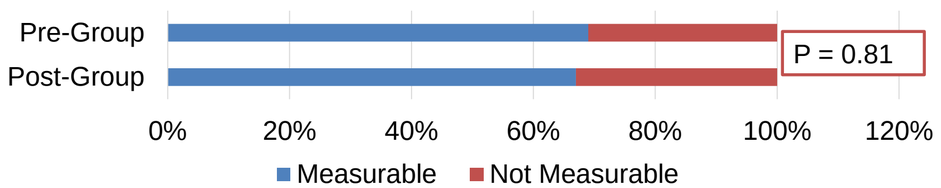
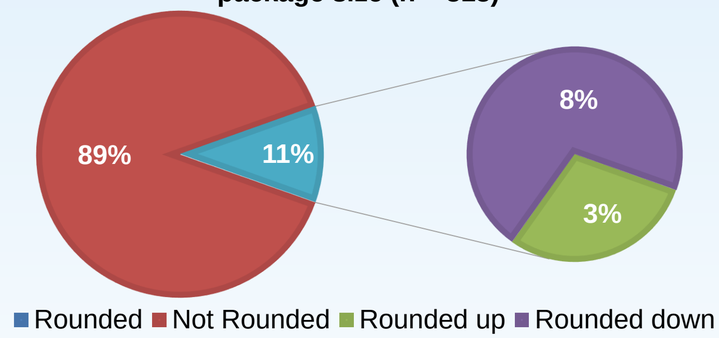



**Table 2. Secondary Outcomes: Protocol Evaluation**

| | |
|---|---|
| **Patients who had medications dose rounded**, n (%) | 197 (97) |
| **Number of medications dose rounded**, n (%) | 313 (64) |
| **Discharge prescriptions that matched inpatient orders that were dose rounded by pharmacists**, n (%) | 21 (38) |
| **Protocol Adherence**: | |
| • Excluded medications rounded, n (%) | 0 (0) |
| • Medications rounded outside 10%, n (%) | 0 (0) |
| • Home medications rounded, n (%) | 27 (9) |

**Figure 4: Cost Analysis**
**Medications that were rounded up or down to a whole package size (n = 313)**




## Summary

- There was a statistically significant difference in the number of measurable dose volumes ordered and administered to patients after the implementation of the pediatric dose rounding protocol at CRMH.
- Twenty-one discharge prescriptions matched inpatient orders that were dose rounded by pharmacists and there was not a statistically significant difference in the number of patients discharged on a measurable volume of medication.
- Limitations of our study include the retrospective study design, patient identification through Sentri7, restricted number of discharge prescriptions, use of average wholesale cost, impact of COVID on census and types of medication prescribed, and the syringe size for evaluation.
- The utility of building dose rounding capabilities or standardization of doses into EPIC orders should be considered for antibiotics and analgesics.
- Expansion of the dose rounding protocol should include discharge prescriptions and consider medications that were originally excluded from the protocol.

**Disclosure:**
All authors report no potential conflicts of interest.

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# Evaluation of Multi-dose Container Dispensing to Observation Patients

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Department of Pharmacy Services

## Background

- Medicare Part B does not cover maintenance medications for patients under observation status, resulting in patients having to pay out of pocket.
- At our institution, approximately 30% of medication histories completed by pharmacy technicians are updated after admission orders are placed resulting in the prescribing of discontinued or unnecessary medications.
- “As-needed” medications are frequently ordered from the prior to admission (PTA) medication list and may not be clinically necessary during a short observation stay.
- Ordering these potentially unnecessary medications increases pharmacy workload, pharmacy costs, patient costs and medication waste.

## Methods

**Objective**

- To examine dispensing of non-critical multi-dose containers to patients admitted under observation status and the effect on pharmacy workflow and costs to patients and pharmacy.

**Project Design**

- Single center, retrospective medication use evaluation
- Carilion Clinic Roanoke Memorial Hospital is a 763-bed tertiary care facility located in Roanoke, VA. The Carilion Clinic Institutional Review Board determined this project qualified as quality assurance/quality improvement and not human subjects research.

**Setting and Population**

- Observation status patients who were ordered one of nine pre-determined multi-dose containers (Table 1) from their PTA medication list were included.
- Patients were excluded if the multi-dose container was not on their PTA list or if they were switched to inpatient status.

**Data Collection**

- Medications dispensed in January 2020 were included.
- Data collected includes number of multi-dose container dispenses per product, number of administrations, length of stay, number of re-dispenses, number of pharmacy returns, total cost of medication to patient (AWP), cost of medication to pharmacy (AWP), and length of stay.

**Analytical Plan**

- Descriptive statistics were used to analyze the data.

## Results

**Table 1: Pre-Determined Multi-dose Containers**

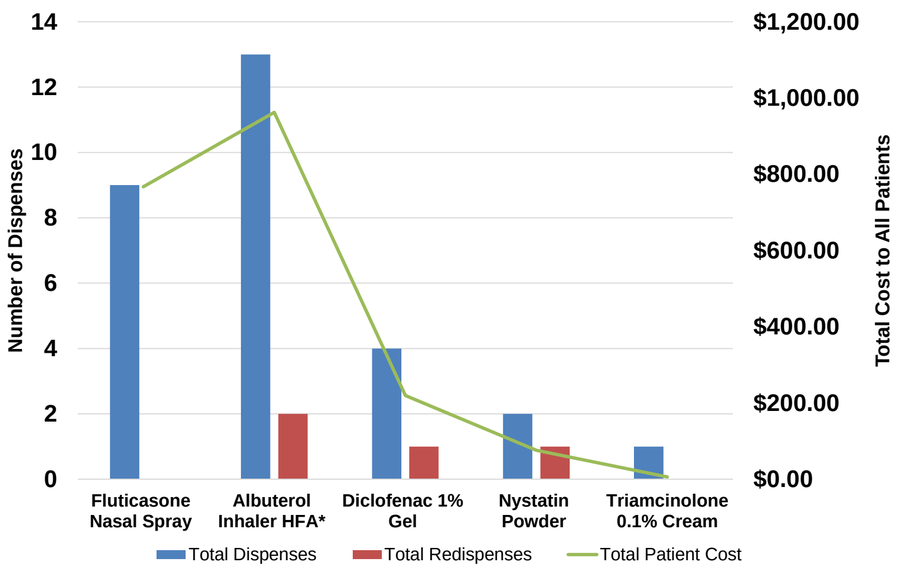
| Medication | Package | Average Wholesale Price |
|---|---|---|
| **Fluticasone Propionate Nasal Spray** | 16 gm | $85.26 |
| **Albuterol Sulfate HFA** | 8.5 gm | $74.02 |
| **Diclofenac Gel 1%** | 100 gm | $54.82 |
| **Nystatin 100,000 units/gm powder** | 15 gm | $37.95 |
| Nystatin 100,000 units/gm cream | 15 gm | $17.50 |
| Icy Hot Cream | 90 gm | $11.96 |
| **Triamcinolone Acetonide 0.1% cream** | 15 gm | $5.85 |
| Hydrocortisone 1% topical ointment | 25 gm | $4.25 |
| Saline Nasal Spray | 44 mL | $1.19 |

- Of the nine pre-specified medications evaluated in the time-frame there were five products with dispenses, represented in bold lettering

**Table 2: Finalized Data**

| | |
|---|---|
| Number of Patients | 47 |
| Total Multi-dose Container Dispenses | 29 |
| Total Multi-dose Container Returns | 4 |
| Mean Length of Stay | 45 hours |
| Mean Number of Administrations per Patient | 1.8 |
| Calculated Waste due to Re-dispenses | $202.96 |
| Total Monthly Cost to Pharmacy | $2,170.71 |
| Extrapolated Annual Pharmacy Cost | $26,048.52 |

**Figure 1: Comparison of Dispenses and Total Patient Cost**




* 36 albuterol inhalers were ordered, 35% of those were dispensed from the automated dispensing cabinet and administered to a patient.

## Summary

- Pharmacy workflow is minimally affected by dispensing of these products. Multi-dose containers contributed to 15 additional dispenses from the central pharmacy and only four products returned and re-dispensed.
- Albuterol inhalers, the most frequently dispensed multi-dose containers are dispensed from an automated dispensing cabinet limiting their impact on workflow.
- The largest impact seen with these products is the increased patient and pharmacy costs.
- Cost per product may not appear significant but considering less than two doses are administered there is a significant amount of drug waste and potential out-of-pocket costs to patients.
- Reducing the dispensing of these products would significantly decrease the annual pharmacy drug costs and waste.
- Limitations include the small sample size and the seasonal effect of medication usage.
- Future Steps:
  - Utilizing albuterol nebulizers as opposed to inhalers in this subgroup of patients would result in significant reduction in drug costs and waste.
  - January’s total cost difference between these products was $948.15, using AWP of $0.83 for nebulizers
- Recommendations based on this data include limiting albuterol inhaler dispenses to observation patients by utilizing albuterol nebulizers and educating providers about ordering potentially unnecessary bulk-container medications.

**Disclosure**

Authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:

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# Evaluation of re-initiation rate of unfractionated heparin infusions in patients with confirmed activated partial thromboplastin time greater than 180 seconds

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## Background

- Intravenous (IV) unfractionated heparin (UFH) is administered continuously for the treatment of deep vein thrombosis (DVT), pulmonary embolism (PE), and acute coronary syndrome (ACS).
- Providers will order UFH, based upon indication with or without bolus doses.
- Per a collaborative practice protocol, Carilion Clinic pharmacists manage UFH based on activated partial thromboplastin time (aPTT) levels. The therapeutic aPTT range for those on the ACS protocol is 55-85 seconds, while those on the VTE protocol 63-105 seconds is therapeutic goal.
- When an aPTT >180 seconds results and the accuracy of the sample is confirmed, the UFH infusion is held, and a 2-hour aPTT is ordered.
- The 2-hour aPTT will determine if the UFH infusion should be held or re-initiated at a lower rate.
- The current protocol does not give specific guidance regarding the rate at which the infusion should be re-started. The rate reduction results in collaboration between the pharmacist and the provider.

## Methods

**Objective**

- To evaluate if the six-hour aPTT level post-UFH re-initiation was therapeutic based on the percent reduction in the rate in patients who had an aPTT >180 seconds.

**Study Design**

- Single-center, retrospective review of UFH infusion dose adjustments in patients with at least one confirmed aPTT >180 seconds.
- Time period: March 2019 – April 2020
- Carilion Roanoke Memorial Hospital, a 763-bed tertiary care facility located in Roanoke, VA.

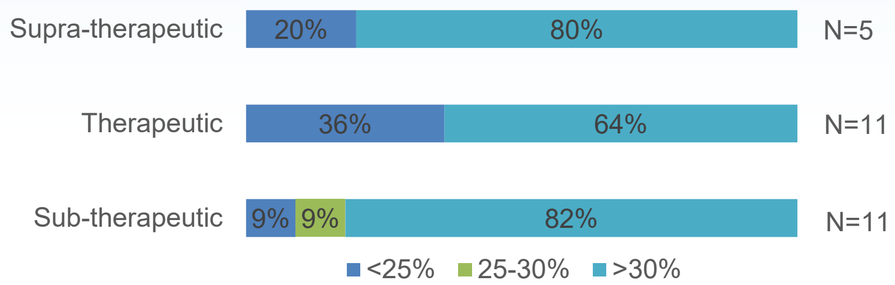
**Data Collection**

- Data was extracted from medical records using a standardized instrument.
- Data collected included: Age, gender, weight, and heparin indication.
- Descriptive and inferential statistics were used to analyze data.

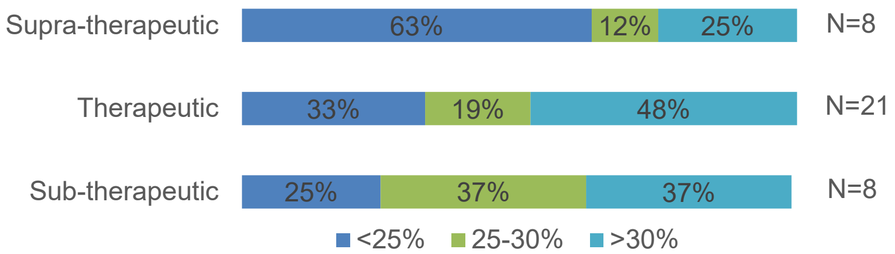
## Results

| Baseline Characteristics | N=64 |
|---|---|
| Age, mean ± SD | 68 ± 12.9 |
| Male sex, n (%) | 25 (39.1) |
| Weight (kg), mean ± SD | 83 ± 13.2 |
| Additional antiplatelet/anticoagulant, n (%) | 44 (68.8) |
| Indication<br>ACS protocol, n (%)<br>VTE protocol, n (%) | <br>27 (42.2)<br>37 (57.8) |
| Received an initial bolus, n (%) | 58 (90.6) |

**ACS Protocol:** 6-hour aPTT post UFH re-initiation based on % rate reduction (Goal aPTT: 55-85 sec), N=27




**VTE Protocol:** 6-hour aPTT post UFH re-initiation based on % rate reduction (Goal aPTT: 63-105 sec), N=37




| Study Objectives | N=64 |
|---|---|
| 6-hr aPTT levels post UFH re-initiation<br>ACS Protocol (N=27)<br>VTE Protocol (N=37) | <br>p=0.47<br>p=0.43 |
| Time UFH infusion was held (hours), median | 3.4 (1.1-19.3) |
| Safety<br>Minor Bleed, n (%) | <br>1 (1.6) |

## Summary

- In patients with an aPTT > 180 seconds, most received IV UFH per the VTE protocol (goal aPTT of 63-105 seconds).
- Majority of patients with an aPTT >180 seconds had a rate reduction >30% upon UFH re-initiation, regardless of the indication.
- There was no significant difference found between UFH rate reduction and the 6-hour aPTT post UFH re-initiation (ACS protocol p=0.47, VTE protocol p=0.43).
  - For ACS protocol patients in each rate reduction category, there was no significant difference in aPTT result.
  - For VTE protocol patients in each rate reduction category, there was no significant difference in the aPTT result. However, there was a large proportion of patients with a <25% rate reduction who remained supra-therapeutic.
- Potential to update VTE protocol to allow for ≥25% rate reduction upon UFH re-initiation in patients with an aPTT >180 seconds.
- The safety outcomes assessed were major/minor bleeds and new clotting events 24 hours post aPTT >180 seconds. There were no major bleeds or new clotting events. However, there was one minor bleeding event categorized using the BARC criteria.
- Limitation: Small sample size due to 77 patients meeting exclusion criteria. Commonly, patients were excluded due to lab error or discontinuation of the UFH infusion before repeat aPTT.

**Disclosure**

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

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# Assessment of insulin prescribing at hospital discharge in insulin naïve patients with type 2 diabetes mellitus (T2DM)

**Meghna Rathi, PharmD; Hannah Hall, PharmD, BCPS; Ann Lucktong, PharmD, BCACP; Jennifer Wright, PharmD, BCPS**

Carilion Clinic
Department of Pharmacy Services

## Background

- The 2020 American Diabetes Association (ADA) guidelines recommend insulin therapy to treat persistent hyperglycemia in hospitalized patients. Basal insulin or basal + bolus insulin is preferred and sliding scale only insulin regimens should be avoided.[1]
- Insulin is a high-risk medication that can lead to significant hypoglycemia-related cardiovascular mortality if used in error. It should only be initiated in the appropriate patient at discharge. [2]
- In the outpatient setting, the 2020 ADA guidelines recommend basal insulin initiation in patients with severe hyperglycemia, defined as hemoglobin (Hgb) A1c ≥ 10%, symptomatic hyperglycemia, or uncontrolled hyperglycemia in patients already on ≥ 2 anti-hyperglycemic medications.[3]
- Rehospitalization may be reduced by 30% in patients initiated on insulin at hospital discharge if education and a structured follow-up plan are provided. [4,5]

## Methods

**Objective:**

- Primary: Evaluate the appropriateness of insulin prescribing at discharge in insulin naïve patients with T2DM
- Secondary: Describe the insulin prescribing practices at discharge and evaluate transitions of care activities at discharge for patients with new insulin prescription

**Study Design:**

- Single center, retrospective cohort study

**Setting and Population**

- The project was conducted at Carilion Clinic: Roanoke Memorial Hospital The study was exempted by the Carilion IRB as a QA/QI
- **Inclusion criteria:** Adult patients with T2DM initiated on insulin at discharge to home between June 1 to August 31, 2020
- **Exclusion criteria:** All patients who were pregnant, incarcerated, deemed comfort care, or on insulin prior to admission

**Analytical Plan**

- Descriptive statistics

**Definitions**

- Appropriate insulin prescribing:
  - Insulin initiation in patients meeting at least one of the following criteria:
    - Hgb A1c ≥ 10%
    - Persistent hyperglycemia at admission on ≥ 2 antihyperglycemic medications
    - Symptomatic hyperglycemia: defined as ketonuria at admission
- Transitions of care activities:
  - Diabetes supplies prescribed at discharge
  - Disease state education provided by a certified diabetes educator (CDCES)
  - Follow-up appointments within 2 weeks of discharge

## Results

- Thirty-six insulin naïve patients with T2DM were prescribed insulin at discharge from June 1st, 2020 to August 31st, 2020

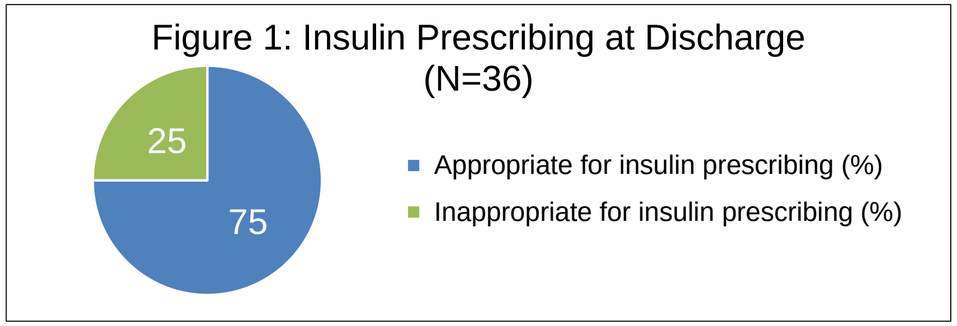
**Table 1: Baseline Characteristics (N=36)**

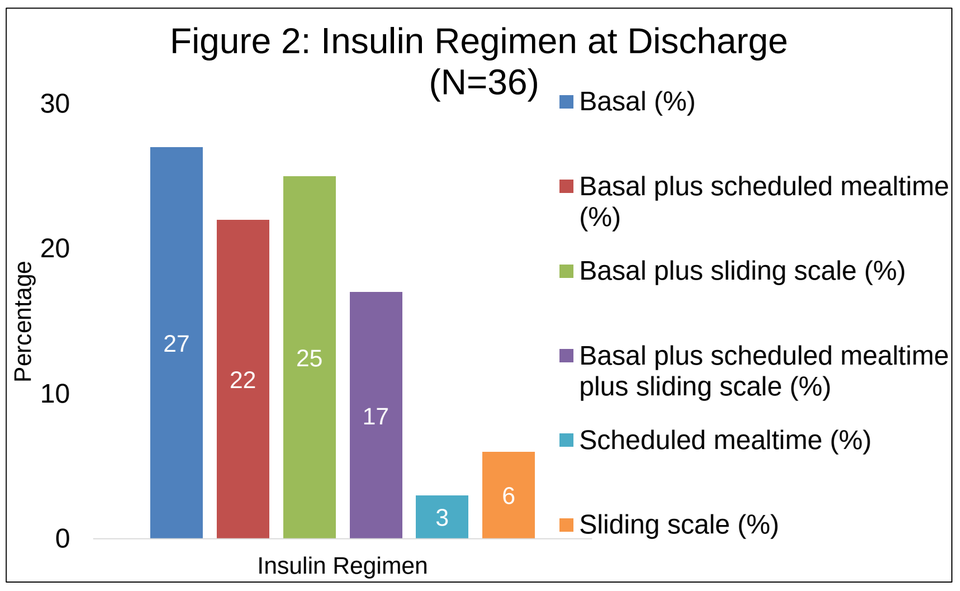
| | |
|---|---|
| Age, years; median (IQR) | 54.2 (32-83) |
| Female, n (%) | 16 (44.4) |
| Race: Caucasian, n (%) | 26 (72.2) |
| Discharging Service: Hospitalist, n (%) | 32 (88) |
| Insured, n (%) | 32 (88) |
| eGFR* <60ml/min/1.73m$^2$ n (%) | 3 (8.3) |

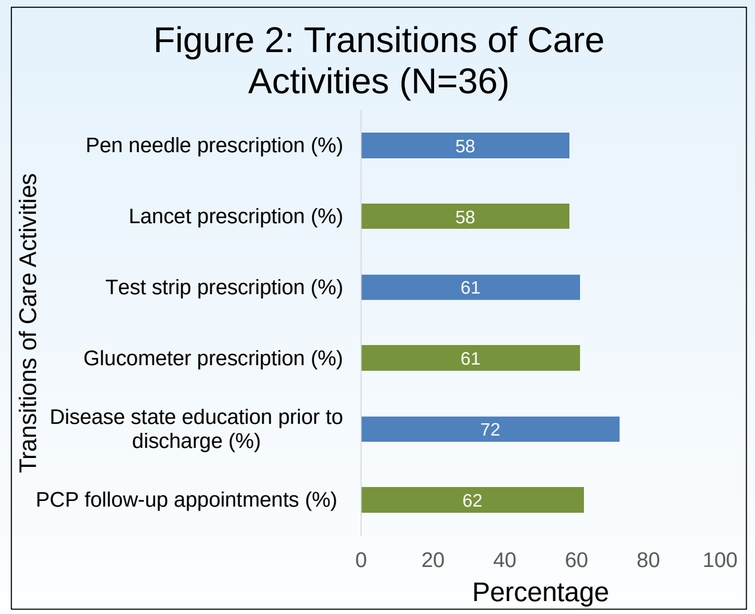
*eGFR= estimated glomerular filtration rate

**Table 2: Baseline Diabetes Characteristics (N=36)**

| | |
|---|---|
| Hgb A1c, median (IQR) | 12 (5.3-17.1) |
| Hyperglycemia related hospitalization , n (%) | 17 (47.2) |
| **Number of diabetes medications at admission** | |
| Zero medications, n (%) | 25 (69.4) |
| One medication, n (%) | 8 (22.3) |
| 2+ medications, n (%) | 3 (8.3) |




## Summary

- This study highlights that insulin is initiated in patients who do not meet the guideline recommendations at least 25% of the time.
- Nine percent of the patients received regimens that did not include basal insulin, inconsistent with guideline recommendations.
- Sixty-one percent of patients did not receive all of the transitions of care activities that previously have been shown to reduce hospital readmissions, indicating room for internal process improvement.
- Limitations: Retrospective, single center study, potential for selection bias, subjective definitions for appropriate insulin prescribing, did not evaluate if patient felt that appropriate education was provided.
- Future directions: Development of an order set to guide discharge prescribing of insulin, supplies, and outpatient follow-up. Provider education to reinforce guideline recommendation.

**Disclosure**

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
Meghna Rathi, PharmD: Nothing to Disclose, Hannah Hall, PharmD, BCPS: Nothing to Disclose
Ann Lucktong, PharmD, BCACP: Nothing to Disclose, Jennifer Wright, PharmD, BCPS: Nothing to disclose

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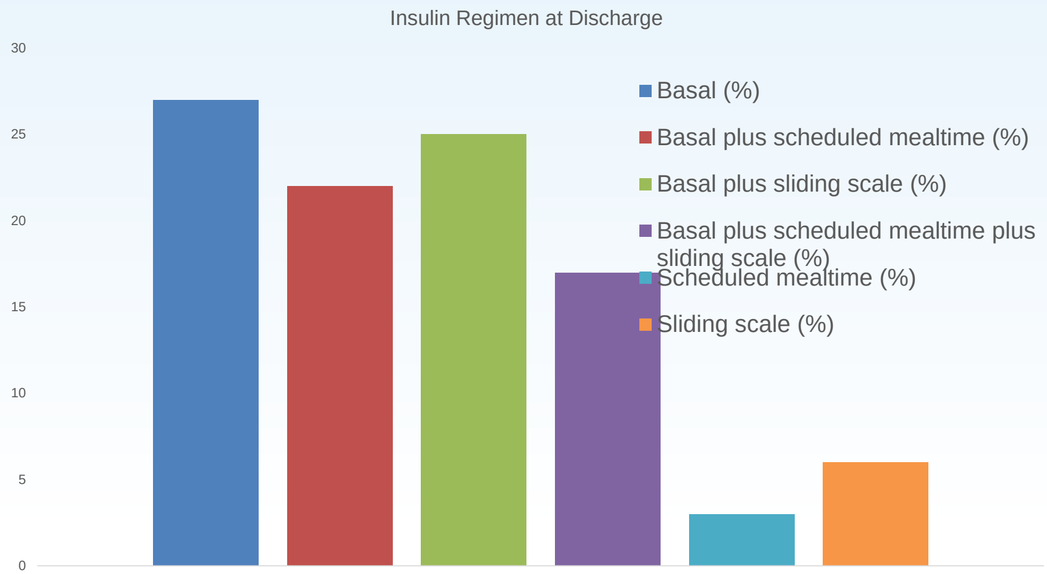


| Table 3: Insulin Regimen at Discharge (N=36) | |
|---|---|
| Basal, n (%) | 10 (27) |
| Basal plus scheduled mealtime, n (%) | 8 (22) |
| Basal plus sliding scale, n (%) | 9 (25) |
| Basal plus scheduled mealtime plus sliding scale, n (%) | 6 (17) |
| Scheduled mealtime, n(%) | 1 (3) |
| Sliding scale, n(%) | 2 (6) |

# Empiric Clindamycin Use and Return Rates in Skin and Soft Tissue Infection Patients

Yang Zhao, PharmD, Jessica L. Schad, PharmD, BCPS, Brandi L. Wian, PharmD, BCPS, Matthew J. Hornsby, PharmD, BCPS

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Department of Pharmacy Services

## Background

- Clindamycin is a poor empiric agent for the treatment of skin and soft tissue infections (SSTI) due to the increasing resistance against common causative bacteria and adverse event profile.
- The outpatient antibiogram from Carilion Clinic shows low susceptibilities to common SSTI pathogens with clindamycin
  - Methicillin-susceptible *staphylococcus aureus* (MSSA): 81%
  - Methicillin-resistant *staphylococcus aureus* (MRSA): 79%
  - *Streptococcus pyogenes:* 46%
- A concern with empiric clindamycin therapy is treatment failure, leading to poor patient outcomes and an increased healthcare burden on the institution.

## Methods

**Objective**

- To describe the return rates of patients discharged on clindamycin from the ED for empiric coverage of SSTIs.

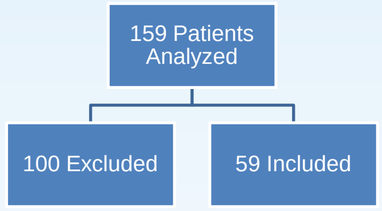
**Study Design**

- Retrospective, cross-sectional, observational, multicenter medication use evaluation
- Primary endpoint:14-day return rate due to a combined incidence of non-adherence, adverse effects to clindamycin, and treatment failure.
  - Treatment failure defined as persistent infection
  - Adverse effects defined as rash, anaphylaxis, nausea, vomiting, diarrhea
- Secondary endpoints: 7-day return, 30-day return, ED pharmacist vs. no pharmacist present at time of prescription, return due to adverse effect, non-adherence, or treatment failure, therapy changed on return visit, and frequency of each site sending prescriptions.
- All analysis was performed using descriptive statistics

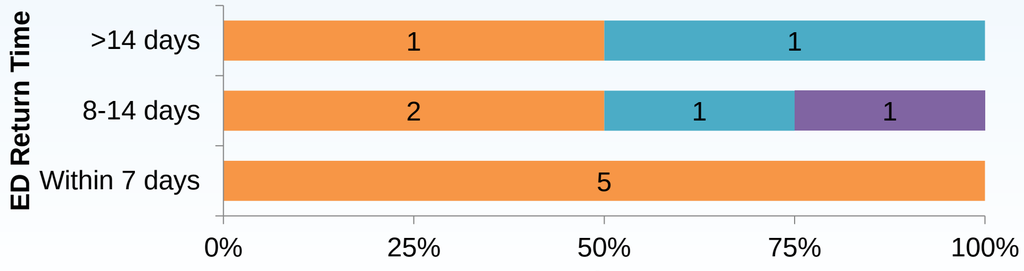
**Setting and Population**

- The study was deemed a quality assurance/quality improvement study by the Carilion Clinic Institutional Review Board.
- Patients discharged on clindamycin from the ED from any of 6 Carilion Clinic hospitals for empiric coverage of SSTIs were analyzed from June 2020 to July 2020.
- Inclusion criteria: ≥ 18 years old, diagnosed with SSTI, and discharged on an oral prescription of clindamycin
- Exclusion criteria: Secondary infection along with SSTI, infections requiring more than 2 days of IV antibiotics, admission to inpatient services, or patient left against medical advice on initial visit

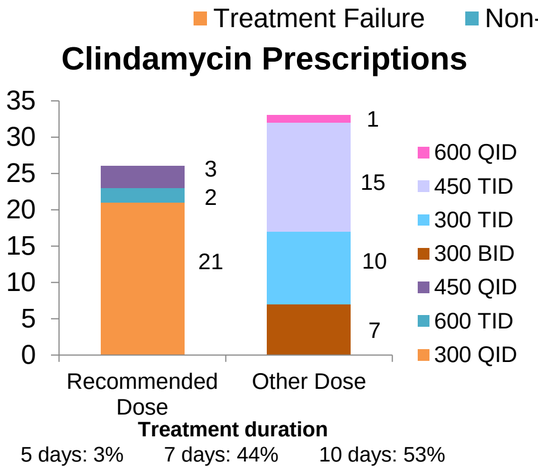
## Results



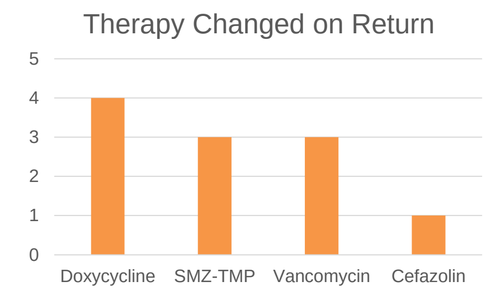

| Baseline Patient Characteristics | | Treatment Description (%) | |
|---|---|---|---|
| Age (years, median) | 41 | Penicillin allergy | 36 |
| Weight (kg, median) | 86 | Cephalosporin allergy | 5 |
| Males (%) | 61 | Sulfa allergy | 14 |
| IVDU (%) | 17 | Purulent | 44 |
| 90-day IV abx (%) | 8 | I&D performed | 29 |
| SSTI Hx (%) | 24 | Culture Collected | 27 |
| Diabetes (%) | 20 | MRSA Species | 7 |

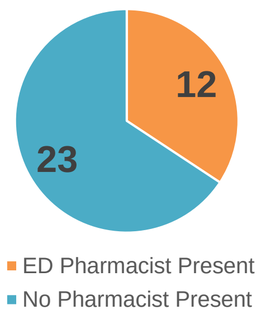



**Patients**




| | Frequency (%) | Returns (N) |
|---|---|---|
| CMC | 34 | 4 |
| CNRV | 25 | 1 |
| CFMH | 5 | 0 |
| CGCH | 7 | 1 |
| CSJH | 5 | 1 |
| CTCH | 24 | 4 |




## Summary

- The 14-day return rate was 15% for patient prescribed clindamycin for empiric treatment of SSTIs.
- Majority of returns were due to treatment failure
  - Only 44% of the clindamycin prescriptions followed the institution's recommended dosing
  - The most common duration of clindamycin was 10 days, while typical guideline treatment duration ranges from 5-7 for uncomplicated cases
  - Previous studies looking at hospital readmissions for cellulitis found that the overall 30-day all-cause nonelective readmission rate after cellulitis discharge was 9.8%[7]
  - Although this study setting and time window are different, the >5% difference shows that clindamycin may play a role in increasing return
- Fewer clindamycin prescriptions were written when an ED pharmacist was present
  - Potential of ED pharmacists guiding providers to more institution recommended first-line treatment options
  - ED pharmacists were present only at two sites: CMC and CNRV
- During this study period, pharmacy did not have the ability to prospectively review discharge prescriptions
  - Currently, Carilion Clinic is prospectively reviewing discharge prescriptions for antibiotics and anticoagulants from the EDs
- Although no *C. difficile* infections or resistance to clindamycin were noted, future impact of *C. difficile* development was not assessed
  - Analysis was limited to 30 days post discharge
- Given the findings of this study, additional education opportunities exist within Carilion's EDs on the proper usage of clindamycin

**Disclosure**
All authors report no potential conflicts of interest

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# Evaluation of Candidemia Management and Clinical Outcomes

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Carilion Clinic
Department of Pharmacy Services

## Background

- Candidemia is a bloodstream infection associated with a high morbidity and mortality.
- Complications of disseminated infection, including endocarditis and endophthalmitis can prove devastating if candidemia is not managed using a multifaceted approach.
- A positive impact of early infectious diseases consultation (IDC) for patients with bloodstream infections has been observed in the literature, with developing literature surrounding candidemia management.

**Study Purpose**: To characterize current candidemia management practices within Carilion Clinic and to evaluate the impact of IDC on patient outcomes.

## Methods

**Study Design**

- Retrospective, observational cohort study.
- All patients aged ≥ 18 years with blood cultures positive for *Candida* species experiencing their first episode of candidemia between January 2014 to August 2020 were included.
- Exclusion criteria included death or transfer to palliative care plan within 48 hours from culture positivity, pregnancy, or cultures from outside of Carilion Clinic.

**Primary Outcome**

- Composite of 90-day all-cause mortality and recurrence of candidemia with index organism.

**Secondary Outcomes**

| Receipt of Bundle Components |
|---|
| Receipt of antifungal with *in vitro* susceptibility |
| Source controlling procedure conducted |
| Repeat culture negativity |
| Underwent ophthalmologic evaluation |
| Echocardiographic imaging obtained |

**Patient Identification**

- Recipients of IDC were identified through presence of infectious diseases consultation notes during admission with candidemia.

**Statistical Analysis (SAS® Studio)**

- Descriptive statistics: Continuous and categorical
- Categorical Data: Pearson Chi-Square or Fisher's Exact Test
- Continuous Data: Wilcoxon rank sum test
- Two-tailed *P*-value of <0.05 considered statistically significant in all analyses

**Disclosure**
Authors of this presentation have nothing to disclose regarding possible financial or personal relationships with commercial entities.

## Results

**Table 1. Demographics and Baseline Clinical Characteristics**

| Characteristic | No IDC (n=63) | IDC (n=131) | *P value* |
|---|---|---|---|
| Age (years), mean ± SD | 62 (16.7) | 55.9 (17.2) | 0.025 |
| Male sex, no. (%) | 30 (47.6) | 68 (51.9) | 0.57 |
| Previous hospitalization in past 3 months, no. (%) | 27 (42.9) | 62 (47.3) | 0.68 |
| Abdominal surgery in past 3 months, no. (%) | 10 (15.9) | 17 (13) | 0.58 |
| ICU at onset of candidemia, no. (%) | 35 (55.6) | 68 (51.9) | 0.63 |
| On vasopressor at onset of candidemia, no (%) | 18 (28.6) | 39 (30) | 0.83 |
| Hospital LOS (days), median (IQR) | 17 (10 – 30) | 22 (10 – 42) | 0.10 |
| Cardiothoracic surgery recipient, no. (%) | 1 (1.6) | 9 (7) | 0.16 |

**Table 2. Candidemia Characteristics**

| Characteristic | No IDC (n=63) | IDC (n=131) | *P value* |
|---|---|---|---|
| Healthcare-associated candidemia, no. (%) | 29 (46) | 71 (54.2) | 0.28 |
| Polymicrobial bloodstream infection, no. (%) | 12 (19) | 39 (30) | 0.10 |
| CVC present for at least 48 hours, no. (%) | 42 (66.7) | 94 (71.8) | 0.46 |
| CVC duration (days), median, (IQR) | 9 (6 – 22) | 10 (7 -16) | 0.93 |
| Candida Score ≥ 3, no. (%) | 15 (23.8) | 32 (24.4) | 0.92 |
| Causative Species | | | |
| *C. albicans* | 29 (46) | 63 (48.1) | 0.78 |
| *C. glabrata* | 24 (38.1) | 34 (26) | 0.08 |
| *C. parapsilosis* | 3 (4.7) | 15 (11.5) | 0.18 |
| *C. tropicalis* | 4 (6.4) | 8 (6.1) | 1 |
| *C. krusei* | 0 (0) | 3 (2.3) | 0.3 |
| Other | 3 (4.8) | 8 (6.1) | 1 |
| Treatment duration (days), median (IQR) | 13.5 (10 – 15) | 14 (13 – 16) | 0.09 |

**Candida Score:** Severe Sepsis (2 points), TPN (1 point), Initial Surgery (1 point), Multifocal Candida Colonization (1 point)
**Healthcare-associated candidemia**: Candidemia onset ≥ 48 hours into admission

**Figure 1. Source of Candidemia**

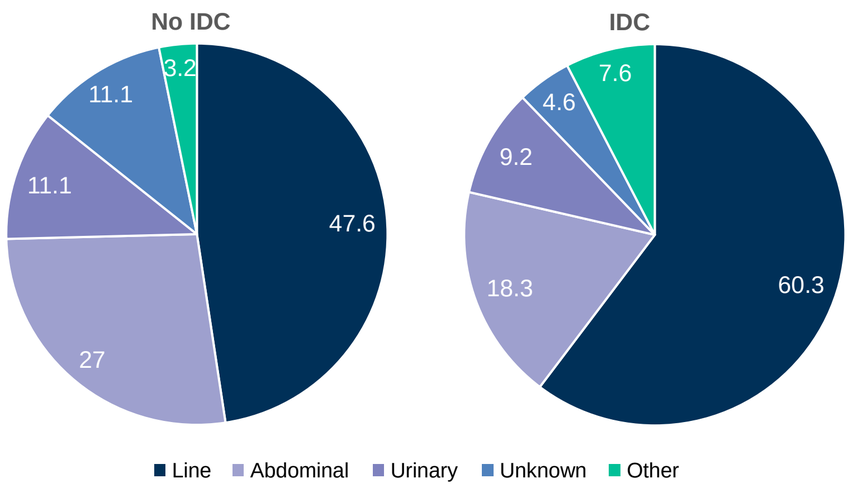
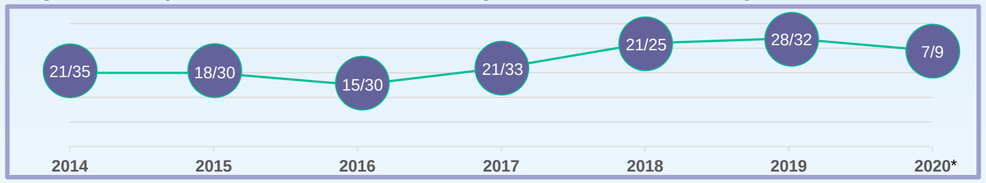



**Figure 2. Proportion of Patients Receiving IDC for Candidemia by Year**

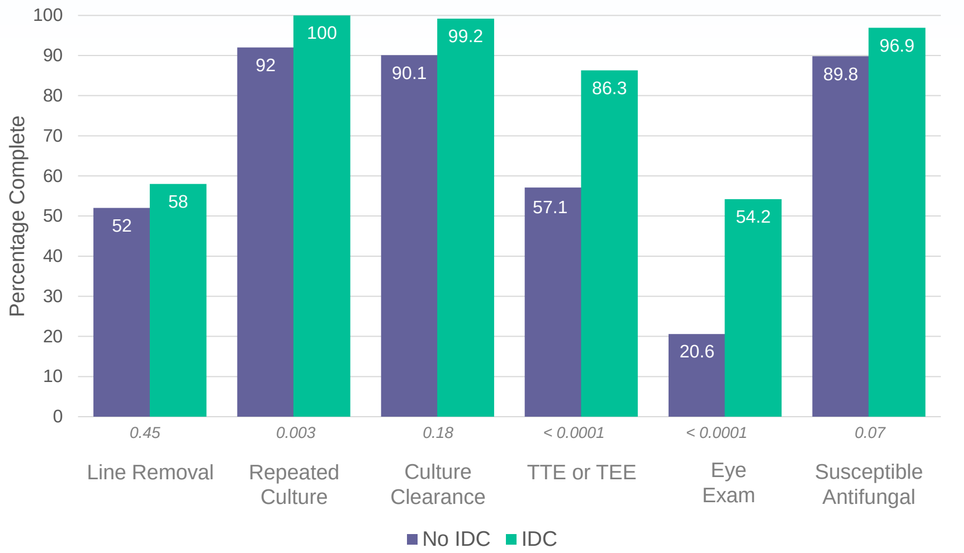



*Data through August 2020

**Table 3. Clinical Outcomes**

| Outcome | No IDC (n=63) | IDC (n=131) | *P value* |
|---|---|---|---|
| 90-day composite, no. (%) | 22 (34.9) | 28 (21.4) | 0.043 |
| 90-day all cause mortality, no. (%) | 19 (30.1) | 28 (21.4) | 0.18 |
| All-cause in-hospital mortality, no. (%) | 15 (23.8) | 25 (19.1) | 0.44 |
| Fungal endocarditis found, no. (%) | 1 (1.6) | 14 (10.7) | 0.04 |
| Time to susceptible antifungal (hours), median (IQR) | 43 (27 – 61) | 35 (27 – 52) | 0.06 |
| Duration of candidemia (days), median (IQR) | 2.59 (1.9 – 9.7) | 1.97 (1.2 – 3.5) | 0.001 |
| Recurrence of candidemia within 90 days, no. (%) | 3 (4.76) | 0 (0) | 0.03 |

**Figure 3. Individual Bundle Outcomes**




## Conclusions

- The proportion of candidemia episodes that received IDC were noted to have increased over the study timeframe.
- A statistical difference was observed for the 90-day composite outcome of mortality and candidemia recurrence. Although not statistically significant, 90-day mortality alone was lower in the IDC cohort despite a higher rate of fungal endocarditis identified.
- The IDC cohort received significantly more comprehensive workup for signs of metastatic site involvement (echocardiographic imaging and ophthalmologic evaluation).

**References**

Cornely OA, Bassetti M, Calandra T, et al. ESCMID guideline for the diagnosis and management of Candida diseases 2012: non-neutropenic adult patients. Clin Microbiol Infect. 2012;7: 19–37.
Lionakis MS, Netea MG. Candida and host determinants of susceptibility to invasive candidiasis. PLoS Pathog. 2013;9: e1003079

# Evaluating the Impact of Dose Request Cord Light Settings on Patient Controlled Analgesia Administration

Miranda Thomas, PharmD; Shannon Brown, PharmD, MSPH; Charlene Blubaugh, PharmD, BCPS; Mimi Liu, PharmD, MBA/HSA; Bridgette Smigiel, PharmD, MS

Department of Pharmacy, Carilion Roanoke Memorial Hospital, Roanoke, VA

Carilion Clinic — Department of Pharmacy Services

## Background

- Patient-controlled analgesia (PCA) has been associated with better pain control and higher patient satisfaction than parenteral analgesics prescribed as-needed.[1]
- Carilion Medical Center (CMC) uses Alaris PCA pumps to deliver opioid medications. With this pump, patients utilize the dose request cord to administer medication.
- The Alaris pump has three light options for the dose request cord. The light can be always on, always off, or only on when a dose is available to be administered. Since initiating the use of Alaris Pumps, CMC has set the pump default for the dose request light cord to always be on. However, there is not a standard of care for light settings. We aimed to optimize patient care by evaluating the impact of default light settings.

## Methods

- **Purpose:** to determine whether having the visual queue of a light from the dose request cord when a dose is due increases the number of doses the patient requests
- **Design**: single center, pre- and post- quasi-experimental study
- **Population**: patients greater than or equal to 18 years of age prescribed fentanyl, hydromorphone, or morphine PCAs during an inpatient encounter at Carilion Roanoke Memorial Hospital during November 2 – December 31, 2020 (pre-group) or January 1 – February 28, 2021 (post-group)
- **Exclusion:** patients on airborne contact precautions, PCA by proxy, end of life/palliative care, admission from correctional facility, pump settings found manipulated from default settings upon visual inspection, and patients who were on PCA for less than 8 hours
- **Data collection**: patient characteristics, comorbidities, previous opioid tolerance, vitals, pain and sedation scores, and concurrent intravenous or oral pain medications administered during hospitalization. PCA dose, type, indication for use, lock out period, number of dose requests allowed, total dose administered, number of attempts patient requested and the maximum dose allowed
- **Primary endpoint**: number of PCA doses attempted every 8 hours for the first 48 hours of therapy
- **Secondary endpoints**: maximum number of doses allowed in the defined time period, pain control, indication for use, sedation scores, total 8-hour dose of PCA medication, and composite safety outcome

## Results

**Table 1. Baseline Patient Characteristics (N = 56)**

| | Pre-Group (N = 36) | Post-Group (N = 20) |
|---|---|---|
| **Age:** years, median (IQR) | 53.5 (22) | 56.5 (38.5) |
| **Sex:** female, n (%) | 27 (48) | 12 (60) |
| **BMI:** k/m$^2$, median (IQR) | 29 (5) | 28.5 (13.1) |
| **Hospital Unit:** n (%) | | |
| • ICU | 26 (72) | 8 (40) |
| • PCU | 9 (25) | 7 (35) |
| • Med Surg | 1 (3) | 5 (25) |
| **Race:** n (%) | | |
| • White or Caucasian | 28 (78) | 14 (70) |
| • Black or African American | 8 (22) | 6 (30) |
| **Previous Opioid Tolerance:** n (%) | | |
| • Naïve (< 60 MME) | 23 (64) | 17 (85) |
| • Tolerant (≥ 60 MME) | 13 (36) | 3 (15) |
| **Indication for use:** n (%) | | |
| • Post-surgical Pain | 26 (72) | 14 (70) |
| • Hematology/Oncology Pain | 6 (16) | 4 (20) |
| • Trauma | 2 (6) | 2 (10) |
| • Chronic Pain | 2 (6) | 0 (0) |

**Figure 1: Number of Patients Per PCA Type**

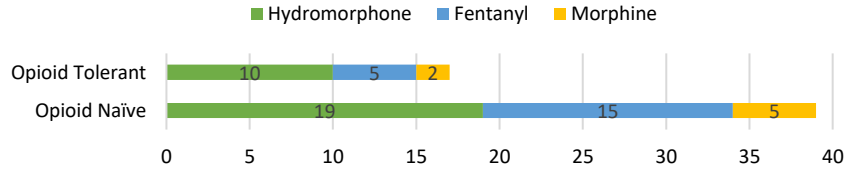



**Figure 2: Number of Dose Attempts and Administrations**

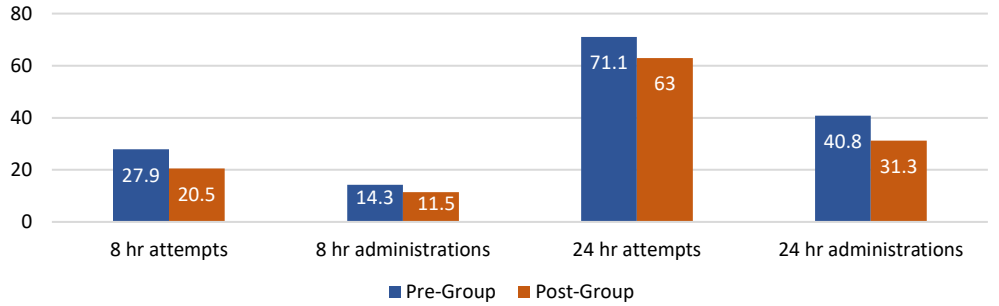



**Table 2: Safety Outcomes**

| Outcome | 8 hour | | P-value | 24 hour | | P-value |
|---|---|---|---|---|---|---|
| | Pre | Post | | Pre | Post | |
| **Heart Rate**, mean | 84 | 93 | 0.04 | 79 | 83 | 0.49 |
| **$O_2$**, mean | 94 | 92 | 0.28 | 92 | 90 | 0.34 |
| **Respiratory Rate**, mean | 16 | 17 | 0.37 | 15 | 16 | 0.91 |
| **End-Tidal $CO_2$**, mean | 37 | 36 | 0.69 | 36 | 29 | 0.14 |
| **Lowest RASS**, mean | -0.09 | -0.50 | 0.01 | -0.52 | -0.40 | 0.69 |

## Summary

- There was no statistically significant difference in PCA dose attempts between patients who had the dose request cord light on when a dose was available or always off.
- A statistically significant difference was noted between pre- and post-groups for heart rate and lowest RASS; however, the clinical significance of this finding is difficult to interpret given the small sample sizes and percentages of missing values (38% and 46%, respectively).
- Limitations for this study include a small patient sample size that did not allow for the calculation of power, the large number of patients who were excluded, variance in patient education, and missing values for analysis.
- During the study period, process improvement opportunities were identified for standardizing patient education in regards to PCA pump usage.
- The findings of this study will be presented at Pain Committee and Practice Council meetings to establish standardized default light settings and education for patients upon initiation of PCA pumps.

## References

1. McNicol E, Ferguson MC, Hudcova J. Patient controlled opioid analgesia versus non-patient controlled opioid analgesia for postoperative pain. Cochrane Database Syst Rev. 2015; (6).

**Disclosure:**
All Authors have nothing to disclose

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# Antimicrobial usage in psychiatric patients following psychiatric pharmacist implementation

Regina Mathew, PharmD; Holly Gilliam, PharmD, BCPP; Caitlin Swindall, PharmD, BCIDP; Daniel McClure, PharmD, MSCR

*Carilion New River Valley Medical Center (CNRV)*

## Background and Objectives

- Asymptomatic bacteriuria (ASB) is recognized as a condition frequently treated with inappropriate antimicrobial therapy.[1]
- Pharmacist-led interventions can reduce inappropriate antimicrobial use on psychiatric units.[2, 3]
- A designated psychiatric pharmacist responsible for daily comprehensive medical therapy reviews joined the psychiatric care team in August 2019.
- The primary objective was to evaluate antimicrobial usage for urinary tract infection (UTI) and ASB among psychiatric patients following psychiatric pharmacist implementation.

## Methodology

**Study Design:**

- This was a single-center retrospective pre-post- quasi experimental study.

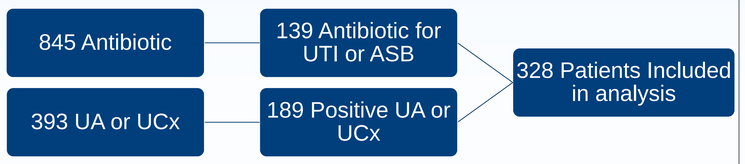
**Inclusion Criteria:**

- Age 18 years or older
- Admitted to in-patient psychiatry unit between October 1, 2017 and August 1, 2019 (pre) or October 1, 2019 and August 2020 (post)
- Positive urinalysis or urine culture or antibiotic ordered during admission

**Exclusion Criteria:**

- Prescribed an antibiotic for an indication other than UTI or ASB
- No serum creatinine during admission

## Subject Accountability



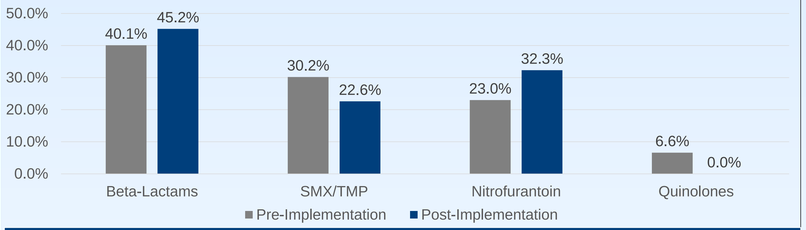

*Numbers denote subjects

## Results

**Demographic Characteristics**

| | Pre (n = 283) | Post (n = 45) |
|---|---|---|
| Mean Age (years) | 43.7 | 47.6 |
| Female (%) | 87.6 | 86.7 |

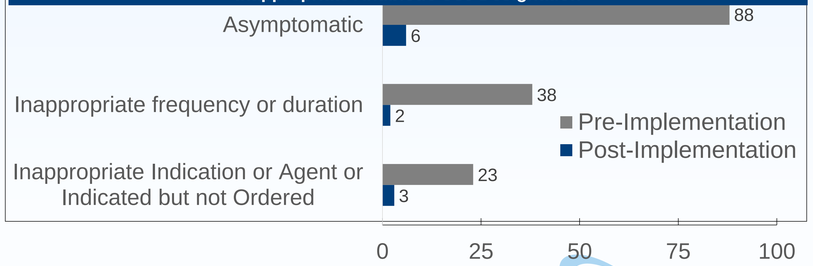
**Antibiotics Ordered**




**Outcomes**

| | Pre (n = 283) | Post (n = 45) |
|---|---|---|
| Inappropriate (%) | 52.7 | 24.4 |
| Appropriate (%) | 47.3 | 75.6 |
| Median Length of Stay (days) | 5 | 6 |
| Infection-related 30-day Readmission or ED Visit | 0 | 0 |

**Inappropriate Antibiotic Use Designation**




## Discussion

- Appropriateness of antibiotic prescribing increased approximately 30% following psychiatric pharmacist implementation.
- ASB was the most common reason antibiotic prescribing was deemed inappropriate.
- Limitations:
  - Reliance on urinary symptom documentation
  - Psychiatric pharmacist conducts medical therapy reviews on weekdays only
  - Appropriateness of antibiotic therapy designation based partially on provider selected indication
  - Patients LOS primarily determined by psychiatric, not infection-related, condition
- Future considerations:
  - Provider education regarding IDSA ASB guidelines and Carilion Clinic UTI guidelines
  - Consider an Epic soft stop for antibiotics ordered with provider selected indication of asymptomatic bacteriuria

## Conclusion

- The percentage of psychiatric inpatients with ASB or UTI and inappropriate antibiotic therapy declined in the period following psychiatric pharmacist implementation relative to the pre-implementation period.
- No increase in 30-day readmissions or ED visits for infection accompanied the decrease in inappropriate antibiotic use.

## References

1. Nicolle LE et al. Clinical practice guideline for the management of asymptomatic bacteriuria: 2019 update by the Infectious Diseases Society of America. *Clin Infect Dis*. 2019.

2. Ellis K, Rubal-Peace G, Chang V, et al. Antimicrobial stewardship for a geriatric behavioral health population. *Antibiotics*. 2016; 5.

3. Althagafi AA, Alshibani M, Fallatah S, et al. Hospital readmission rates following implementation of an antimicrobial stewardship intervention in acute inpatient psychiatric units. *Trends Med*. 2017; 17:1-4.

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CARILION CLINIC

# Evaluation of sulfonylureas and the risk of inpatient hypoglycemia

**Regina Mathew, PharmD; Courtney Dickerson, PharmD, BCPS, BCACP**

***Carilion New River Valley Medical Center***

## Background and Objective

- The American Diabetes Association guidelines list sulfonylureas as a preferred treatment, particularly for patients who require a low-cost add-on to metformin[1].
- Hypoglycemia, which is defined as a blood glucose reading < 70 mg/dL, is a common adverse event of sulfonylureas[2].
- Glycemic goals for inpatients are 140 – 180 mg/dL, which is higher than outpatient goals[1].
- The risks of continuing patients' home sulfonylureas while admitted to Carilion New River Valley Medical Center (CNRV) may outweigh the benefits.
- The primary objective was to determine whether patients admitted to CNRV who receive sulfonylureas are at an increased risk for hypoglycemia and other adverse events.

## Methodology

**Study Design:**

- This was a single-center, retrospective chart review medication use evaluation

**Inclusion Criteria:**

- Age 18 years and older
- Admitted to CNRV during the study period (July 2019 to June 2020)
- Received glipizide, glimepiride, glyburide, or any other sulfonylurea at any dose during hospital stay

Outcomes:

- Primary: the rate of hypoglycemia associated with sulfonylureas
- Secondary:
  - Frequency of hypoglycemia occurring in NPO patients

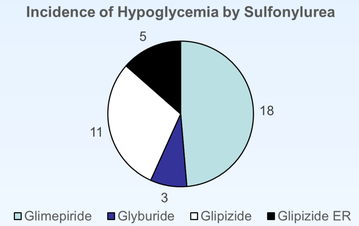
## Results

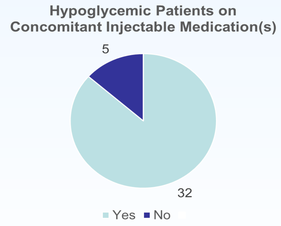
**Table 1. Patient Baseline Characteristics**

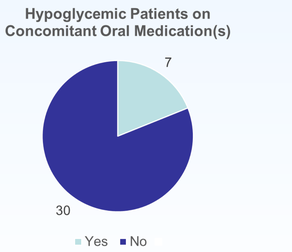
| | | | |
|---|---|---|---|
| Total Population, n | 150 | Hemoglobin A1c, mean ± SD (%) | 7.6 ± 1.8 |
| Age, mean ± SD (yrs) | 69.9 ± 13.2 | Serum Glucose, mean ± SD (mg/dL) | 201.7 ± 93.6 |
| Gender, n (%)<br>Male<br>Female | <br>85 (57)<br>65 (43) | Sulfonylurea, n (%)<br>Glimepiride<br>Glipizide<br>Glipizide ER<br>Glyburide | <br>69 (46)<br>50 (33)<br>19 (13)<br>12 (8) |
| Race, n (%)<br>White<br>African American or Black<br>Asian | <br>144 (96)<br>4 (3)<br>2 (1) | | |

**Table 2. Outcomes**

| | |
|---|---|
| Patients with a Hypoglycemic Episode, n (%) | 37 (25) |
| Symptomatic, n (%) | 5 (14) |
| Severity of Hypoglycemia, n (%)<br>Level 1<br>Level 2 | <br>34 (92)<br>3 (8) |
| Treatment Documented on MAR, n (%) | 11 (30) |
| NPO, n (%) | 13 (35) |
| Subsequent Hypoglycemic Episode, n (%) | 20 (54) |




## Conclusions and Future Considerations

- 25% of patients on a sulfonylurea experienced at least one hypoglycemic episode while inpatient.
- At least 14% of these patients were symptomatic.
- Most patients had multiple hypoglycemic episodes.
- Based on these results, continuing sulfonylureas puts patients who are admitted to CNRV at increased risk of experiencing a hypoglycemic episode, especially if patients are NPO or on injectable glucose lowering medications, such as insulin.
- Limitations: retrospective study, small sample size, episodes of hypoglycemia may have been missed since patients were not on continuous glucose monitors, dependence upon proper documentation in electronic medical record, overlap between symptoms of hypoglycemia and other medical conditions.

## Future Considerations

The results of this evaluation will be used by the Insulin Tag Group for evaluation of use of oral hypoglycemics in the inpatient setting.

## References

1.Riddle MC et al. Standards of medical care in diabetes. *ADA*. 2020.
2.Sola D et al. Sulfonylureas and their use in clinical practice. *Arch Med Sci*. 2015.

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CARILION CLINIC

# One Dose Will Do: Evaluation of Pre-Operative Antibiotic Prophylaxis in Pediatric Patients Undergoing Uncomplicated Appendectomy

Zach Stevenson, PharmD, Susan Gladfelter, PharmD, BCPS, Lark Dunton RPh

Carilion Clinic
Department of Pharmacy Services

## Background

- Appendicitis is the most common cause of emergency abdominal surgery in the pediatric population, affecting an estimated 70,000 children in the United States each year. Pre-operative antibiotic prophylaxis has shown to be effective in reducing surgical site infections in a wide variety of surgical procedures.
- The American Society of Health-System Pharmacists (ASHP) state that the current standard of care for prevention of surgical site infections is the administration of a single dose of prophylactic antibiotic(s) within 60 minutes prior to surgical incision.
- The Infectious Disease Society of America (IDSA) and the Surgical Infection Society (SIS) both recommend against standard use of broad-spectrum prophylactic antibiotic(s) in the absence of complicated appendicitis.
- Currently there is not a standardized protocol at Carilion for surgical site infection prophylaxis in uncomplicated appendectomy

## Methods

**Objective**

- Evaluate the compliance of pre-operative prophylactic antibiotic use in uncomplicated appendectomies among pediatric patients with the current standard of care which is the receipt of a single dose of prophylactic antibiotic(s) within 1-hour prior to incision

**Study Design**

- Single-center, retrospective medication use evaluation conducted from June 2, 2019 through October 30, 2019 at Carilion Roanoke Memorial Hospital

**Population**

- We evaluated patients 1 month to 17 years of age
- Inclusion Criteria
  - Uncomplicated (simple appendicitis) undergoing a laparoscopic appendectomy
- Exclusion Criteria
  - Complicated appendicitis
  - Present infection unrelated to appendicitis
  - Non-operative management of appendicitis
  - Immunosuppression
  - Blunt abdominal trauma

**Outcomes**:

- Primary: Determine percent of patients that received prophylactic antibiotics in accordance with the standard of care
- Secondary: Determine percent of patients that received post operative antibiotics and the percentage of antibiotics received during each phase of the operation

**Data Collection**

- Data was extracted from electronic medical records using Microsoft Excel.
- Data collected included: patient demographics, antibiotic regimen, surgical intervention, operative complications, and hospital length of stay

**Analytical Plan**

- Descriptive data analysis occurred using Microsoft Excel

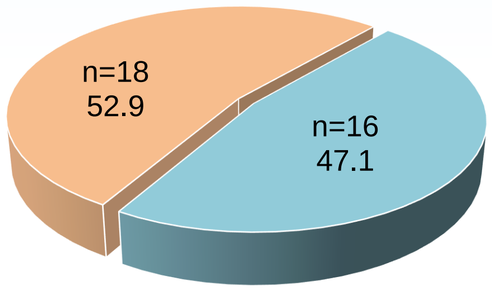
## Results

- From June 2nd through October 30th of 2019, 67 pediatric patients were screened for eligibility of which 34 met inclusion criteria.
- The primary outcome occurred in 11.8% (n=4) of patients.
- For the secondary outcomes: 47.1% received a single dose of pre-operative antibiotics. Of those, 31.3% received a single dose within 1-hour of incision. Lastly, 52.9% of patients received post-operative antibiotics.
- The average time of first dose of antibiotic(s) to surgery was 5.1 hours.

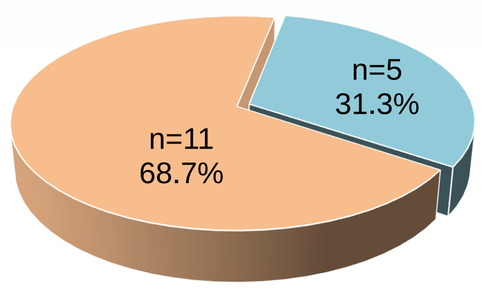
**Baseline Characteristics of Patients**

| Patients | Age (year) | Weight (kg) | Height (cm) | BMI (kg/m2) | Gender (% Male) | Ethnicity (% White) |
|---|---|---|---|---|---|---|
| **n=34** | 10.4 | 48.1 | 151.1 | 20.4 | 52.9 | 82.3 |

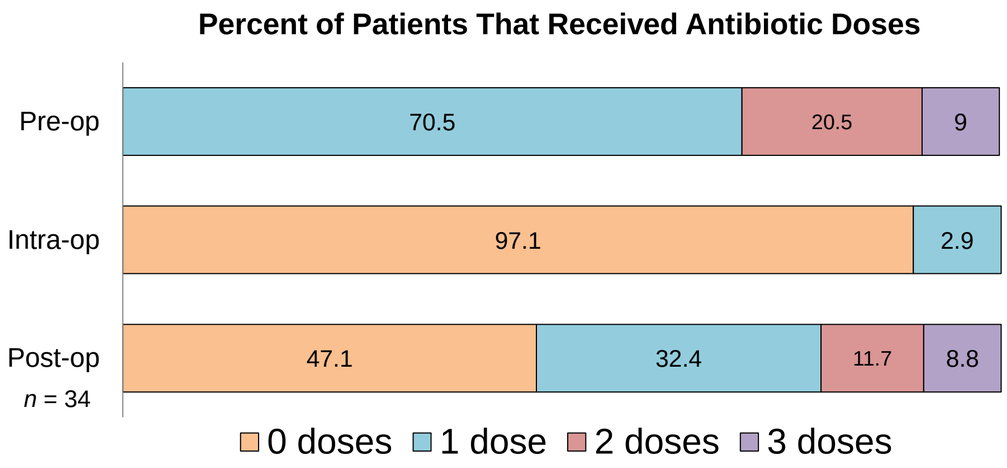
Single dose of pre-op antibiotics




Single dose given within 1 hour of incision




**Percent of Patients That Received Antibiotic Doses**




## Conclusion

- This evaluation showed that only 11.8% of pediatric patients with an uncomplicated appendicitis undergoing a simple laparoscopic appendectomy received the current standard of care defined as a single dose of prophylactic antibiotic(s) given within 1-hour of incision and no antibiotic doses given post-operatively.
- Most of the patients (52.9%) included in this evaluation received at least one dose of antibiotic(s) post-operatively and 20.5% of patients receiving greater than 2 doses.
- In addition, time of the first dose of antibiotic(s) given to incision time was significantly longer than the recommended time frame of 60 minutes prior to incision by ASHP.
- As evidenced by our findings, there is not a consistent process for the prevention of surgical site infections in patients undergoing a simple laparoscopic appendectomy.
- The results of this medication use evaluation will be shared with the Pharmacy and Therapeutics Committee in hopes to standardize the use of antibiotic(s) for prophylaxis of surgical site infections in patients undergoing a laparoscopic appendectomy.
- The following were limitations of this evaluation: documentation inconsistencies incision times, pre-operative antibiotic dose charting, and unknown antibiotics given at outside facilities before transfer to Carilion Clinic could have limited the number of patients that met the primary or secondary outcomes.

**Disclosure**

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
Zach Stevenson, Susan Gladfelter, Lark Dunton: Nothing to disclose

## References

1. Bowater RJ, Stirling SA, Lilford RJ. Is antibiotic prophylaxis in surgery a generally effective intervention? Testing a generic hypothesis over a set of meta-analyses. Ann Surg. 2009;249(4):551-556.
2. Bratzler DW, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health-Syst Pharm. 2013; 70:195–283.
3. Joseph S. Solomkin, et, al. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America, Clinical Infectious Diseases, Volume 50, Issue 2, 15 January 2010, Pages 133–164
4. John E. Mazuski. The Surgical Infection Society Revised Guidelines on the Management of Intra-Abdominal Infection. Surgical Infections. Jan 2017.1-76

# Nursing

CARILION CLINIC

# Introducing Yoga to the Hope Pathway for Inpatients with Substance Use Disorders

**Presenter: Nancy S. Harvey, MSN, MS, NP-BC, C-IAYT**
**Affiliation: Carilion Community and Family Medicine**

## Introduction

Yoga has been found to be an effective integrative therapy improving outcomes in outpatient substance abuse treatment settings[1].

This pilot feasibility study examined the impact of yoga on depression, anxiety, and pain in patients with substance use disorders hospitalized for 4 to 6 weeks for intravenous antibiotic therapy. The yoga program was introduced to patients enrolled in the Hope Pathway, a comprehensive inpatient counseling and support program.

## Intervention

The yoga intervention was a gentle chair-based program based on the Yoga for 12 Step Recovery progam of Nikki Myers[2]. In-person and instructor-developed GetWellNetwork video classes incorporated gentle chair-based stretches, breathing exercises, and meditations.

## Methods

Pre-test post-test questionnaires using the PROMIS® surveys for anxiety, depression, and general health were used to compare treatment as usual (Hope Pathway) to treatment as usual with the yoga intervention. Qualitative feedback was collected in journals and analyzed for content.
The Carilion IRB approved this study.

## Results

There was no significant difference on responses to the PROMIS® questionnaires between the Hope Pathway and the Hope Pathway with yoga cohorts as noted in the table below.

**Table 1** t tests for survey t scores

| Survey | TAU | Yoga | P value |
|---|---|---|---|
| Depression | 55.24 (12.62) | 55.15 (9.21) | 0.9871 |
| Anxiety | 56.60 (11.42) | 58.01 (6.50) | 0.7692 |
| Mental Health | 47.60 (13.73) | 45.46 (4.10) | 0.7035 |
| Physical Health | 40.17 (7.94) | 43.76 (10.89) | 0.4846 |

Within the yoga cohort there were significant differences in responses to the mental health and physical health questions not reflected in the TAU group.

**Table 2** t tests for within cohort change

| Survey | Cohort | Mean change in survey response | P value |
|---|---|---|---|
| Depression | TAU | -3.2143 | 0.5054 |
| Depression | YOGA | -2.9625 | 0.2760 |
| Anxiety | TAU | -3.7857 | 0.3942 |
| Anxiety | YOGA | 1.2625 | 0.7081 |
| Mental Health | TAU | 7.1286 | 0.2991 |
| Mental Health | YOGA | 5.0500 | 0.0072 |
| Physical Health | TAU | 4.1714 | 0.2160 |
| Physical Health | YOGA | 5.7625 | 0.0129 |

Statements in their journals from study participants about their yoga practice included:

- "Left with a feeling of tranquility and calmness"
- "Seemed to be separating the chaos in my head"
- Before yoga "felt overwhelming state of emotion" and after "felt light . . . like a feather in the wind".
- Initially described feeling "a little sore" and after "felt limber and relaxed"
- "Needs to continue."

## Conclusions

Although changes in depression and anxiety were not noted, significant changes were detected in mental (p=.007) and physical health (p=.013) for yoga participants. Subjects indicated strong support for yoga in the Hope Pathway.

Limitations include small sample size and possible effects of the suspension of the research for three months due to COVID. When the research resumed the subjects participating in the yoga intervention were experiencing the additional stresses of hospitalization during COVID restrictions.

The staff of the Hope Pathway and patients have continued to find the intervention to be beneficial. A larger, prospective study may help to increase understanding of the impact of this mind-body experiential practice on the recovery from substance use disorders.

## Research Team

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**References: List is available upon request.**

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RADFORD UNIVERSITY

# Impact of a Team-based, Interprofessional Clinical Ethics Immersion on Moral Resilience

**Phyllis Whitehead, PhD, APRN/CNS, ACHPN, PMGT-BC, FNAP[1,2]; Mark Swope, PhD[1,2]; Kimberly Carter, PhD, RN, NEA- BC[1]**

***[1]Carilion Clinic and [2]VTCSOM***

## Background

- Contemporary healthcare poses dilemmas for healthcare professionals (HCPs) related to challenging patients and families, moral conflicts, and moral failure.
- HCPs encounter a multitude of barriers to provide good care; however, their education may not have prepared them to negotiate challenges of an ethical or moral nature to facilitate good patient outcomes.
- Although HCPs identify specific ethical issues, having a structured approach and awareness of ethical principles can assist in resolving the dilemma.
- This presentation details the design and impact of a unique team-based, interprofessional clinical ethics immersion to support moral resilience for HCPs. [1,2,3]

## Purpose/Methods

- The goal of 4-week immersion was to improve teamwork and collaboration, support resolution of basic ethical dilemmas, and develop on-site ethics scholars who apply basic ethical principles to challenging clinical situations.
- The purpose of this study was to explore the shared experience using qualitative methodology. Face-to-face interviews were conducted to elicit expectations of the training, what information was new, impact of the training on confidence and comfort with ethical climate/work environment, team communication, and resolving common ethical dilemmas, and recommendations for future offerings.

## Participants, Findings

- Eight participants completed immersion, four in each session, including 4 registered nurses, 2 pulmonary critical care fellows, 1 chaplain, and 1 nurse manager.
- Seven of the eight participants completed the interviews.
- 100% recommended the training be continued, with a larger group representing more patient care units and healthcare disciplines.
- Participants noted that the immersion achieved the stated goals.
- The case study approach was a valuable teaching strategy.
- Appreciated having the text as a reference.
- Recommended additional time to practice end-of-life conversations.
- Notable participants' comments included:
  - The need for consistent messaging from all teams to patients and families
  - Words matter
  - Great to understand the process to determine a patient's capacity to make medical decisions
  - Excellent discussion regarding the process for Treatment Appropriateness Review Committee (TARC)
  - Self-bias and the importance of recognizing it in self and others
  - Helpful to understand brain death and donation after cardiac death criteria


## Conclusions

- An interprofessional ethics immersion training can be a valuable strategy to improve ethics knowledge and confidence to resolve common patient care dilemmas.
- By studying ethical concepts and cases as an interprofessional team, HCPs can gain experience in identifying and resolving ethical dilemmas.
- The training improved perceived teamwork, collaboration, and team communications.
- As a result of the ethics immersion, HCPs may feel more confident to discuss ethical issues with other members of the interprofessional team while clarifying ethically challenging clinical situations and enhancing their moral resilience.
- The unique aspects of this ethics immersion, team-based and interprofessional, are important considerations for ongoing development of HCPs to address the challenges encountered daily in healthcare.

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# Psychiatry

CARILION CLINIC

# Title: Bridge over Troubled Waters: From the ED to Outpatient Care

**Presenter: Cheri W. Hartman, Ph.D.** [12]

***Co-authors: J.H. Burton, MD*** [12]***, K.D. Kuehl, MD*** [12] ***D, M. Hollen, K. L. Tolhurst, MD*** [2]***, Erin Trinh*** [2] ***and D.W. Hartman, MD*** [12]

***Affiliations:*** [1]***Virginia Tech Carilion School of Medicine,*** [2] ***Carilion Clinic Department of Psychiatry***

## Background

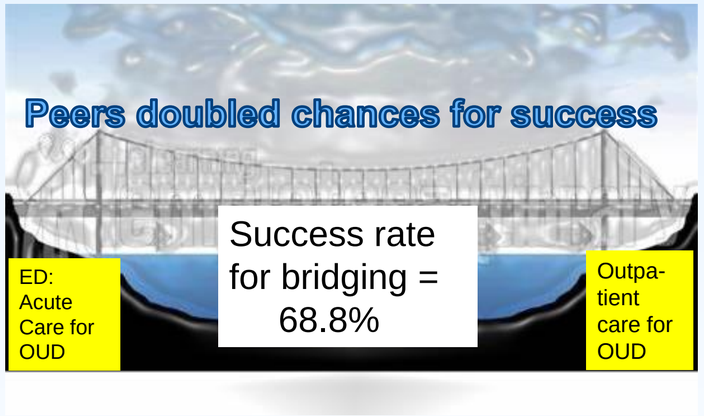
Over 81,000 US citizens died from drug overdoses in the 12 months ending May 2020 per the Center for Disease Control.[1] An Emergency Department (ED) committed to starting patients on the path to recovery, building on the model derived from Andrew Herring's[2] and Gail D'Onofrio's[3] research. Medical care in the ED for patients with an opioid use disorder (OUD) could be a bridge to treatment; in 2018, at Carilion Clinic's ED estimates are that < 10% were transitioning from the ED to outpatient care. The aim of this study was to investigate: Do ED initiated buprenorphine and prescriptions facilitate patients' admission into the best practice of office-based opioid treatment? What factors improve transitions into outpatient care for patients with an opioid use disorder?

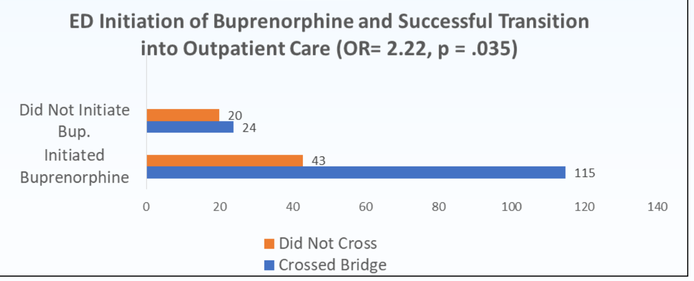
## Methods

In a 16-month study, 41 ED doctors completed waiver requirements to prescribe buprenorphine (combined with naloxone). A protocol was developed for initiating buprenorphine in the ED for patients with an OUD, presenting in withdrawal or developing withdrawal symptoms post-overdose during ED visit. ED physicians provided 7-10 day scripts to patients appropriate for outpatient treatment; referrals were made to an office-based opioid treatment program. Peer linkages were initiated by phone or in person. Rapid access to outpatient care (within 7 – 10 days) was provided. Chart reviews were conducted for 400 patients, 202 met inclusion criteria diagnostic for OUD, not actively psychotic, not pregnant and not referred for inpatient care. Analytics were completed on the data entered into a REDCap survey based on retrospective chart reviews.

## Results

- The key outcome: 68.8% of patients transitioned from the ED into outpatient treatment for their opioid use disorder.
- Providing buprenorphine in the ED significantly increased the likelihood of the crossing bridge into care (OR: 2.22, p= .036).
- Of the 132 patients admitted into outpatient treatment, 81.8% remained in treatment ≥ 1 month.
- Patients linked with a peer were twice as likely to cross bridge than patients not linked with peer. (OR=2.103; p = .09).
- Increase in transitions when the ED prescribed buprenorphine did not reach significance. Average prescription duration was 8 days; average wait duration to see an outpatient prescriber was also 8 days. Following ED physicians' waiver training on medications for opioid use disorders, they reported the rewards of having a tool to help patients; patients reported a respectful ED experience.




## Conclusions/Discussion

Transitions into outpatient care post-ED visits were facilitated by initiating buprenorphine in the ED. Providing a buprenorphine prescription did not significantly increase likelihood of a successful transition. Linkage with peer support doubled the odds of crossing bridge into outpatient treatment from the ED.
Findings revealed a culture shift following ED physicians' waiver training on medications for opioid use disorders: reported by both physicians and patients. Physicians reported the rewarding experience of having a tool to help patients; patients described a most respectful experience in the ED. Initiating buprenorphine provided immediate relief for acute withdrawal symptoms and was followed by an increased likelihood of pursuing and obtaining admission into treatment. Comparing preCOVID19 transitions in care to COVID19 conditions and outcomes warrants exploration.

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# Partnering to Enhance Engagement in Maternal Mental Health, iTHRIV Interviews

*Felicity Adams, MD Carilion Clinic*
*Robin Haldiman, CHIP of the Roanoke Valley*
*Cynthia Morrow, VTC School of Medicine*

## Background

A collaboration between CHIP and Carilion's department of psychiatry aims to improve maternal engagement in mental health services by linking at risk mothers to peer support. The initial phase of this project used semi-structured interviews to explore barriers mothers face when seeking mental health care.

## Methods

Twenty-one clients of CHIP who scored 'at-risk' on a PHQ-9 screening and were offered mental health resources were interviewed about their experiences receiving resources for mental health care. The clients provided verbal consent to participate and received a $25 gift card after completing the interview  Responses were reviewed and categorized.  Themes were identified to help inform the planned integration of peer support services into the resources offered by CHIP.

## Results

All subjects were served consistently by CHIP home visitors for 1-3 years.  All had screened at risk for depression on a PHQ-9.  This screening tool is used regularly by CHIP staff to screen clients for possible depression.  All clients found at-risk are offered resources and referrals.

Two of the twenty-one women interviewed reported never having received additional resources for mental health care, and one of these reported that her home visitor had never discussed her mental health. Nineteen women reported receiving resources for further mental health care, and of those, sixteen described positive experiences with mental health care. The at-risk mothers who did not accept referrals for mental health services shared reasons such as: lack of time, lack of childcare, and prior negative experiences with mental health care which left them less likely to access it in the future.

## Discussion

Maternal depression is the most common complication of pregnancy and occurs in an about one in eight women.  Rates are higher in younger mothers and for those who have stressful life events in the year prior to a birth.  Maternal depression may be associated with adverse developmental outcomes in young children and health risks to mothers.

Effective treatment is expected to improve health for mothers and their children. Understanding barriers mothers experience accessing mental health care may inform the development of enhanced care delivery models to specifically address barriers unique to new mothers.

## Future Steps

These interviews inform the rest of the project. Peer support is now included as an additional referral option for at-risk mothers served by CHIP. Ongoing research will review if peer support enhances maternal engagement in mental health care.

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# Using Patient Reported Outcome Measures to Examine the Effects of COVID 19 in Adult Ambulatory Psychiatry

**AS Kablinger, AJ Gatto, VC O'Brien, H Ko, RS McNamara, HD Sharp, MT Tenzer, LD Cooper**

***CC-VTCSOM Department of Psychiatry and Behavioral Medicine, Virginia Tech Department of Psychology***

## Objective

•To examine COVID-19 effects on US adults in ambulatory psychiatry, utilizing data from a measurement-based care system, evaluating impacts on psychiatric functioning.

## Methods

•This observational study included measurement-based care data collected from November 2019 through May 2020.

•Patient Reported Outcome Measures were examined for changes in symptomatology over treatment course and resulting from the pandemic.

•Adult patients initiating or continuing psychiatric care (in-person or virtually through telemedicine) were included in analyses if they completed at least one measure.

•Psychiatric functioning was evaluated for psychological adjustment (Brief Adjustment Scale-6 – BASE-6), depression (Patient Health Questionnaire-9 – PHQ-9), anxiety (Generalized Anxiety Disorder-7 – GAD-7).

• Adverse effects related to COVID-19 were measured by the COVID-19 Event Checklist (CEC).

•Suicidality was assessed via Q#9 on the PHQ-9.

## PROM Bundle*

- PHQ-9
- GAD-7
- BASE-6
- CEC

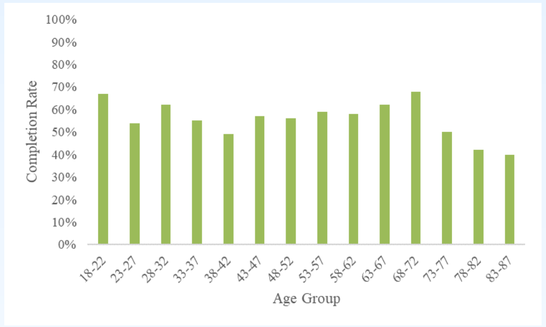
•* Other scales used clinically but not reported here

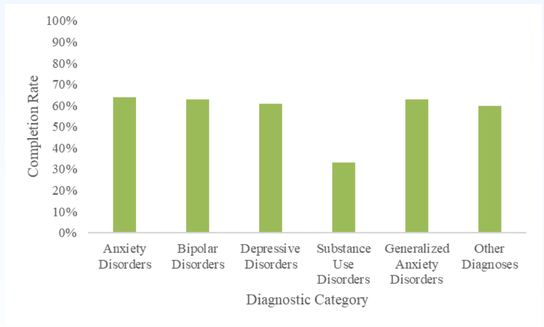
## Results

Table 1. *Paired-sample t-test of survey responses for the BASE-6, GAD-7, and PHQ-9.*

| | N | Pre | Post | p-value |
|---|---|---|---|---|
| BASE-6 | 156 | 24.54 | 22.05 | 0.055 |
| GAD-7 | 157 | 10.54 | 9.06 | 0.03 |
| PHQ-9 | 144 | 11.31 | 10.39 | 0.06 |

*Figure 1.* Completion rates for patients completing at least one PROM by (a) age group, (b) diagnostic category




## Discussion

- We hypothesized that psychiatric symptomology would ↑ both between and within subject groups during the COVID-19 pandemic compared to pre-pandemic times. This did not occur. Within subject differences in depression and functional status were not significantly different pre-and post-onset of the pandemic declaration. Anxiety significantly improved statistically, which may not be clinically meaningful. (table 1). There was a trend toward improvement in the PHQ-9 and BASE-6.
- Between subject comparisons reflected no difference with respect to age, gender, race, payor, rurality location or diagnosis (Figure 1 top). There was no difference before and after the pandemic declaration with respect to suicidality.
- Differences in completion rates based on demographics and mental health diagnosis were significant only for Substance Use Disorders (SUD), which demonstrated lower PROM completion rates (Figure 1 bottom).

## Conclusions

•In this observational study of 872 ambulatory psychiatric patients, psychological functioning remained stable, with anxiety significantly decreasing from November 2019 through May 2020, though adverse events and distress were reported on the CEC since the onset of the COVID-19 global pandemic.

•Measurement-based care (MBC) is a promising tool for tracking mental health outcomes and maintaining continuity of care during a pandemic. However, ways to increase MBC utilization, especially with certain populations, may be necessary in order to have more of a therapeutic effect and for strengthening any analysis of change during treatment.

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# Creating a Skills Group to Reduce Inpatient Acuity


## Ryan White, DO PGY-5

***Child & Adolescent Psychiatry Fellowship***


## Purpose

To reduce average acuity level for child and adolescent (age 9-17) inpatient psychiatry unit through the creation and implementation of a standardized group therapy focusing on core coping skills.

## Faculty Mentors

Angela Nardecchia, PhD – Clinical Psychology
Felicity Adams-Vanke, MD – Child & Adolescent Psychiatry
Katherine Liebesny, MD – Child & Adolescent Psychiatry

## Background

The acuity of inpatient units is a complex interaction between staff to patient ratio, staff expertise, patient ability to self-regulate, environmental and space considerations and the effectiveness of treatments provided. Addressing any of these factors could impact the overall safety of patients and staff and would be anticipated to decrease overall milieu acuity. Evidence based research has shown coping skills in both Cognitive Behavioral Therapy (CBT) and Dialectical Behavioral Therapy (DBT) can be effective at reducing externalizing behaviors (self harm, SI, aggression, etc) (1,2,3,4).

In developing a program for the Child & Adolescent inpatient unit, it was important to consider such factors as ease of implementation, costs of adding the programming, staffing limitations, typical short treatment course, age range of milieu and other programming already present. Noting that the average length of stay was under 1 week, coping skill selection was narrowed to those that could be taught and practiced within a single session.

We chose to take an approach like START NOW, in which several core skills were the focus of a program to develop healthy and adaptive coping skills, shown to be effective with externalizing behaviors (5,6).

Acuity is communicated using a color-coded system of Green, Yellow, Orange, and Red. Green acuity indicates low acuity and Red is high acuity. I joined the call nightly over 10 week to record this data.
Acuity Data was gathered for 14 days prior to implementation of group to serve as pre-test baseline and will be compared to 4 within-test blocks of 14 days to monitor for any changes in average acuity. Colors were converted to numeric values for analysis (Green=1, Yellow=3, Orange=5, Red=7).

## Preliminary Data

**Daily Acuity By Color (Visual)**

| Week | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| 1 | Y | Y | Y | Y | G | G | G |
| 2 | G | G | Y | G | O | O | Y |
| 3 | Y | G | Y | Y | Y | G | Y |
| 4 | G | Y | G | Y | Y | Y | Y |
| 5 | Y | G | G | Y | Y | G | G |
| 6 | Y | G | G | G | --- | --- | --- |

**Average Daily Acuity by Week**

| | |
|---|---|
| Week 1 | 2.14 |
| Week 2 | 2.71 |
| Week 3 | 2.43 |
| Week 4 | 2.43 |
| Week 5 | 1.86 |
| Week 6 | 1.50 |

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# Adaption and Effectiveness of START NOW Psychotherapy for Office-Based Opioid Treatment: Non-Inferiority to TAU

**AY Truong, AS Kablinger, D Hartman, C Hartman, J West, A Hanlon, A Lozano, R McNamara, R Seidel, RL Trestman**

•*Virginia Tech Carilion School of Medicine, Carilion Clinic Psychiatry & Behavioral Medicine, Virginia Tech Department of Statistics*

## Background

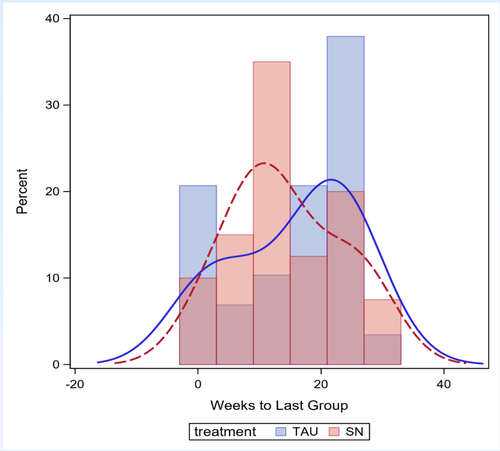
- START NOW (SN) is a manualized, skills-based group psychotherapy originally developed and validated in a correctional population resulting in a decrease of reportable behaviors.
- The SN modality, manual and facilitator guide were adapted to an outpatient substance use disorder clinic (specifically opioid use disorder) population

## Methods

- One hundred and thirty-nine OUD patients were quasi-randomized to participate in SN (n=78) or Treatment-As-Usual or TAU (n=61) weekly groups in additional to Medication Assisted Treatment (MAT).
- Psychotherapy groups were run by psychiatric physicians and NPs—from this point forward referred to as group leaders or clinicians. Postgraduate year three (3) psychiatry residents supported physician-led groups with 1 resident per physician per group. Some clinicians ran both a START NOW group as well as a TAU group. A maximum number of 10 patients were allowed per group.
- Both START NOW and TAU involved a once-weekly group-based psychotherapy administered for 32 weeks or 8 months.

## Results

•**Figure 1: Among a Subset of the Data: Weeks-to-Last-Group by Treatment Group**




- **Interpretation tip.** Among those that did not attend beyond the 30th week†, more START NOW participants ceased attendance earlier in the study than TAU participants. Once participants made it beyond the mid-way point in the study, fewer START NOW participants ceased attendance, whereas more TAU participants ceased attendance towards the end of the study.

**Reference point BUP/NAL -assess interaction between drug and SN/TAU group**

Table 3 Drug-related correlates of positive tests versus reference groups

| Parameter | Odds Ratio | 95% Confidence Limits | | P value |
|---|---|---|---|---|
| Treatment | | | | |
| START NOW | 1.357 | 1.088 | 1..693 | 0.0067 |
| TAU (Ref) | | | | |
| Week | | | | |
| 01-08 (Ref) | | | | |
| 09-16 | 0.966 | 0.722 | 1.294 | 0.2371 |
| 17-24 | 0.835 | 0.616 | 1.132 | 0.7341 |
| 25-32 | 0.690 | 0.503 | 0.946 | 0.0313 |
| Drug Category | | | | |
| Alcohol, Metabolites | 0.031 | 0.013 | 0.076 | 0.1547 |
| Barbiturates/Muscle Relaxants | 0.003 | 0.001 | 0.006 | <.0001 |
| Bup/Nal, Metabolites (Ref) | | | | |
| BZD | 0.016 | 0.009 | 0.028 | <.0001 |
| Cannabis | 0.024 | 0.014 | 0.041 | <.0001 |
| Nicotine, Metabolites | 1.477 | 0.660 | 3.306 | <.0001 |
| Opioids (Incl Codeine/Tramadol) | 0.015 | 0.009 | 0.026 | <.0001 |
| Stimulants (Amph, Meth, Cocaine) | 0.046 | 0.046 | 0.079 | 0.5808 |

## Results

•Holding all other variables constant, treatment type did differ in proportion of positive drug screen results (p = 0.0067). SN is associated with higher odds of a positive drug screen when compared to TAU (OR = 1.4). There was no significant dependence (association) between positive drug screens and weeks observed.

START NOW participants are significantly younger than TAU participants (mean age 36 vs 40 years, p = 0.0203)

START NOW intervention has a higher percentage of female participants (67% vs 48%, p = 0.0269)

Among those 18 to 25 years of age, holding gender constant, significant findings by treatment group were observed for:

Number of Groups Attended (3.6 greater rate of group attendance for START NOW, p < 0.0001)

Weeks to Last Group (3.3 greater rate of weeks to last group for START NOW, p = 0.0082)

The risk of drop out is 0.03 lower for START NOW as compared to TAU (p = 0.0579)

Difference in retention time via the log-rank statistic (median weeks: START NOW = 32.9, TAU = 19.4; p = 0.0049).

• Interpret with caution given small sample size.

## Discussion/Conclusion

•Assessments of behaviors (impulsivity, aggression and interpersonal problems), retention in treatment and drug screen results indicated non-inferiority of the SN arm as compared to TAU.

•Both patient and clinician satisfaction were positive for the SN program.

•This study suggests that SN may be an opportune treatment for outpatient clinics focusing on SUD.

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# Dentistry

CARILION CLINIC

# Prevention, Early Detection, and Management of Osteoradionecrosis of the Jaw: Two Case Reports

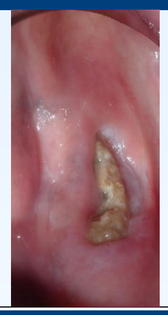
**Ameera Khalefa, DDS, PGY-1**
***Carilion Clinic Dental Care***

## Introduction

Osteoradionecrosis (ORN) of the jaw is a complication found in patients with a history of head and neck radiation. ORN is characterized by mucosal breakdown with exposed necrotic bone that fails to resolve spontaneously in a previously irradiated area. It is progressive and can severely impact quality of life. This study reviews two cases following the protocol for prevention, diagnosis, and management of possible ORN in the dental setting, with an overview of risk factors, progression, and conservative treatment options. This includes a case in which ORN was identified as a possible risk of dental surgery after radiation, and another in which active ORN was observed and managed in a clinical setting.

## Clinical Presentation

ORN is characterized by mucosal breakdown in an area with exposed necrotic bone and cannot be identified as recurrence of tumor or metastasis in this area.[1] It may also present with drainage and fistula formation.[1] Patients may be asymptomatic in earlier stages, while pain is more common in later stages.



## Risk Factors

Factors that may predispose a patient to developing ORN include: a history of surgical resection and radiation of the affected area, particularly in the mandible, and a later history of trauma. ORN can also occur spontaneously.[1] While there are other risk factors that may predispose patients to osteonecrosis of the jaw, this poster will focus on the risks related to patients with a history of head and neck radiation.

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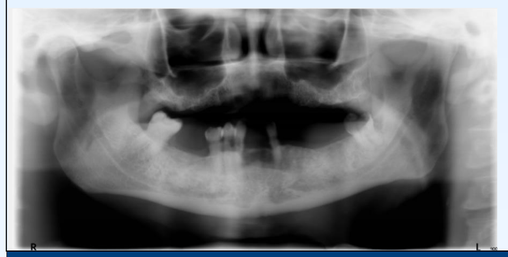
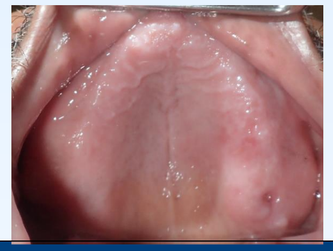
## Case I

60M referred for "tooth pain." Patient's chief complaint is that he has been in pain in "all of my teeth" for the last few months. Patient has a history of right supraglottic squamous cell carcinoma Stage IVA, diagnosed in 2018. Patient underwent concurrent Cisplatin radiation therapy and completed treatment in November 2018. Patient's PMH includes protein S deficiency, bilateral lower extremity DVT, recurrent pulmonary emboli on Coumadin, hypercholesterolemia, GERD, COPD, chronic back pain, and allergic rhinitis. Clinical examination shows retained root tips with deep caries on remaining teeth. Patient reports symptoms with all remaining teeth. Consult with radiation oncologist reveals that patient received <45 Gy to the posterior mandible, <30 Gy to the anterior mandible, with the maxilla relatively spared. With these IMRT dosages, risk of developing ORN was deemed low-moderate, and patient was offered the following treatment options: extractions with or without hyperbaric oxygen. Patient also offered option of hyperbaric oxygen after extractions if poor wound healing occurred. Patient elected to extract without hyperbaric oxygen. Extractions were then completed, with patient showing signs of adequate healing on follow-ups.

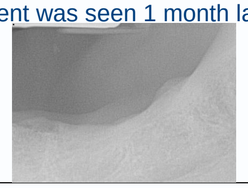




## Case II

64 M with a history of squamous cell carcinoma of the supraglottic larynx, extending to the base of tongue, T4N0M0. Full mouth extractions were completed on 1/15/2020, with a follow-up and clearance for treatment on 1/29/2020. Patient began chemoradiation treatment from 2/4 - 3/20/2020. Patient was planned to receive 70 Gy IMRT for the duration of this treatment period. He was later referred for "exposed bone" on 12/15/2020. Patient noted soreness in the affected area one month prior (11/2020). Patient is unsure of true cause, though he admits to eating more abrasive foods such as chips and fried chicken. Obtained periapical radiograph to make note of any changes in the bone and to ensure no bony remnants from extractions remained. Periapical film shows no bony remnants, no radiographic changes other than healing extraction sites #17 and 20. Clinical exam shows a 12mm x 5mm area of exposed mandible on the lingual in the region of left third molar. Sharp areas were smoothed out with high-speed hand piece and carbide football bur to patient's satisfaction. Provided Peridex and instructed patient to rinse with it twice a day, and to switch to Listerine Zero after he finished with the Peridex. Patient was seen 1 month later, with no changes noted in size or symptoms.

Patient was seen another month later; it was noted at this appointment that the area of necrosed bone had increased in size. Patient was then referred to ENT for evaluation and further treatment.



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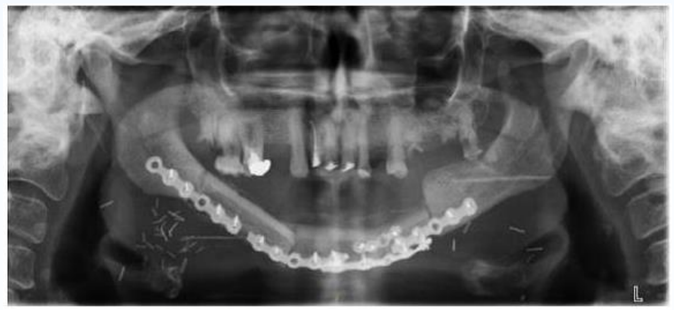
## Prevention

While different methods of treatment are indicated based on the progression of ORN, prevention is the best treatment. Prevention of ORN involves addressing dental needs prior to radiation therapy, proper oral hygiene, and close follow-ups with all providers involved in patient's treatment. Dental evaluation of areas that are planned to be irradiated includes diagnosis and treatment of any teeth that are likely to become symptomatic in the future. Completion of extractions at least 2 weeks prior to start of radiotherapy is recommended as well, in order to avoid irradiating tissues that are not fully healed.[2] When extractions are indicated after completion of radiation therapy, it is imperative that they be extracted as atraumatically as possible. Hyperbaric oxygen may be used as an adjunct therapy as well, particularly when radiation dosages were >60Gy in the affected area.[2]

## Treatment

When ORN is first observed, radiographs should be obtained to evaluate extent of bone necrosis, as well as documentation of size and extent of lesion. Conservative treatment options begin with removal of debris, sharp remnants, and sequestra, in order to promote healing.[2] Sequestra may also be allowed to detach spontaneously.[2] Maintenance of proper oral hygiene and regular use of chlorhexidine mouth rinses is beneficial in facilitating the resolution of ORN as well. Hyperbaric oxygen may also be used as an adjunct to aid healing.



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## Acknowledgements

Zachary Swanner, DMD; Lee Jones, DMD

# Case Report: A Multidisciplinary Approach To Dental Trauma

Greta Castonguay DMD, Zachary Swanner DMD, Karina Miller DDS, Carilion Clinic Dental Care

## Case Background

- **HPI:** 17-year-old female presented to the RMH ED with complete closed alveolar fracture and avulsion #23 following motor vehicle accident.
- **PMH:** Surgically fixated mandibular fracture one year prior. No prescription medications or allergies.
- **CC:** Pain localized to inferior front teeth and jaw, non radiating, moderate to severe, worse with any movement and touch of teeth, better with rest. Difficult to close jaw, hurts to swallow and with movement in mouth.

## Assessment and Plan

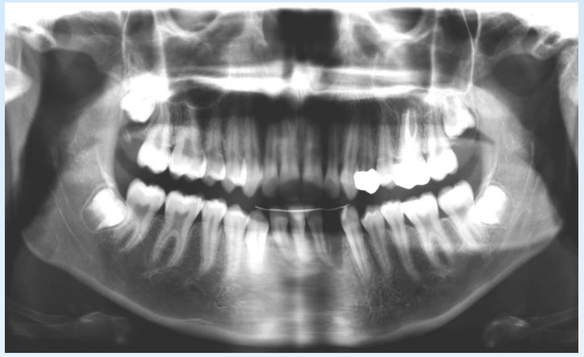

**Figure 1.** Panoramic radiograph taken as the first diagnostic imaging in the dental setting to assess for mandibular/dental fracture or TMJ displacement. Pano demonstrates displacement of mandibular incisors and existing orthodontic retainer, avulsion tooth #23. Alveolar fracture diagnosed on initial head/neck CT obtained in the ED when evaluating for other facial/cervical trauma.

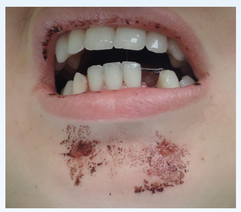

**Figure 2**. Extraoral abrasion

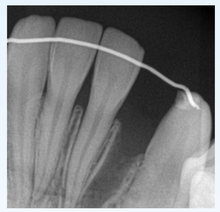

**Figure 3**. PA taken to rule out dental fracture shows complete avulsion #23 without dental fracture

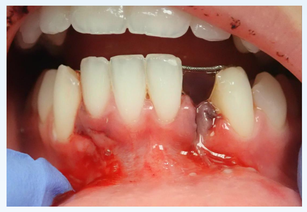

**Figure 4.** Laceration of the keratinized gingiva extending to the unattached mucosa caused by avulsion #23

**Plan:**

- Initial medical evaluation - place avulsed tooth into hypotonic solution as soon as possible (if more than 60 minutes dry time, dental prognosis is poor)
- Dental consultation- assessment and treatment planning, treatment as soon as possible, coordinate multidisciplinary care and schedule follow up

| Results, one year after the injury | Number of diagnosed events | Estimated risk (%) | 95% confidence interval |
|---|---|---|---|
| Tooth loss | 2 | 1.9 | [ 0 - 4.5 ] |
| Pulp necrosis | 0 | 0 | not available |
| Pulp canal obliteration | 0 | 0 | not available |
| Ankylosis | 73 | 71.6 | [ 62.9 - 80.2 ] |
| Inflammatory root resorption | 29 | 27.6 | [ 19.1 - 36.2 ] |
| Surface resorption | 2 | 1.9 | [ 0 - 4.5 ] |
| Bone loss | 9 | 8.6 | [ 3.2 - 13.9 ] |
| **Results, three years after the injury** | **Number of diagnosed events** | **Estimated risk (%)** | **95% confidence interval** |
| Tooth loss | 9 | 16 | [ 5.5 - 26.5 ] |
| Pulp necrosis | 0 | 0 | not available |
| Pulp canal obliteration | 0 | 0 | not available |
| Ankylosis | 55 | 72.9 | [ 62.6 - 83.2 ] |
| Inflammatory root resorption | 12 | 16.4 | [ 7.9 - 25 ] |
| Surface resorption | 6 | 8.2 | [ 1.9 - 14.5 ] |
| Bone loss | 7 | 10.8 | [ 3.1 - 18.6 ] |

Figure 5*. Prognosis statistics for tooth avulsion (mature apex)

| Results, one year after the injury | Number of diagnosed events | Estimated risk (%) | 95% confidence interval |
|---|---|---|---|
| Tooth loss | 3 | 1.8 | [ 0 - 4.5 ] |
| Pulp necrosis | 69 | 38.4 | [ 31.2 - 45.5 ] |
| Pulp canal obliteration | 14 | 7.8 | [ 3.9 - 11.7 ] |
| Ankylosis | 2 | 1.3 | [ 0 - 3 ] |
| Inflammatory root resorption | 3 | 1.8 | [ 0 - 3.8 ] |
| Surface resorption | 8 | 5 | [ 1.6 - 8.4 ] |
| Bone loss | 13 | 7.7 | [ 3.7 - 11.7 ] |
| **Results, three years after the injury** | **Number of diagnosed events** | **Estimated risk (%)** | **95% confidence interval** |
| Tooth loss | 5 | 8.4 | [ 0 - 17.7 ] |
| Pulp necrosis | 73 | 42.4 | [ 34.9 - 50 ] |
| Pulp canal obliteration | 19 | 12.2 | [ 6.8 - 17.5 ] |
| Ankylosis | 3 | 2.1 | [ 0 - 4.6 ] |
| Inflammatory root resorption | 4 | 2.7 | [ 0 - 5.3 ] |
| Surface resorption | 8 | 5 | [ 1.6 - 8.4 ] |
| Bone loss | 13 | 7.7 | [ 3.7 - 11.7 ] |

Figure 6*. Prognosis statistics for alveolar fracture (mature apex)

## Treatment

**Treatment rationale:**

- Avulsed teeth should be placed in a hypotonic solution and re-implanted and splinted as soon as possible. #23 was placed in milk approximately 45-60 minutes after the initial trauma. This should happen immediately, if possible. Dental consult and splinting was completed approximately 6 hours after trauma occurred.
- Patient and parent were informed of treatment options including semi-rigid splint with or without reimplantation #23 with a guarded prognosis given the extended time before placement of the avulsed tooth in a hypotonic solution.
- Factors considered included patient dental history/anxiety, oral hygiene, ability to comply with required follow up, esthetic and functional demands.
- Alternatives include no reimplantation #23 due to multidisciplinary care involved and follow up required, replacement of missing #23 with a fixed partial denture, removable partial denture, or dental implant.

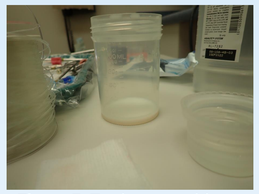

**Figure 7.** Tooth removed from milk, tooth and oral cavity gently cleaned with chlorhexidine gluconate 0.12% in preparation for re-implantation

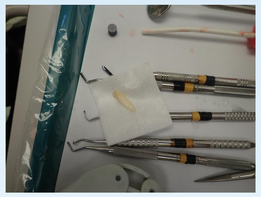

**Figure 8.** Tooth prepared for re-implantation.

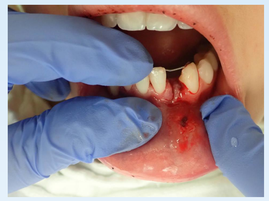

**Figure 9.** Fractured alveolar segment repositioned with gentle digital pressure. For best results, complete as soon as possible after the trauma

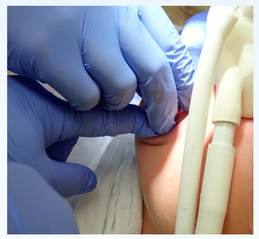

**Figure 10.** Local anesthesia/analgesia given. Oral cavity and facial lacerations cleaned with 0.12% chlorhexidine gluconate.

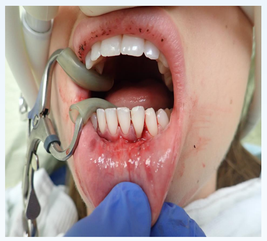

**Figure 11.** Tooth #23 reimplanted, position verified clinically.

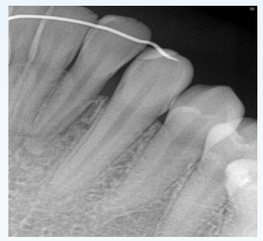

**Figure 12.** Existing lingual retainer separated on impact, was removed.

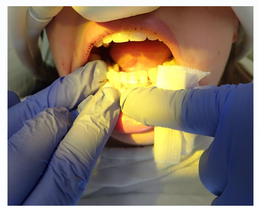

**Figure 13.** Semi rigid splint placed and secured with resin-based composite

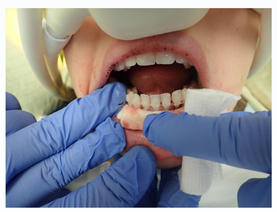

**Figure 14**: Enamolplasty of involved teeth #23-26 to prevent excessive occlusal forces**.**

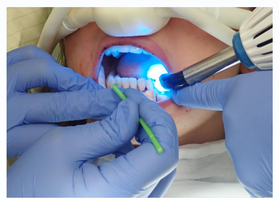

**Figure 15.** Splint placed on the facial surface on the cervical aspect of the mandibular dentition and verified out of occlusion.

## Multidisciplinary Management

**Oral Surgery:**

- Referred for evaluation of prior mandible fracture with surgical repair and TMJ evaluation: WNL, resume yearly follow up

**Endodontics:**

- Root canal therapy (RCT) should be initiated within 2 weeks of dental trauma. RCT #23 completed within 3 weeks and patient seen for 2, 6, and 12 week follow ups. Only tooth #23 has required RCT to this point.

**Orthodontics:**

- Replacement of lingual retainer to maintain arch form and stabilize occlusion. Previously existing lingual retainer likely prevented further trauma at the time of accident via distribution of force on impact.

**Periodontics:**

- Management of soft tissue defect (mucogingival involvement #23) associated with avulsion to promote cleansability and reduce long term periodontal complications

## Follow Up

**Two week follow up:**

- Patient reports 0/10 pain
- Soft tissue healing WNL
- Vitality testing: Endo ice (++) #22, 27, (+) #25, 26, (-) #23, 24. Unable to assess individual tooth mobility due to splint placement. Percussion (+) #24, 25, 26, (-) #22, 23, 27. No pain on palpation, No changes to tooth shade.

**Four week follow up:**

- Patient reports 0/10 pain
- Endo test #21-28: no pain on palpation/percussion except (+) percussion #24, 25, normal response to endo ice #21, 22, 24-28, negative response due to initiation of endodontic therapy #23, no mobility.

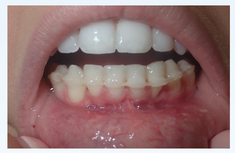

**Figure 16.** Two-week post op evaluation

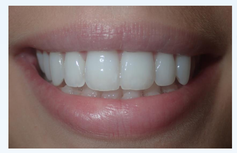

**Figure 17.** Two-week post op evaluation

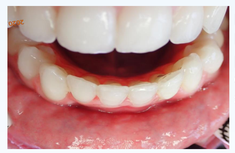

**Figure 18.** Four-week post op evaluation and splint removal

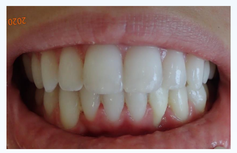

**Figure 19.** Four-week post op evaluation and splint removal

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CARILION CLINIC

# Dermatology

# A case of the “Keto Rash”


## Kiley Fagan MD, Nathan Johnson MD

*Carilion Clinic Dermatology and Mohs Surgery*


## Case Report

A 31-year-old middle eastern male with no significant past medical history presented with a 3-week history of a waxing and waning, mildly pruritic eruption on the trunk. Lesions would last 3-4 days and then healed with dark spots. Physical exam revealed erythematous papules and vesicles distributed on the chest, neck, and back with underlying reticulate hyperpigmentation (Figure 1A, B). He denied any changes to soaps/detergents/skin care products. ROS was negative and he was on no medications. The pt was married, worked in healthcare, and did not smoke or drink. He had not traveled recently and denied any bug bites. He had seasonal allergies only.

## Histopathology

Although this patient was not biopsied out of lack of utility, histopathology varies based on clinical stages of lesions. Early lesions contain a perivascular neutrophilic infiltrate with spongiosis and papillary dermal edema. These progress to vesicles with necrotic keratinocytes and a lichenoid infiltrate of lymphocytes and eosinophils. Late lesions reveal parakeratosis, acanthosis, and dermal melanophages.

## Figures

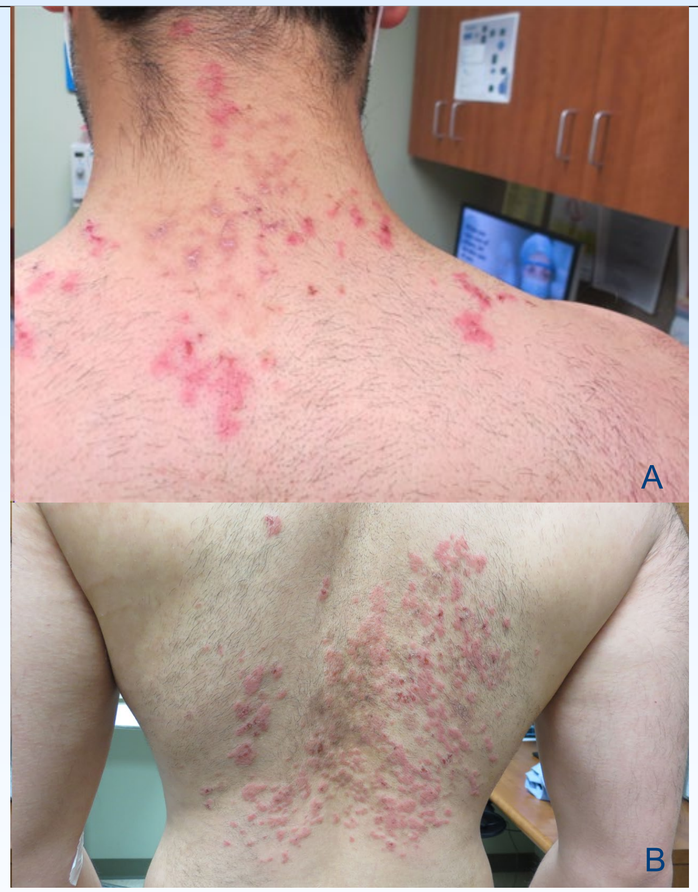


**Figure 1. (A)** Erythematous papules and papulovesicles clustered on his posterior neck. **(B)** Similar lesions appearing on the mid to lower back. Healing areas with residual macular reticulated hyperpigmentation.

## Discussion

Prurigo pigmentosa, also known as the "keto rash", is a rare acquired disorder of unknown origin that is strongly associated with ketosis, diabetes, and post-bariatric surgery. The pathophysiology is thought to be related to ketone body accumulation around blood vessels leading to an inflammatory reaction. The ketone bodies then cause upregulation of intercellular adhesion molecule 1 (ICAM-1) and leukocyte function-associated antigen 1 (LFA-1). It occurs most commonly in young Japanese women and favors the back, neck, and chest. Physical exam reveals recurrent crops of papulovesicles that resolve with reticulate hyperpigmentation. The mainstay of treatment is to reverse the ketosis with the option of treating with doxycycline, particularly in persistent cases. The disorder was recognized in this patient and after stopping the diet, the lesions quickly resolved in 1 week.

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CARILION CLINIC

# Family and Community Medicine

CARILION CLINIC

# Prevalence and Correlates of Health Service Overuse in Primary Care

Michelle Rockwell, PhD, RD[1], John Epling MD, MSEd[1], Jane Colwell, MSN, RN[2], Kyle Russell, MS[3], Beth Bortz, MPP[3]

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[2] Clinical Advancement and Patient Safety, Carilion Clinic
[3] Virginia Center for Health Innovation

***WORK IN PROGRESS***

## Background/ Purpose

In the U.S., health service overuse – also called low value care (LVC) - is prevalent (up to 20% of total health services), costly ($350 billion annually), and associated with patient harm.

We are performing a mixed methods investigation into LVC within Carilion primary care. The purpose of this particular project is to quantify utilization of 42 LVC services and explore trends and patterns in service utilization.

## Methods

Insurance claims data (from the Virginia All-Payers' Claims Database) were collected by our Smarter Care Virginia partners and input into Medinsight Health Waste Calculator (HWC).

- 42 LVC services in 2019
- services were quantified and classified as *LVC* or *necessary*

To date, we have explored 4 services for trends in utilization:

1) Don't obtain **baseline laboratory studies** in patients without significant systemic disease (ASA I or II) undergoing low risk surgery.
2) Don't order **annual EKG** or any other cardiac screening for low-risk patients without symptoms.
3) Avoid prescribing **antibiotics for upper respiratory infections**.
4) Don't perform population based **screening for Vitamin D deficiency**.

We compared LVC utilization to state averages. Then, SPSS v26.0 was used to explore differences in utilization by region, clinician characteristics, and patient insurer via chi-square analysis. Pearson's correlation analysis was used to evaluate the relationship between clinician years in practice and service utilization.

## Preliminary Findings

**Utilization of 4 Low Value Care Services by Carilion Primary Care in 2019**

| Service | Total volume | Est. Spending | % LVC | State Average | Est. LVC Spending | Region | Clinician Degree | Clinician Specialty | Clinician Gender | Clinician Years in Practice | Patient Insurer |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pre-Op Labs** | 3066 | $1,465,000 | 94% | 82% | $1,377,000 | ↑ NRV | ↑ MD & DO | ↑ FM | -- | ↑ w/ years | ↑ Medicare |
| **Annual EKG screening** | 31,235 | $10,200,000 | 15% | 11% | $1,530,000 | ↑ NRV | ↑ MD | ↑ IM | ↑ males | ↑ w/ years | ↑ Medicare & comm-ercial |
| **Vitamin D screening** | 1851 | $278,000 | 7% | 20% | $20,000 | ↑ Roanoke ↓ South | -- | -- | -- | ↓ w/ years | ↑ comm-ercial |
| **Abx for URI** | 14,048 | $323,000 | 96% | 98% | $310,000 | ↑ NRV | ↑ NP & PA | ↑ FM | ↑ males | ↑ w/ years | -- |

Regions: NRV, Roanoke, Shenandoah, South; Degrees: MD, DO, NP, PA; Specialties: FM, IM, other; Genders: male, female, other; Insurers: Medicare, Medicaid, commercial, other

↑= significantly higher utilization or significant (+) correlation ($p<0.05$);
↓= significantly lower utilization or significant (-) correlation ($p<0.05$)

## Strengths/Limitations

S: HWC used broadly in LVC literature; our findings will be comparable to multiple other analyses and inform potential de-implementation.

S: Data may serve as pre-COVID baseline.

L: Virginia All-Payers' Claims Database includes only ~80% of Carilion's patients.

L: Claims data limited in consistency, completeness, details, and clinical nuance.

L: Some disagreement about HWC LVC criteria.

## Next Steps

→ Analyze remaining 38 services.

→ Evaluate overall findings to identify greatest LVC utilization and estimated LVC spending.

→ Along with other parts of the investigation, target opportunities for future LVC de-implementation.

# Obstetrics/ Gynecology

# Becoming a Parent as a Physician in Training


## Conner Blackwell[1], MD, Donald Kees[2], MD, Amanda Murchison[1], MD

*Virginia Tech Carilion School of Medicine, [1]Dept of Obstetrics & Gynecology, [2]Dept of Pediatrics*


## Introduction

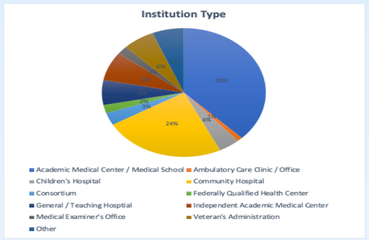
- Formal parental leave policies enhance childhood health outcomes and increase emotional well-being of parents.
- Medical societies, including The American Medical Association, have advocated for institutions to create formal parental leave policies.
- In 2001, a survey of American residency programs found 80% and 69% had formal maternity and paternity leave policies, respectively.
- This survey-based study sought to establish industry norms for parental leave during medical training.

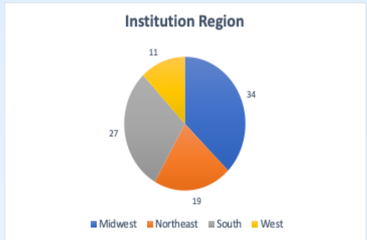
## Methods

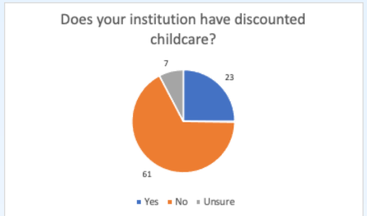
- In Fall 2020, a survey was sent to all American Designated Institutional Officers (DIOs) asking for responses describing maternity, paternity/co-parent, and adoptive leave
- Responses were stored in RedCap database and analyzed with descriptive statistics

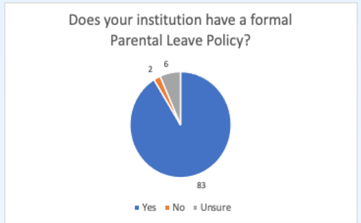
## Results

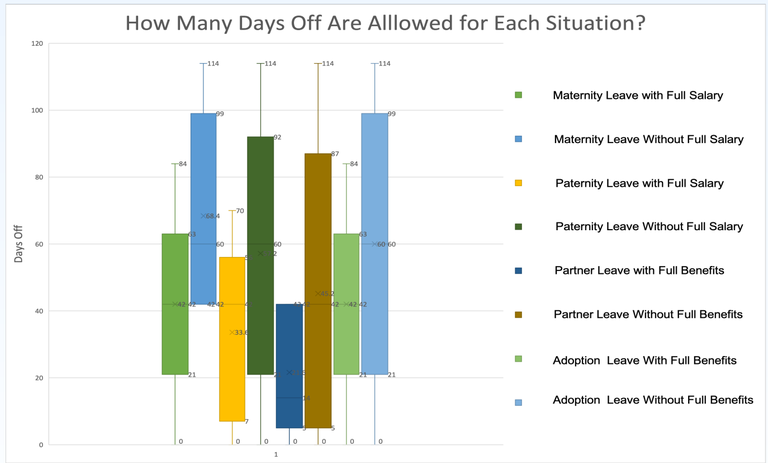
- 91/829 (11%) DIOs responded to the survey




## Analysis

- This study identified vast differences in institutional policies regarding different types of parental leave with many DIOs “unsure” of policies related to paternity, partner, and adoption leave.
- Discounted childcare is offered at a minority (25%) of institutions. This is a missed opportunity to enhance financial and emotional wellness of physicians in training.
- As trainee wellness becomes more emphasized, institutions may use this study’s data to compare their own policies and adapt to industry norms. This could lead to better uniformity in access to protected time off for residents and fellows who become parents.

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# Student

# Post-operative thromboprophylaxis with oral rivaroxaban versus subcutaneous low-molecular-weight heparin: a retrospective comparison in women with a gynecologic malignancy

Meyha N. Swaroop MS, Lindsay E. Borden MD, Tonja Locklear PhD, Shannon Armbruster MD MPH, Erin Saks MD, Janet L. Osborne MD, Fidel A. Valea MD, David A. Iglesias, MD

*Virginia Tech Carilion School of Medicine, Roanoke, VA*

## BACKGROUND

- Perioperative venous thromboembolism (VTE) is the most common preventable cause of in-hospital death in the US.
- Current guidelines recommend perioperative pharmacologic prophylaxis for patients undergoing abdominal or pelvic surgery for a malignancy.
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## OBJECTIVES

- To determine the incidence of post-operative VTE among gynecologic cancer patients stratified by method of pharmacologic VTE prophylaxis.

## METHODS

- Retrospective chart review
- ***Inclusion criteria:*** Women who underwent a laparotomy for a gynecologic malignancy + received extended post-operative thromboprophylaxis with either subcutaneous enoxaparin (40 mg) or oral rivaroxaban (10 mg) for 28 days post-op
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- ***Statistical analysis***: Wilcoxon Two Sample Test and Fisher's Exact Test were performed to determine the rate of VTE, stratified by method of thromboprophylaxis

## RESULTS

| | Enoxaparin (n=233) | Rivaroxaban (n=82) | p-value |
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| **Demographics** | | | |
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| **Median Pre-Surgery BMI (IQR)** | 29.1 (9.2) | 28.8 (10.3) | 0.4766 |
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| **Comorbidities** | | | |
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**Table 1**: Surgical and clinical characteristics of study population
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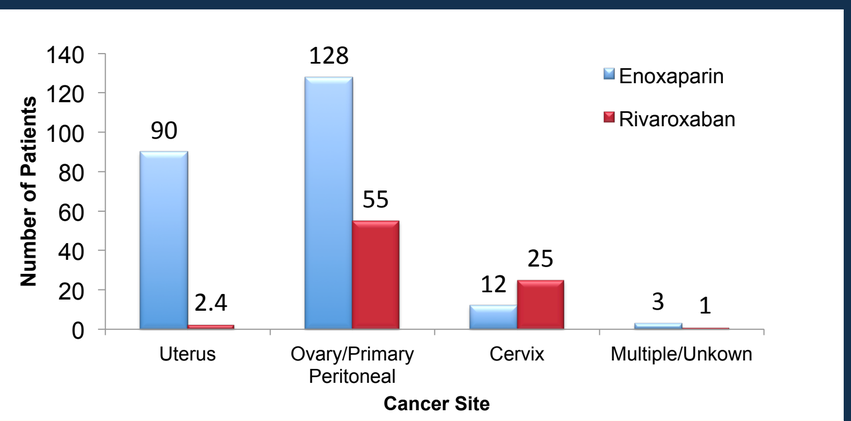


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| **VTE at 30 days** | 4 (1.7%) | 1 (1.2%) | 1.00 |
| **VTE at 90 days** | 10 (4.3%) | 2 (2.4%) | 0.74 |
| **Major bleeding events** | 1 (0.4%) | 3 (3.7%) | 0.06 |

**Table 2**: Incidence of VTE stratified by methods of pharmacologic prophylaxis

## CONCLUSIONS

- No significant difference was seen in the incidence of VTE or rate of major bleeding events following laparotomy in patients with gynecologic malignancies who received subcutaneous enoxaparin versus rivaroxaban for extended thromboprophylaxis.
- Rivaroxaban may be an effective and safe alternative for extended thromboprophylaxis.
- Given the small sample size, these findings should be taken with caution but provide support for future multi-institutional and prospective studies.

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# Psychiatric Profile of a Child with 16p11.2 microduplication and 15q11.2 microdeletion co-occurrence

**Mallory Blackwood[1], Katherine Liebesny, MD[1,2], Kodjovi Kodjo, MD[2]**

1.Virginia Tech Carilion School of Medicine 2. Carilion Roanoke Memorial Hospital Dept. of Psychiatry

## BACKGROUND

This case profiles a child with 2 distinct genetic mutations, each previously associated with a range of neurologic, psychiatric and physical traits. The patient (GL) displays traits associated with both phenotypes and a complex psychiatric profile complicated by a difficult social history.

**16p11.2 microduplication:** prevalence of 3/10,000. Associated with ASD, schizophrenia, self-harm, and ADHD, global developmental delay and seizure disorders[1-6].

**15q11.2 microdeletion:** prevalence of 169/66,462. Associated with language delay, ASD, schizophrenia and seizure disorders[7-10].

Despite the risk associated with this genetic profile, the two anomalies do not appear to have a summative effect on the severity of GL's psychiatric and cognitive profile. Rather, this is a complex case influenced by both genetic and social factors.

## PAST MEDICAL HISTORY

GL was first admitted to Carilion Roanoke Memorial inpatient psychiatry at the age of 9 due to escalating self-harm and auditory hallucinations. In her own words, patient states "my brain tells me to do bad things like hurt myself and you guys"

**Medical History:** Historical diagnoses of PTSD, unspecified seizure disorder (first episode at 22 months in the setting of fever, treated with Lamictal), ADHD (treated with Vyvanse), and hallucinations (diagnosed at the age of 5 and treated with Risperidone).

**Social History: S**ignificant for abuse, early trauma, and disrupted attachment formation. Early abuse resulted in parental loss of custody.

**Family History**: Paternal learning disability and Maternal mental health problems, unspecified

## NEUROPSYCHIATRIC TESTING

### Wechsler Abbreviated Scale of Intelligence-Edition II

| | Composite Score (M=100, SD=10) | Percentile Rank | Qualitative Descriptors |
|---|---|---|---|
| Verbal Comprehension | 82 | 12 | Low Average |
| Perceptual Reasoning | 73 | 4 | Very Low |
| Full-scale (FSIQ-4) | 75 | 5 | Very Low |

### Vineland 3 Parent Rating Form

| | Domain Standard Score (M=100, SD=10) | Percentile | Qualitative Descriptors |
|---|---|---|---|
| Communication | 59 | <1 | Low |
| Daily Living Skills | 56 | <1 | Low |
| Socialization | 52 | <1 | Low |

| Maladaptive Behavior | V-Score (M=15, SD=3) | Severity Rating |
|---|---|---|
| Internalizing Behaviors | 24 | Clinically Significant |
| Externalizing Behaviors | 56 | Clinically Significant |

Based on the above results, GL meets criteria for intellectual Disability (ID), level 2

## CLINICAL COURSE

During this admission and 2 subsequent admissions within a 6 month span, GL participated fully in group activities and readily made friends with other kids on the unit.

Although she initially described an external entity compelling her actions, GL never appeared to respond to internal stimuli and could not describe recognizable voices. Because of this, there was clinical suspicion that GL was describing intrusive thoughts rather than frank auditory hallucination. The treatment team suggested that her symptoms are better understood as part of her PTSD and ID than as a separate psychotic disorder. Intrusive thoughts and angry outbursts are well-described manifestations of PTSD in young children[11].

Additionally, GL's guardians expressed concern for ASD. Although testing revealed both ID and emotion regulation deficits, the absence of any restrictive/repetitive behaviors or social disinterest prevented a formal diagnosis of ASD per DSM VI behavioral criteria[12].

At the time of discharge, GL was without any signs of hallucination, delusion, or thoughts of self-harm. Close outpatient follow-up was strongly recommended.

## CONCLUSION

This is a child with two separate genetic mutations which confer risk for ASD and schizophrenia. However, on close clinical examination, her behavior was better understood through the context of ID and early trauma. This case serves as a cautionary example of how genetic syndrome diagnosis should not serve as a substitute for a developmentally appropriate assessment and biopsychosocial formulation.

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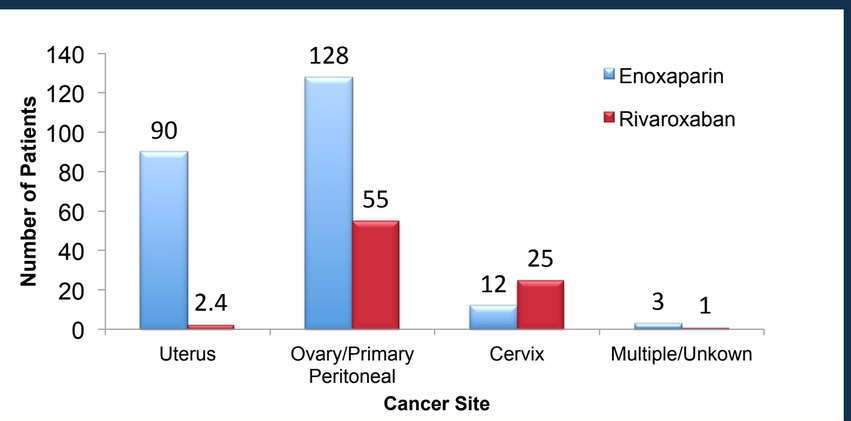


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- Given the small sample size, these findings should be taken with caution but provide support for future multi-institutional and prospective studies.

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# GWIMS Creates a Safe Space for Sharing #MeToo Narratives

Meyha Swaroop[1], Louisa E. H. Eckman[1], Jennifer Vaughn, MD, MSPH[2], Meredith Rahman[1], Adenike Adenikinju[1], Grace Lee[1]
Rebecca R. Pauly, MD[1]; Natalie Karp, MD[1]

1. Virginia Tech Carilion School of Medicine, Roanoke, VA
2. The Ohio State University, Columbus, OH

## BACKGROUND

Sexual harassment is prevalent in medicine and science, with recent studies showing that 30% of female clinician-researchers experienced sexual harassment compared to 4% of males (1). With the growing number of women entering medicine, issues related to gender based discrimination, hierarchical abuse of power, victimization, and sexual harassment are present at all levels of training (2).

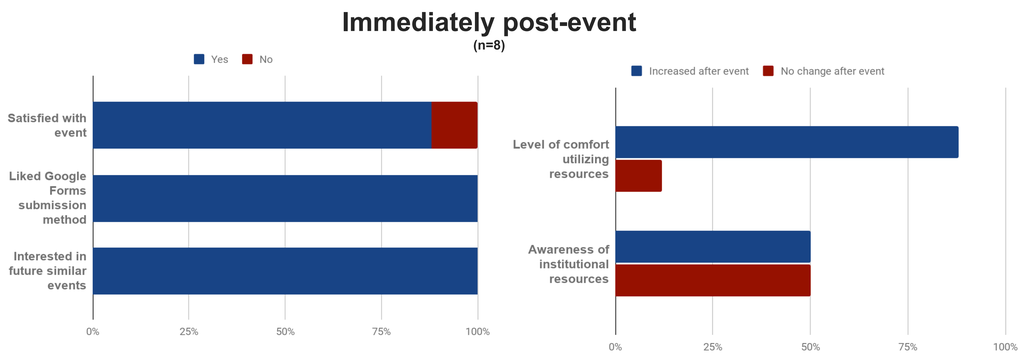
## OBJECTIVES

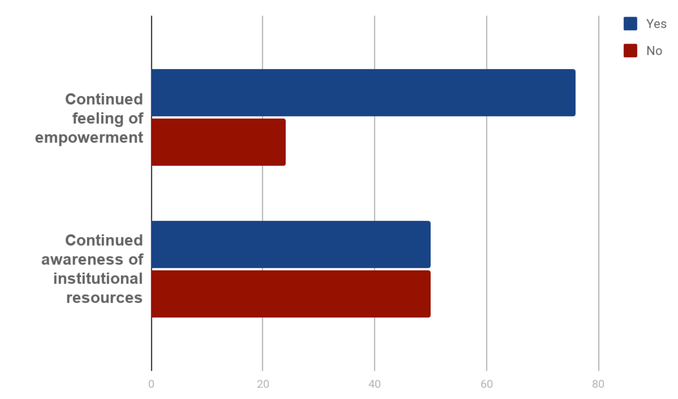
- To give women in medicine and science opportunities to reflect on discriminatory experiences
- To increase awareness of available resources for support
- To foster solidarity among all levels of training

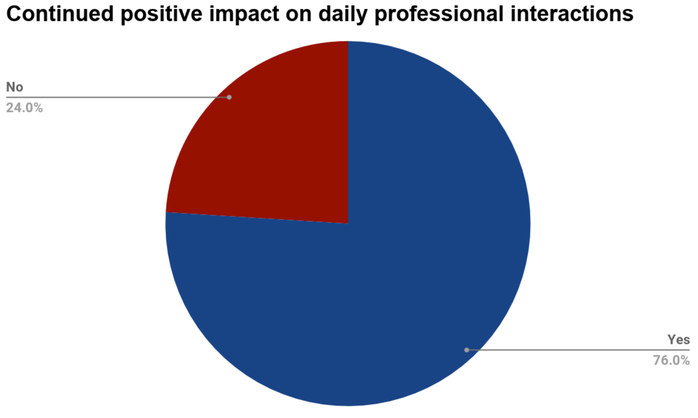
## APPROACH

- Solicited de-identified narratives from all women affiliated with Virginia Tech Carilion School of Medicine, Carilion Roanoke Memorial Hospital, and Fralin Biomedical Institute.
- Women across all training levels were invited to submit narratives, specifically related to experiences of gender based discrimination and misconduct.
- 7/36 narratives were presented and discussed at a forum including a panel of diverse female institutional leaders. These 7 narratives were chosen by Group on Women in Medicine and Science (GWIMS) leadership based on overarching common themes.
- Surveys immediately post-event and 6 months post-event were distributed to all attendees to receive qualitative feedback.

## RESULTS




## DISCUSSION

A successful #MeToo event requires a "multi-generational aspect" including physicians and researchers with years of experience as well as students. De-identifying narratives provided a safe way for women to share their stories, and the panel discussion provided a space to show solidarity and discuss difficult topics. The inclusion of institutional leadership demonstrated the meaning and importance behind this event. Sharing narratives of gender-based harassment and discrimination is valuable and has enduring positive effects. Groups such as GWIMS are uniquely equipped to provide a meaningful platform to sustain the impact of #MeToo discussions. This allows for a space to emphasize solidarity, foster resilience and promote career advancement for those who identify as women.

## FUTURE DIRECTIONS

- Focus on ensuring even more representation among women of color and maximizing audience participation
- Incorporate innovative ways to reinforce awareness. about resources at our institutions that provide support for discrimination and harassment, as only 50% of survey respondents reported awareness of such issues.

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# Intraoperative Ketorolac in Breast Surgery: A Double-Blinded Randomized Controlled Trial

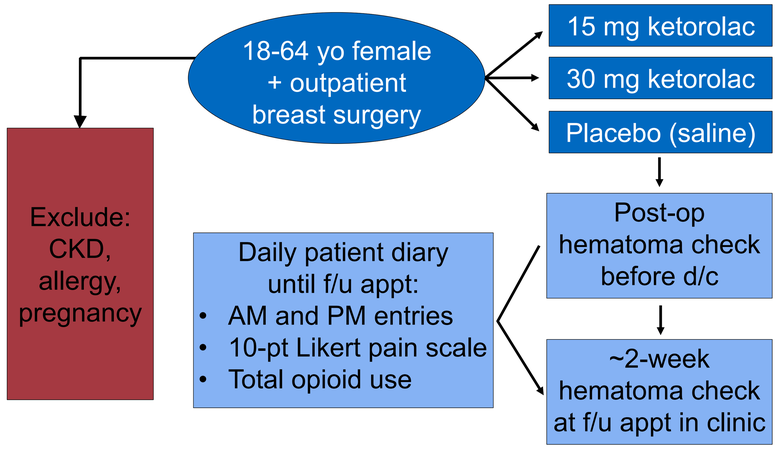
**Joowon Choi (VTCSOM), Jose Rodriguez, MD (Carilion Clinic), Andrew Tranmer, MD (Carilion Clinic), Matthew Applebaum, MD (Carilion Clinic), Brian Cripe, MD (Carilion Clinic), Anthony Capito, MD (Carilion Clinic) Kurtis Moyer, MD (Carilion Clinic), Mark Feldmann, MD (Carilion Clinic) James Thompson, MD (Carilion Clinic)**

## INTRODUCTION

*Can intra-operative ketorolac be used in breast reduction and outpatient reconstruction procedures to reduce post-operative pain and opioid use without an increased risk of hematoma formation?*

- Better intraoperative pain control using non-narcotic analgesics, such as ketorolac, has been shown to reduce post-operative pain and opioid consumption.
- However, ketorolac use is limited in breast procedures due to concerns of hematoma formation[1].
- This study would be the first prospective analysis of hematoma rates following ketorolac use in breast surgery

## MATERIALS & METHODS




This study is a double-blinded randomized controlled trial. Patients identified based on inclusion/exclusion criteria were randomized to receive intraoperative 15 mg, 30 mg ketorolac or placebo. Post-operatively, patients recorded bi-daily pain scores on a 10-pt Likert scale and opioid use. Hematoma formation was assessed before discharge and at their first follow-up appointment. Patient accrual is ongoing and interim analysis is pending.

## RESULTS

| | Group A* | Group B* | Group C* | Total |
|---|---|---|---|---|
| Age | N = 7 | N = 6 | N = 6 | N = 19 |
| 18-24 | 2 | 0 | 1 | 3 |
| 25-34 | 0 | 2 | 0 | 2 |
| 35-44 | 3 | 0 | 1 | 4 |
| 45-54 | 2 | 2 | 1 | 5 |
| 55-64 | 0 | 2 | 3 | 5 |
| Ethnicity | N = 7 | N = 6 | N = 6 | N = 19 |
| Caucasian | 3 | 4 | 4 | 11 |
| African American | 4 | 2 | 2 | 8 |
| Hispanic/Latino(a) | 0 | 0 | 0 | 0 |
| Asian American | 0 | 0 | 0 | 0 |

**Group assignments will continue to be blinded until interim analysis*

Table 1. Patient demographics

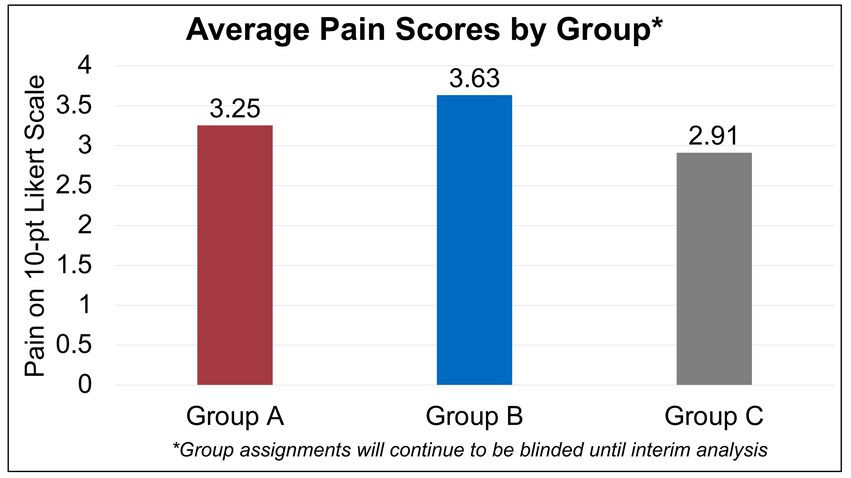



Figure 1. Average Pain Scores by Group*

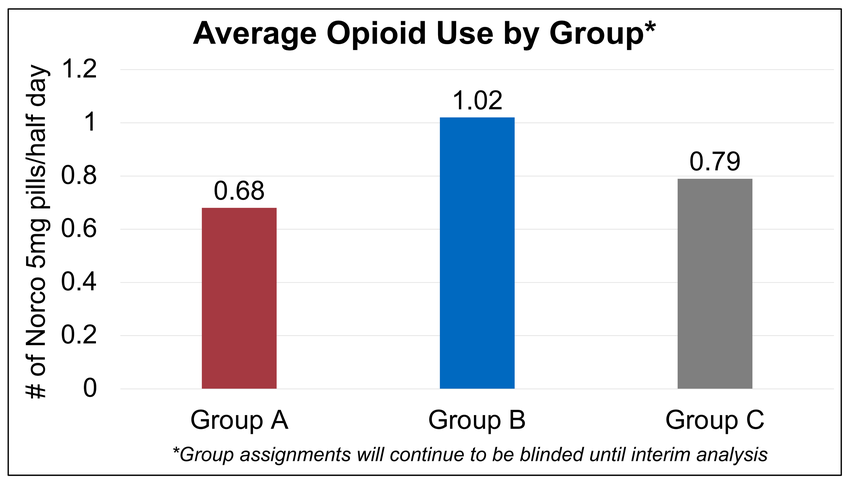



Figure 2. Average Opioid Use by Group*

## RESULTS (CONT.)

| | Hematoma Rate |
|---|---|
| **Group A** | 0% |
| **Group B** | 0% |
| **Group C** | 0% |
| **Total** | 0% |

Table 2. Hematoma Rates by Group

Currently, 19 patients have been enrolled. Group assignments remain blinded due to ongoing patient enrollment. Average pain scores by group show a lower trend in pain scores in Group C (2.91) compared to Group A (3.25) and Group B (3.63). Additionally, Group B has a higher trend in average opioid use (1.02 Norco pills/half day) compared to Group A (0.69) and Group C (0.79). Based on our data & safety monitoring (DSM) review, this prospective cohort has a 0% hematoma rate after an average follow-up time of 9.2 days.

## CONCLUSION

This double-blinded randomized trial is designed to assess the risk and benefit of intraoperative ketorolac administration in outpatient breast surgery. Due to past studies suggesting an association between ketorolac and hematoma formation, plastic surgeons have been reluctant to use ketorolac in breast surgery[1]. Although patient accrual is ongoing, our interim data safety review shows a zero percent hematoma rate in all three groups, suggesting ketorolac may have clinical benefits with no increased risk of hematoma formation. Additionally, there is a lack of prospective data on ketorolac use in breast surgery within the field of plastic surgery making this study the first prospective analysis of ketorolac use and hematoma formation in breast surgery. Future analysis of ketorolac's effect on post-operative pain and opioid use will be performed pending patient accrual.

## REFERENCES & ACKNOWLEDGEMENTS

[1] Barkho JO, Li YK, Duku E, Thoma A. Ketorolac May Increase Hematoma Risk in Reduction Mammaplasty: A Case-control Study. Plast Reconstr Surg Glob Open. 2018 Mar 19;6(3):e1699

# Factors Affecting Female Plastic Surgeons' Decision to Leave Academic Medicine

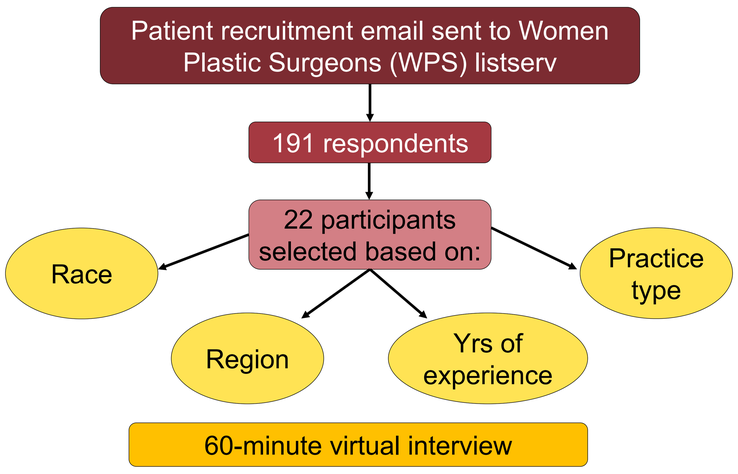
**Joowon Choi, BA (VTCSOM), Aditi Kanth, MD (Medical City Children's Hospital), Meera Reghunathan, MD (UCSD), Katarina Gallus, MD (Restore SD), Wendy Chen, MD (UCLA)**

## INTRODUCTION

*Why do female plastic surgeons' leave academic medicine to go into private practice?*

- Plastic surgery has seen notable growth in female trainees in the past decade[1], but female representation in academia continues to lag with female plastic surgeons being more likely to leave academia for private practice than their male counterparts[2].
- The purpose of this study is to systematically identify factors associated with women deciding to enter and ultimately leave academia.

## MATERIALS & METHODS




IRB exemption was obtained at the University of California San Diego. Twenty-two practicing female plastic surgeons were selected based on experience, region, race, and practice type from a total of 191 women who responded to a study recruitment email sent to the WPS listserv. Virtual interviews examining training experience, first job selection and departure, and workplace culture were conducted based on a script. Responses were anonymized and reported in aggregate.

## RESULTS

| | Private Practice (N = 8) | Former Academia (N = 7) | Always Academia (N = 7) | Total (N = 22) |
|---|---|---|---|---|
| Ethnicity | | | | |
| Caucasian | 3 | 5 | 4 | 12 |
| African American | 0 | 0 | 0 | 0 |
| Hispanic | 1 | 0 | 2 | 3 |
| Asian American | 4 | 2 | 1 | 7 |
| Region | | | | |
| Northeast | 2 | 1 | 3 | 6 |
| South | 2 | 2 | 2 | 6 |
| Midwest | 1 | 3 | 1 | 5 |
| West | 3 | 1 | 1 | 5 |
| Yrs out of Residency | | | | |
| <5 years | 4 | 0 | 2 | 6 |
| 5-15 years | 2 | 3 | 3 | 8 |
| 15+ years | 2 | 4 | 2 | 8 |

Table 1. Participant demographics

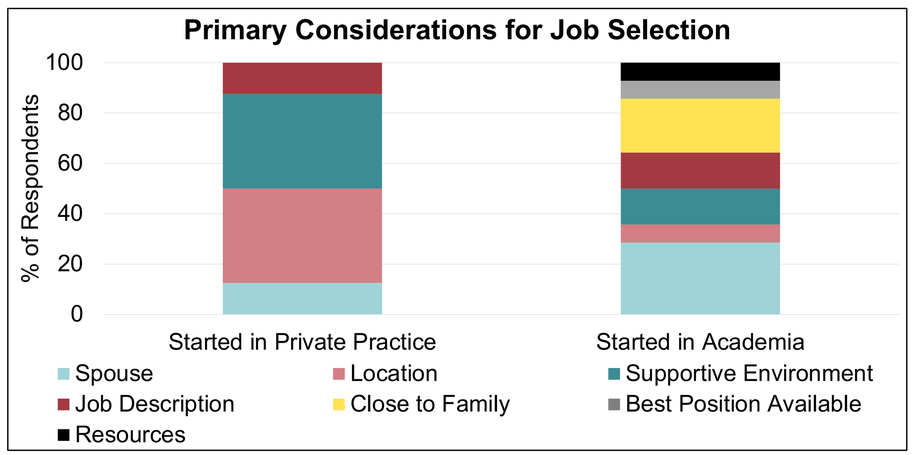



Figure 1. Primary considerations for job selection by practice type

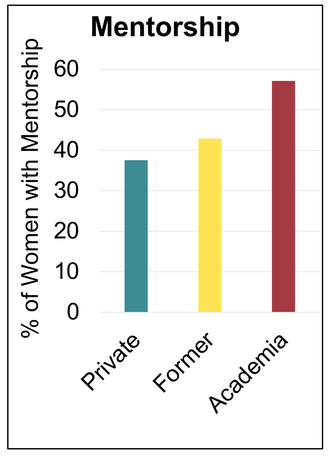



Figure 2. Mentorship by practice type

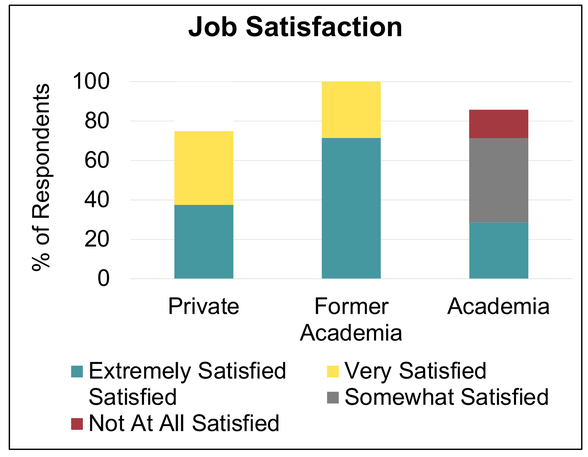



Figure 3. Job satisfaction by practice type

## RESULTS (CONT.)

- Practice content was more important to those going into academia (50% vs 37.5%), while supportive environment and location were more important to those in private practice.
- Women who stayed in academia were more likely to have female mentorship than those who left (42.8% vs 14.2%).
- Those who left academia for private practice cited perceived gender inequity (85.7%) followed by lack of flexibility (71.4%) as reasons for leaving (N=7).
- Satisfaction with current workplace culture is highest in those currently in private practice (87% Extremely or Very Satisfied), versus 33% of participants currently in academia.

## CONCLUSION

Our qualitative analysis suggests that the factors influencing why female plastic surgeons enter and leave academia are multifactorial, including practice content, geography, mentorship, work-place culture, and perception of gender equity. This rich qualitative data is currently being used to design a validated survey tool intended for larger participation amongst female plastic surgeons across the country to create evidence-based interventions to reverse the attrition of women in academic plastic surgery.

## REFERENCES & ACKNOWLEDGEMENTS

1. Chen W, Baron M, Bourne DA, Kim JS, Washington KM, De La Cruz C. A Report on the Representation of Women in Academic Plastic Surgery Leadership. Plast Reconstr Surg. 2020 Mar;145(3):844-852.

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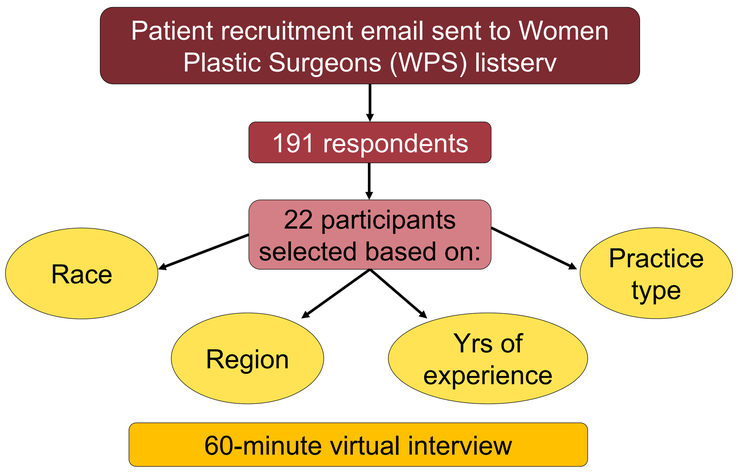


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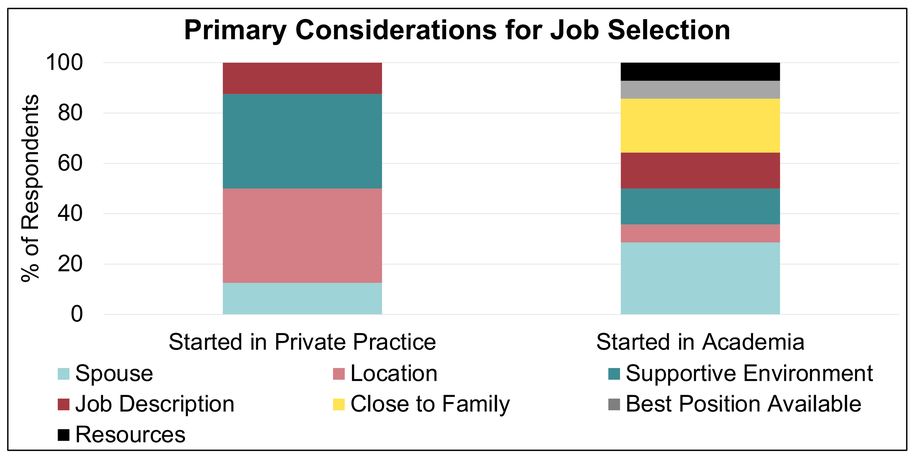


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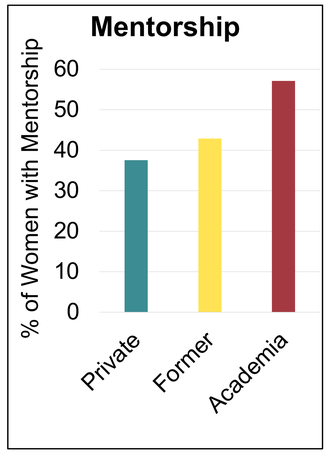


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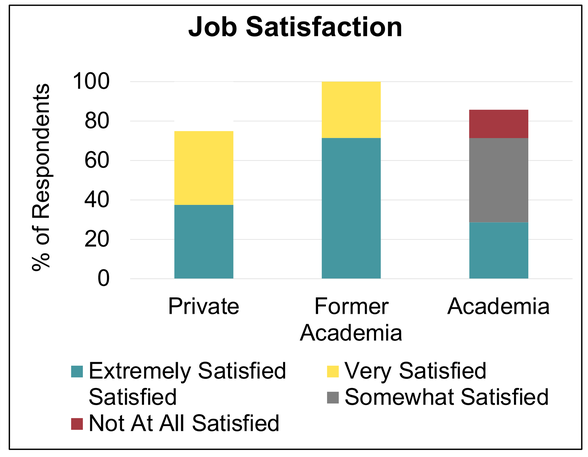


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# Using Delay Discounting to Predict Length of Stay and Readmission for Inpatient Psychiatric Patients: An Interim Analysis

Caroline Woods, MS (VTCSOM), Navroop Kaur, MD (Carilion Clinic), Anita S Kablinger, MD, CPI (Carilion Clinic and VTCSOM)

## INTRODUCTION

- Delay discounting (DD) is the devaluation of a reward when not immediately available
- Represented by k; larger k → greater degree of discounting, or impulsivity (1,2)
- The k of psychiatric diagnoses exists on a continuum (3,4)


- DD tasks have not been implemented in acutely ill inpatient psychiatry
- Using the 5-trial Adjusting DD Task (5), we hypothesize that a higher discounting score will predict longer length of stay

## MATERIALS & METHODS

- Patient voluntarily admitted to inpatient psychiatry
- 24 hours later, patient consented for study and initial RedCap survey administered on iPad
- Patient discharged
- Patient called/emailed discharge RedCap survey
- EPIC chart is followed for readmissions to the emergency department or inpatient psychiatry for 1 year

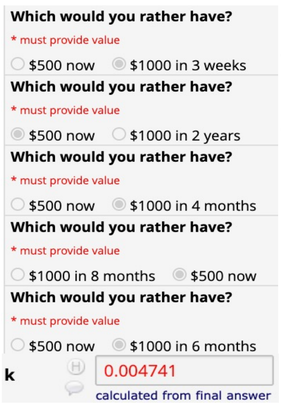


Figure 1. Sample of 5-trial Adjusting DD Task on RedCap and patient responses. Answers dictate time difference between two options. Calculates k.

| Initial RedCap Survey | Discharge RedCap Survey |
|---|---|
| • 5-trial DD<br>• PHQ-9 survey of depression<br>• AUDIT-C alcohol assessment<br>• Fagerstrom smoking survey<br>• DAST 10 drug abuse screening | • 5-trial DD<br>• PHQ-9 survey of depression |
| • Socioeconomic data (education, income, employment status, housing status)<br>• *Diagnoses and drug screen on admission* | |
| • Expected time: 20-25 minutes | • Expected time: 5 minutes |

Table 1. Components of the initial and discharge RedCap surveys.

## RESULTS

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| 18-100 Years old | Mentally unstable to the point that they cannot fill out survey |
| Patient admitted to psychiatric inpatient floor | Previous participation in the study |

Table 2.Inclusion and exclusion criteria for this study.

| | |
|---|---|
| **Age** | n = 47 |
| **Mean** | 36.57 |
| **SD** | 16.03 |
| **Gender** | n = 47 |
| **Female** | 25 (53%) |
| **Male** | 22 (47%) |
| **Race** | n = 47 |
| **White/Caucasian** | 37 (78.7%) |
| **Black/African American** | 9 (19.1%) |
| **Biracial** | 1 (2.1%) |

Table 3. Demographics table of current study participants.

| Diagnosis | Average k | SD |
|---|---|---|
| Autism Spectrum Disorder (n = 2) | 0.0010 | 0.0013 |
| Schizoaffective Disorder (n = 2) | 0.0019 | 0 |
| Obsessive Compulsive Disorder (n = 3) | 0.0067 | 0.0066 |
| Post-Traumatic Stress Disorder (n = 4) | 0.0092 | 0.0099 |
| Generalized Anxiety Disorder (n = 5) | 0.0198 | 0.0351 |
| Suicidal Ideation (n = 7) | 0.0259 | 0.0412 |
| Major Depressive Disorder (n = 31) | 0.0365 | 0.0736 |
| Substance Abuse (n = 7) | 0.0496 | 0.1058 |
| Cannabis Abuse (n = 3) | 0.0909 | 0.0445 |
| Bipolar Disorder (n = 5) | 0.0986 | 0.1767 |
| Alcohol Use Disorder (n = 14) | 0.2761 | 0.5023 |
| Substance Induced Mood Disorder (n = 5) | 0.3014 | 0.6231 |

Figure 2. Mean k and standard deviation for each diagnosis. Diagnoses are not mutually exclusive. Each patient can have one or more diagnoses. Sorted by increasing k.

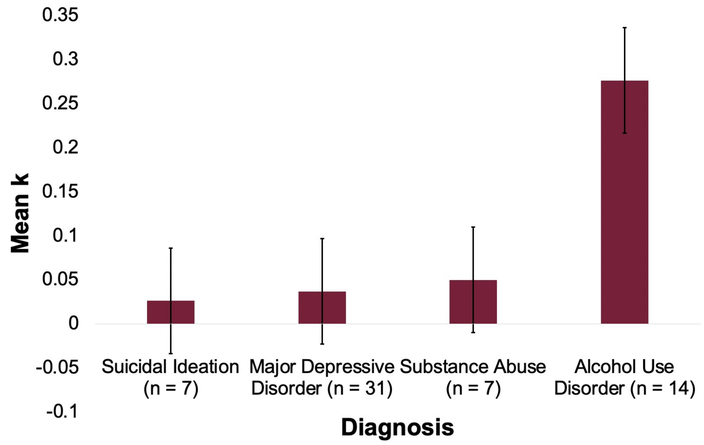


Figure 3. Plot of the mean k for the four diagnoses with n > 5. ANOVA analysis shows p = 0.031, indicating that these means are not equal.

## RESULTS

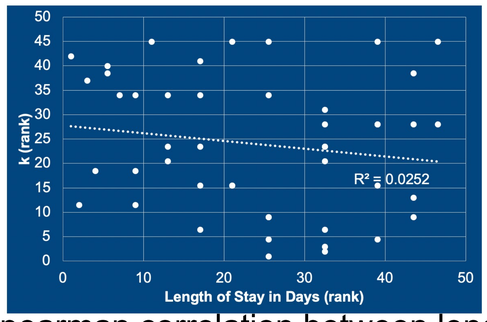


Figure 4. Spearman correlation between length of stay (in days) and delay discounting (k). $R^2 = 0.0252$; Spearman coefficient = -0.1586; p-value = 0.287. This indicates little to no correlation between these two variables.

## CONCLUSION

- DD has been called a "robust marker" for psychiatric illness (6)
- This interim data shows little to no correlation between DD score (k) and length of stay in the inpatient psychiatry facility at Carilion Clinic
- Psychiatry diagnoses fall across the spectrum in terms of DD score
- 2017 study done at Carilion in adolescent inpatient psychiatry showed a positive correlation between DD score and readmission rate (7)
- Future direction is looking at this relationship in the adult population

## REFERENCES & ACKNOWLEDGEMENTS

Many thanks to the people at VTCSOM and Carilion Clinic Inpatient Psychiatry, especially Allison Tegge, PhD and Cara Spivey, MS

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