



# MetroHealth

## MetroHealth's Center for Clinical Informatics Research and Education (CCIRE) – SPEED ROUNDS

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Ruba Hossain, MD

*Senior Clinical Informatics Fellow and Emergency Medicine Physician*

David C Kaelber, MD, PhD, MPH

*Professor of Internal Medicine, Pediatrics, Population and Quantitative Health Sciences*

Eric Kim, MD, PhD

*Clinical Informatics Fellow and Family Medicine Physician*

Nicholas Riley, MD, PhD

*Assistant Professor of Family Medicine*

# Learning Objectives

- To understand what types of research occurs within the Center for Clinical Informatics Research and Education (CCIRE).
- To describe at least one informatics “big data” and one informatics “interventional” study undertaken by CCIRE.
- To think of at least one way that you can partner/partner more with CCIRE faculty for research in the future.

**Disclosures : NONE (except our entire operational, academic, and research careers are based on leverage informatics and Epic 😊)**

# Outline

- CCIRE/Epic Background (10 min)
- Informatics Data Science/"Big Data" Studies (15 min)
- Informatics Implementation Science/"Interventional" Studies (15 min)
- CCIRE Research Informatics Resources (10 min)
- Wrap-up/Questions/Discussion (10 min)

# CCIRE Faculty



Peter Greco  
Internist

*Director of Clinical Informatics –  
Software Infrastructure*



David Kaelber  
Internist and Pediatrics

*“Leader”/CMIO*



Nicholas Riley  
Family Physician

*Director Clinical Informatics –  
Ambulatory Informatics*



Yasir Tarabichi  
Pulmonary/Critical Care

*Director of Research Informatics  
Director of Clinical Informatics –  
Clinical Decision Support*



David Bar-Shain  
Pediatrician



Johnbuck Creamer  
Adult Hospitalist

*Director of Clinical Informatics –  
Inpatient Informatics*



Rubayat (“Ruba”) Hossain  
Emergency Medicine Physician  
*Senior Clinical Informatics  
Fellow*



Janeen Leon  
Nutritionist

*Associate Director of  
Research Informatics*



Deveroux (“Dev”) Sellers  
Pathologist  
*Clinical Informatics Fellow*



Jonathan Siff  
Emergency Medicine  
Physician

*Associate CMIO*



Fang Zhao  
Pathologist  
*Senior Clinical Informatics  
Fellow*

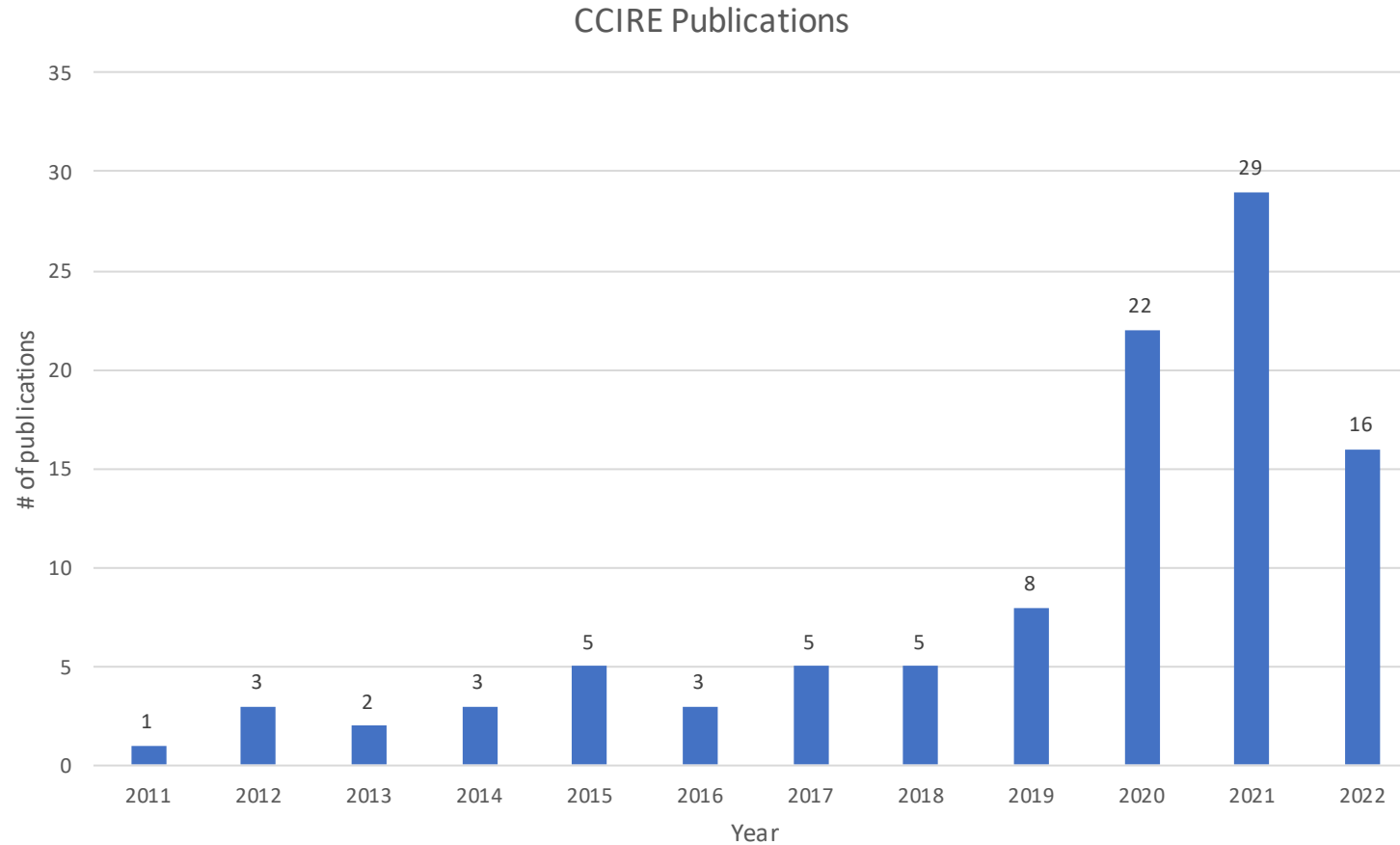


Eric Kim  
Family Physician  
*Clinical Informatics Fellow*

Blue – at least partially externally funded faculty



# CCIRE Publications



**RAPID growth in CCIRE publications in the last ~2 years!**

# MetroHealth Data and Informatics Infrastructure

## System Overview

- 1 tertiary care academic hospital
- 4 emergency departments
- 4 drug marts
- 13 schools
- 21 health centers
- 350+ resident/fellow physicians
- 550+ staff physicians
- 1,500 nurses
- 25,000 inpatient stays/year
- 120,000 ED visits/year
- 1,200,000 outpatient visits/yr
- Affiliated with CWRU
- Cleveland's public/safety-net health care system

## Total EHR data

- 1.6 million patients
- 22 million visits
- 150 million labs/pathology
- 4 million imaging studies
- 23 years of data in Epic

- 1999 – Ambulatory EHR (EpicCare w/ Cadence, Prelude, & Resolute)
- 2004 – EHR in ED (ASAP)
- 2009 – Inpatient EHR (Epic w/ Inpatient Willow and Beacon)
- 2011 – CareEverywhere, e-Rx, MyChart, Nurse Triage
- 2012 – Epic Enterprise Contract, MU Stage 1
- 2013 – BCMA, EpicCare Link, Welcome
- 2014 – ADT, Beaker, Bed Tracking, Anesthesia, OpTime, Research, Resolute Hospital Billing and SBO
- 2015 – Epic 2014, Kaleidoscope
- 2017 – Epic 2016, Stork, LGBT module
- 2018 – Epic 2017, Infection Control, Clinical Case Management
- 2019 – Epic 2019, Claims Data/Healthy Planet
- 2020 – Epic 2020, Grand Central Station, MyChart Bedside, Secure Chat
- 2021 – Epic 2021, Radiant, Rehab, Ambulatory Willow, Willow Inventory
- 2022 – Epic 2022, BH Module, Compass Rose, Rover

1<sup>st</sup> public health care system in US to install Epic in the outpatient setting (1999)!!!  
1<sup>st</sup> public health care system in US with Epic to achieve HIMSS Stage 7 EMRAM Ambulatory & Hospital recognition (2014) and revalidation (2017)!!!  
1<sup>st</sup> public health care system in the US with Epic to achieve HIMSS Enterprise Davies award (2015)!!!

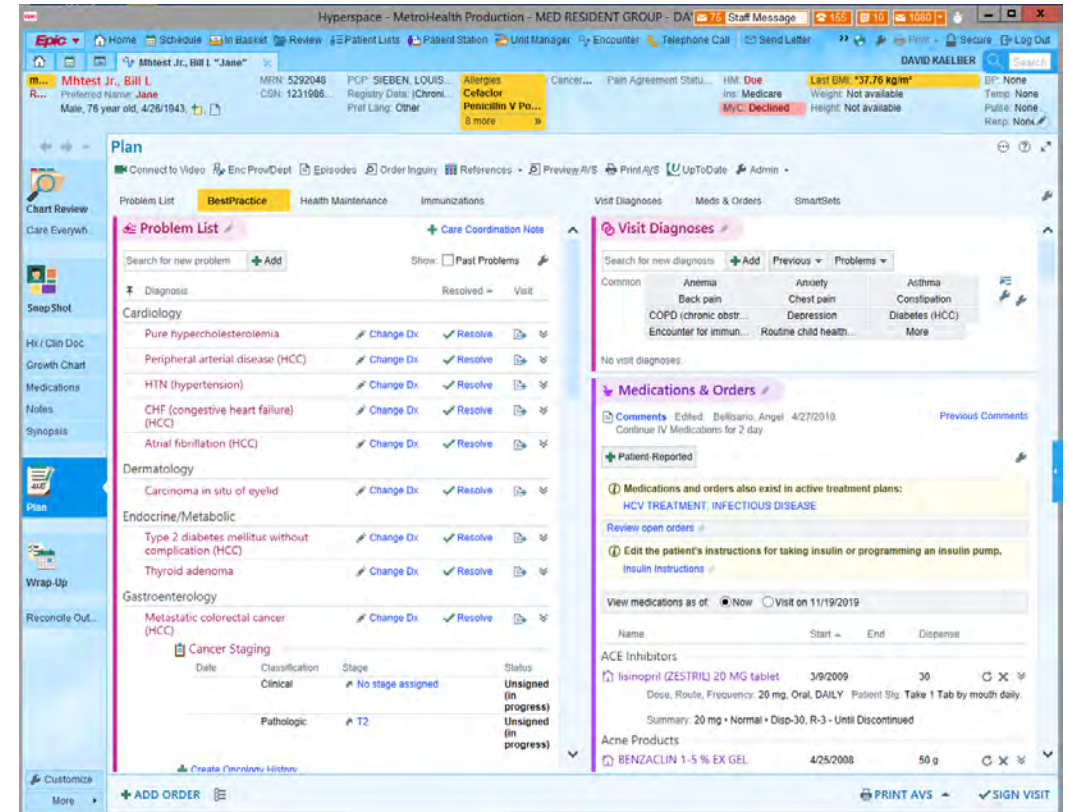
# CCIRE Research Focuses



<https://marketoonist.com/2014/01/big-data.html>

Using electronic health record  
"big data"

Informatics Data Science



Studying how electronic health  
records can improve care

Informatics Implementation Science

# Informatics Data Sciences - "Big Data"



<https://marketoonist.com/2014/01/big-data.html>

Using electronic health record  
"big data"

Informatics Data Science



# Informatics Data Sciences - “Big Data”

Project Title	Goal	Collaborators
<i>Ohio Valley Node Clinical Trials Network</i> <sup>NIH</sup>	To develop electronic health records as a tool for drug abuse research.	University of Cincinnati
<i>Maternal and Child Health Measurement Research Network</i> <sup>HRSA</sup>	To increase the number and quality and on-going support for measurement of maternal and child health measures.	University of Rutgers; multi-center
<i>CONNECT to Predict Sick Children</i> <sup>NIH</sup>	To expand clinical and translational approaches to Predict Severe Illness in Children (COVID-19 related).	University of Rutgers; multi-center
<i>Characterize multifaceted interactions between COVID-19 and alcohol use disorder based on real-time analysis of electronic health records of 62 million adult patients</i> <sup>NIH</sup>	To test the hypothesis that patient and alcohol use disorder are at higher risk of acquisition of SARS-CoV2.	CWRU
<i>Clinical and Translational Science Collaborative of Cleveland</i> <sup>NIH</sup>	To establish a novel and academic home to train leaders for the nation’s multidisciplinary clinical and translational sciences workforce	CWRU
<i>Maternal and Child Health Measurement Research Network</i> <sup>HRSA</sup>	To increase the number and quality and on-going support for measurements of maternal and child health measures.	Multi-center study
<i>COVID</i>	To leverage large de-identified data set to study COVID-19.	CWRU
<i>De-identified Population Query Tools</i>	To help develop and utilize de-identified population query tools (Epic Cosmos Data Network, Explorys, and TriNetX, and geocoding).	Epic corporation and TriNetX

**~\$2 million in external funding; ~12 grants; >50 publications**  
 (since last PHRI “speed rounds” presentation)



# EHR data aggregation networks/collaborations



## The Cosmos Collaborative: A Vendor-Facilitated Electronic Health Record Data Aggregation Platform

Yasir Tarabichi<sup>1,2,3</sup> Adam Frees<sup>4</sup> Steven Honeywell<sup>4</sup> Courtney Huang<sup>4</sup> Andrew M. Naidech<sup>5</sup>  
Jason H. Moore<sup>6</sup> David C. Kaelber<sup>1,7</sup>

Cosmos Description and “validated” research finding examples:

1. Chronic Disease Surveillance: Asthma and Obesity
2. Syndromic Surveillance: Seasonal Influenza and the Novel Coronavirus
3. Immunization Utilization and Adherence Reporting: HPV Vaccination Adherence
4. Vaccine Adverse Event Reporting: MMRV and Febrile Seizures
5. Health Services Research: Antibiotic Usage for Upper Respiratory Infections

**FIRST EVER** peer reviewed manuscript using Cosmos published with MetroHealth first and last authors!



# EHR data aggregation networks/collaborations

Christine Wang (now graduating CWRU MD student), Adam Perzynski and Yasir Tarabichi

- Society of Critical Care Medicine's VIRUS Registry, evolving into
  - > Society of Critical Care Medicine's PEEP (Practical EMR Export Pathways) evolving into
  - > a CURES-ID funded initiative to "OMOP"-ify our data



RAPID COMMUNICATION | [Free Access](#)

## Association of hypothyroidism with outcomes in hospitalized adults with COVID-19: Results from the International SCCM Discovery Viral Infection and Respiratory Illness Universal Study (VIRUS): COVID-19 Registry

Marija Bogojevic, Vikas Bansal, Vishwanath Pattan, Romil Singh, Aysun Tekin, Mayank Sharma, Abigail T. La Nou, Allison M. LeMahieu, Andrew C. Hanson, Phillip J. Schulte, Neha Deo, Shahrzad Qamar, Simon Zec, Diana J. Valencia Morales, Nicholas Perkins, Margit Kaufman, Joshua L. Denson, Roman Melamed, Valerie M. Banner-Goodspeed, Amy B. Christie, [Yasir Tarabichi](#), Smith Heavner, Vishakha K. Kumar, Allan J. Walkey, Ognjen Gajic, Sumit Bhagra, Rahul Kashyap, Amos Lal, Juan Pablo Domecq  Society of Critical Care Medicine (SCCM) Discovery Viral Infection and Respiratory Illness Universal Study (VIRUS): COVID-19 Registry Investigator Group ... [See fewer authors](#) ^


First published: 18 February 2022 | <https://doi.org/10.1111/cen.14699>

## BMC Nephrology

[Home](#) [About](#) [Articles](#) [Submission Guidelines](#) [Blog](#)

Research | [Open Access](#) | Published: 11 February 2022

## SARS-CoV-2 infection increases risk of acute kidney injury in a bimodal age distribution

[Erica C. Bjornstad](#) , [Gary Cutter](#), [Pramod Guru](#), [Shina Menon](#), [Isabella Aldana](#), [Scott House](#), [Nancy M. Tofil](#), [Catherine A. St. Hill](#), [Yasir Tarabichi](#), [Valerie M. Banner-Goodspeed](#), [Amy B. Christie](#), [Surapaneni Krishna Mohan](#), [Devang Sanghavi](#), [Jarrod M. Mosier](#), [Girish Vadgaonkar](#), [Allan J. Walkey](#), [Rahul Kashyap](#), [Vishakha K. Kumar](#), [Vikas Bansal](#), [Karen Boman](#), [Mayank Sharma](#), [Marija Bogojevic](#), [Neha Deo](#), [Lynn Retford](#), [Ognjen Gajic](#), [Katja M. Gist](#) & [SCCM Discovery VIRUS Investigators Group](#) [— Show fewer authors](#)



# Underdiagnosis and Under-evaluation of Obesity and Metabolic Syndrome among 60 million Adolescents and Adults

Eric Kim and David Kaelber  
MetroHealth Medical Center, Cleveland, OH  
Center for Clinical Informatics Research and Education  
March 25th, 2022

# Pediatric Underdiagnosis of Obesity and Related Conditions

- Previous studies suggest
  - under-diagnosis of pediatric obesity
  - under evaluation of obesity related conditions
- Amongst the patient sample represented in Cosmos:
  - How many patients are obese and what is their distribution between adults and pediatric patients?
  - Is there a difference in the proportion of obese patients carrying a diagnosis between adults and pediatric patients 10-17 years old?
  - Is there a difference in the proportion of obese patients who have received screening for obesity related conditions between adults and pediatric patients? Between male and female patients? Between different patient race?
  - What is the prevalence of metabolic syndrome? How does it differ between adults and pediatric patients?

# Frequency of Obesity and Obesity Diagnosis

Characteristic	Adult	Pediatric
BMI consistent with obesity	41% (22,224,896/54,526,896)	46% (2,434,599/5,252,141)
Obesity BMI with diagnosis of obesity	37% (8,211,874/22,224,896)	49% (1,181,958/2,434,599)

# Comorbidities Screening and Prevalence of Metabolic Syndrome

Characteristic	Adult	Pediatric
Among patients with BMI in obese range		
HDL performed	40% (8,779,902/22,224,896)	28% (680,718/2,434,599)
TG performed	41% (9,095,145/22,224,896)	28% (687,746/2,434,599)
Fasting BG or A1C performed	36% (7,959,750/22,224,896)	28% (674,722/2,434,599)
LFTs performed	55% (12,197,607/22,224,896)	35% (854,497/2,434,599)
Without all 4 metabolic syndrome labs performed	76% (16,819,782/22,224,896)	82% (2,008,311/2,434,599)
With no metabolic syndrome labs performed	36% (7,934,608/22,224,896)	57% (1,382,158/2,434,599)

Characteristic	Adult	Pediatric
Meeting 3+ of 5 criteria for metabolic syndrome diagnosis	26% (5,662,593/21,687,874)	2% (37,282/2,156,673)

# Obesity and Comorbidity Screening: Adults vs Pediatrics

- There is a significant burden of obesity among various sample populations for both adult and pediatric patients.
- Rate of formal diagnosis of obesity appears to be greater among pediatric patients than adults.
- Rate of screening for obesity related conditions among obese patients is LOW for both adult and pediatric patients, AND is significantly lower in pediatric patients than in adult patients.
- Rate of screening for obesity related conditions among obese patients does vary by gender and by race, though significantly less than by adult vs pediatric.
- Prevalence of metabolic syndrome is significantly lower among pediatric patients.
- Concerning that rates of screening are so much lower among pediatric patients
  - Low rates of screening raise the possibility that metabolic syndrome is SIGNIFICANTLY underdiagnosed among children
- Further work will be needed to ensure this sample is representative



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# Rubayet (Ruba) Hossain

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- Emergency medicine
- 2<sup>nd</sup>-year clinical informatics fellow
- Areas of focus:
  - Analytics and quality improvement
  - Business intelligence
  - EHR-based research



# Overview

- Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure
- Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- Many COVID-19 risk scoring systems rely on routinely obtained laboratory data from cell count and population analyzers.
- Neutrophil-to-lymphocyte ratio (NLR) is a leading predictor of COVID disease severity.
- MDW has been shown to be a reliable early marker of sepsis.
- Does MDW add any prognostic value beyond the more routinely available NLR?
- We leveraged retrospective data to assess the additive value of MDW to NLR in predicting the risk of hypoxemic respiratory failure (RF) in patients with COVID-19 presenting to the MetroHealth emergency department.

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- Cohort: ED patients with a positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) PCR between 7 days prior to and 5 days after arrival, between May 1st, 2020 and February 8th, 2021.
- Hypoxemic RF: need for mechanical ventilation, high-flow nasal cannula, or non-rebreather, venturi, or simple face mask during encounter.

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- MDW and NLR discrimination for hypoxemic RF was computed using area under the curve measures with 95% confidence intervals.
- Optimal specificity and sensitivity cutoffs for each biomarker were determined using Youden's index.
- Logistic regressions were developed to predict RF using NLR alone, and then NLR with the addition of MDW. The additive value of MDW to NLR was determined using a likelihood ratio chi-squared test, and the fraction of new information added to the NLR-only model by MDW determined using Harrell's approach.
  - Statistically Efficient Ways to Quantify Added Predictive Value of New Measurements. 2020.
  - <https://www.fharrell.com/post/addvalue/>

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- Cohort of 550 patients:
  - Average age: 57.6 years +/- 15.9 (SD)
  - Female: 280 (50.9%)
  - White: 204 (37.1%)
  - Black: 261 (47.5%)
  - Admitted to the inpatient setting: 318 (57.8%)
  - Outcome of RF: 83 (15.1%)
  - Death or 3-day ICU admission: 79 (14.4%)

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- In encounters with RF, median MDW was 26.0 (interquartile range [IQR]: 23.0-28.0) and median NLR was 7.08 (IQR: 4.32-10.67).
- In encounters without RF, median MDW was 23.0 (IQR: 21.0-26.0) and median NLR was 3.48 (IQR: 1.98-6.27).
- The c-statistic (area under receiver operator curve) for NLR was 0.73 (95% CI: 0.67-0.78) and for MDW was 0.68 (95% CI: 0.62-0.74).
- Youden's index cutoff for NLR was 5.46 (66% sensitivity, 72% specificity), and for MDW was 23.5 (74% sensitivity, 53% specificity).

# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

	NLR alone		NLR + MDW	
Variables	OR (95% CI)	P value	OR (95% CI)	P value
NLR	1.90 (1.44 - 2.52)	<0.001	2.18 (1.55 - 3.07)	<0.001
MDW			1.70 (1.30 - 2.22)	<0.001
NLR x MDW (interaction term)			0.74 (0.61 - 0.92)	<0.01
<b>Model performance</b>				
Chi-square	26.74		47.37*	



# Monocyte distribution width adds prognostic value in detection of COVID-19 respiratory failure

- The likelihood ratio chi-squared test comparing these two models demonstrated that the combined NLR plus MDW model was statistically significantly better at predicting hypoxemic failure than NLR alone (LR chi-square = 20.6,  $p < 0.001$ ).
- The adequacy index calculated from the likelihood ratio chi-squared was 0.56; thus, the fraction of new information from the addition of MDW to NLR was 43.5%.
- When NLR and MDW were both below their individual Youden's index cutoffs, the negative predictive value for respiratory failure was 96.5%.

# Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

- There is a paucity of large-scale studies regarding how the pandemic affected racial disparities for asthmatics.
- To address this, we leveraged data from a large externally validated multi-site data aggregation initiative to conduct an interrupted time-series (ITS) analysis of retrospective data examining how the pandemic affected known disparities in Emergency Department (ED) utilization between white and non-white asthmatics.

# Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

- Epic Corporation's Aggregate Data Program (ADP) combines de-identified electronic health record (EHR) data monthly from Epic sites across all 50 states.
- Variables collected by ADP include total patient counts, asthma prevalence, and relative monthly incidence of asthma-related ED visits.
- Asthma prevalence and ED visits are stratified by race, ethnicity, age groups (pediatric vs. adult), sex, and location (i.e., state).

# Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

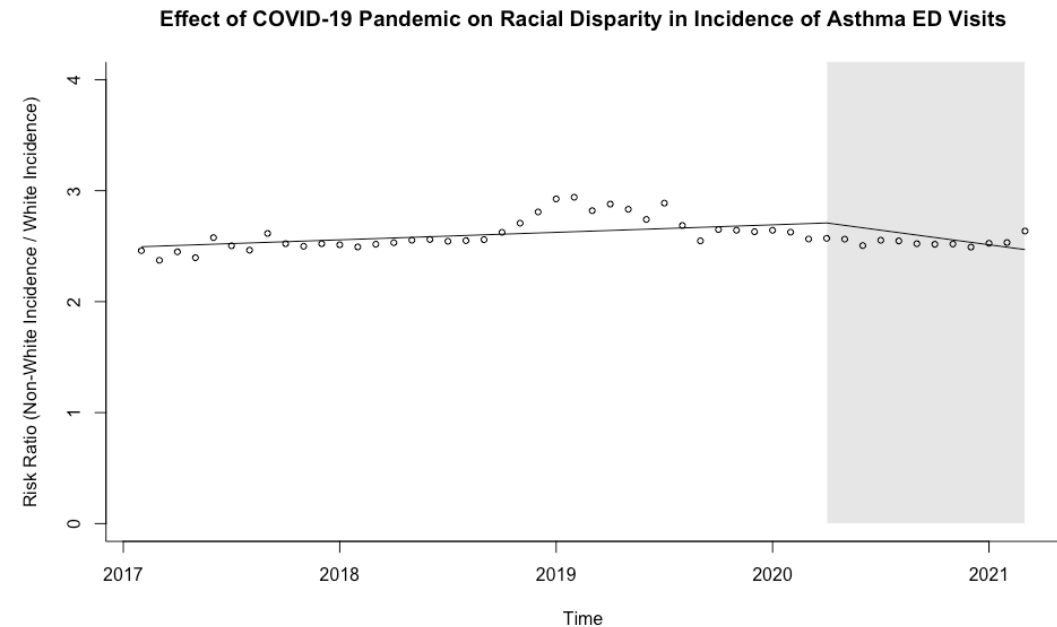
- We determined the monthly incidence of asthma ED visits for non-white (combined black, Asian, Native American/Alaskan Native, and Hawaiian/Pacific Islander) and white asthmatics separately.
- We then calculated the monthly risk ratio by dividing incidence for non-white asthmatics by incidence for white asthmatics. This risk ratio served as our measure for racial disparity.
- We defined the start of the pandemic as March 11, 2020, when the World Health Organization officially declared a pandemic.
- We compared the pre-pandemic and pandemic risk ratio via unpaired t-test.
- We performed an ITS analysis by constructing a linear regression model of risk ratio as predicted by time and onset of pandemic.

# Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

- Adult asthmatics (i.e.,  $\geq 20$  years old) comprised 76.4% of our population.
- Women comprised 59.1%
- ADP dataset included monthly average of 77.3 +/- 32.4 million patients.
  - 22.4 million patients beginning in January 2017.
  - 102.2 million ending in February 2021.
- Monthly average of asthmatics was 4.6 +/- 1.9 million patients.
  - 1.3 million in January 2017.
  - 6.0 million in February 2021.
- Monthly asthma prevalence was 5.9% +/- 0.2%.
  - 5.9% in January 2017.
  - 6.0% in February 2021.
- Our data included a total of 15.4 million asthma ED visits, with 59.0% comprised by non-white asthmatics.
- The number of asthma ED visits per month on average were 0.31 +/- 0.12 million.
  - 0.087 million in January 2017.
  - 0.25 million in February 2021.

# Trends in racial disparities of emergency department utilization for asthma in coronavirus disease 2019

- Pandemic risk ratio was statistically significantly lower than pre-pandemic risk ratio (pre-pandemic mean 2.61, pandemic mean 2.54,  $p < 0.01$ ).
- ITS analysis demonstrated pre-pandemic risk ratio trend of 0.006/month, (95% CI 0.003, 0.009,  $p < 0.01$ ).
- During the pandemic, the change in the risk ratio trend was -0.027/month, (95% CI -0.043, -0.012,  $p < 0.01$ ).



# Informatics Implementation Science

The screenshot displays the Epic EMR interface for a patient named Jane. The top navigation bar includes options like Home, Schedule, In Basket, Review, Patient Lists, Patient Station, Unit Manager, Encounter, Telephone Call, and Send Letter. The patient's name is Mhstest Jr., Bill L. The interface is divided into several sections:

- Plan:** Contains a Problem List, Visit Diagnoses, and Medications & Orders.
- Problem List:** Lists various medical conditions such as Pure Hypercholesterolemia, Peripheral arterial disease (HCC), HTN (hypertension), CHF (congestive heart failure) (HCC), Atrial fibrillation (HCC), Carcinoma in situ of eyelid, Type 2 diabetes mellitus without complication (HCC), Thyroid adenoma, and Metastatic colorectal cancer (HCC). Each entry includes options to Change Dx, Resolve, or Add.
- Visit Diagnoses:** Lists common diagnoses like Anemia, Anxiety, Asthma, Back pain, Chest pain, Constipation, COPD (chronic obstr...), Depression, Diabetes (HCC), and Encounter for immun... Routine child health... More.
- Medications & Orders:** Shows a list of medications, including ACE Inhibitors (Lisinopril) and Acne Products (Benzaclyn).

At the bottom of the interface, there are buttons for '+ ADD ORDER', 'PRINT AVS', and 'SIGN VISIT'.

Studying how electronic health records can improve care  
Informatics Implementation Science

# Informatics Implementation Science

Project Title	Goal	Collaborators
<i>Safety and Healthcare Epidemiology Prevention Research Development Program 2021 Domain 1 – A012 Electronic Support for Public Health – CAERS (ESPVAERS) for COVID-19</i> <sup>CDC</sup>	To update open-source vaccine adverse event reporting system (VAERS) software for COVID-19 and to improve algorithms. Also implement VAERS software at a third (non-Epic) healthcare system and develop process and tools to facilitate easy implementation and adoption at additional healthcare systems.	Harvard
<i>Improving Equity in Smoking Cessation for Low-Income Adults</i> <sup>ACA</sup>	To improve point of care effective referral to smoking quit line.	CHRP, Oregon Health Sciences University
<i>Integrating Behavior Health and Primary Care for Comorbid Behavioral and Medical Problems</i> <sup>PCORI</sup>	To integrate behavior health providers into primary care clinics and measure the impact.	MetroHealth
<i>PREPARE: PeRson EmPowered Asthma Relief</i> <sup>PCORI</sup>	Patient empowered strategy to reduce asthma morbidity in highly impacted patients.	Harvard; Multi-center
<i>Pediatric Broad Implementation of Outpatient Stewardship</i> <sup>PCORI</sup>	To compare effectiveness of broad and narrow spectrum antibiotics for acute respiratory tract infections in children.	CHOP
<i>Assessment of Biomarkers in Children to Help Parents Quit Smoking</i> <sup>NIH</sup>	To assess intervention at pediatric visits, including pediatric cotinine levels, to assess their effectiveness of parent/adult smoking cessation.	Harvard
<i>Investigating Dupilumab's Effect in Asthma by Genotype (IDEA) study</i> <sup>NIH</sup>	Phase 4 clinical trial to see if to investigate if individuals ages 12 years and older, carrying the IL-4R $\alpha$ R576 gene variant, will have a greater response to therapy acting directly on the anti-IL-4R.	Boston Children's Hospital; Multicenter
<i>Drug Alerting</i>	To improve drug alerting in Epic.	UPMC, Epic corporation, Wolters-Kluwer

**~\$2 million in external funding; ~12 grants; >50 publications**  
 (since last PHRI “speed rounds” presentation)





# EHR-based interventions for care gaps & disease phenotyping



*Just accepted:*

The Impact of an Electronic Health Record Intervention on Spirometry Completion in Patients with Chronic Obstructive Pulmonary Disease

Christine Wang BS<sup>1</sup>, Jonathan Siff MD<sup>2,3</sup>, Peter J Greco MD<sup>2,3</sup>, Edward Warren MD<sup>4</sup>, J. Daryl Thornton MD MPH<sup>3,4,5</sup>, Yasir Tarabichi MD MSCR<sup>2,3,4</sup>

1. School of Medicine, Case Western Reserve University, Cleveland, OH
2. Center for Clinical Informatics Research and Education, The MetroHealth System, Cleveland, OH
3. The Population Health Research Institute, The MetroHealth System, Cleveland, OH
4. Division of Pulmonary, Critical Care, and Sleep Medicine, The MetroHealth System, Cleveland, OH
5. Center for Reducing Health Disparities, The MetroHealth Campus of Case Western Reserve University, Cleveland, OH

*In progress:*

PREVAIL: PRagmatic EVALuation of a quality Improvement program for people Living with modifiable high-risk COPD.

Tarabichi, Leon and Kaelber

- Multisite cluster randomized initiative for EHR-based COPD phenotype driven care processes.
- Drives innovative data exchange and curation
- Slated to start approximately mid-2022.

## CONQUEST

Collaboration On Quality Improvement Initiative  
for Achieving Excellence in Standards of COPD Care.



# QI studies of predictive model-driven clinical decision support

You've seen this:

CLINICAL INVESTIGATIONS

## Improving Timeliness of Antibiotic Administration Using a Provider and Pharmacist Facing Sepsis Early Warning System in the Emergency Department Setting: A Randomized Controlled Quality Improvement Initiative\*

Tarabichi, Yasir MD, MSCR<sup>1,3</sup>; Cheng, Aurelia MD<sup>3,4</sup>; Bar-Shain, David MD<sup>2,3</sup>; McCrate, Brian M. PharmD, BCPS, BCCCP<sup>5</sup>; Reese, Lewis H. PharmD, BCPS<sup>5</sup>; Emerman, Charles MD<sup>3,4</sup>; Siff, Jonathan MD, MBA<sup>2-4</sup>; Wang, Christine BS<sup>3</sup>; Kaelber, David C. MD, PhD, MPH<sup>3,6,7</sup>; Watts, Brook MD, MS<sup>3,8</sup>; Hecker, Michelle T. MD<sup>3,9</sup>

[Author Information](#) ☺

**Critical Care Medicine**: March 2022 - Volume 50 - Issue 3 - p 418-427  
doi: 10.1097/CCM.00000000000005267

Next up: *(work in progress)*

**The efficacy and equitability of prediction driven proactive appointment outreach in patients with high no-show risk: A randomized controlled quality improvement initiative**

Yasir Tarabichi MD<sup>1,2</sup>, MSCR, Nicholas Riley MD<sup>1,2</sup>, Brook Watts MD<sup>1,2</sup>, David C Kaelber MD<sup>1,2</sup>, PhD

1. Center for Clinical Informatics Research and Education, MetroHealth, Cleveland OH
2. School of Medicine, Case Western Reserve University, Cleveland, OH

### Abstract

No-show prediction models allow systems to selectively dedicate additional resources for outreach, but their role in the era of increasing telehealth options and equitability are unclear. We implemented a localized random forest-based risk of no-show model through a prospective randomized controlled quality improvement initiative where schedulers contacted patients at high risk of no-show. Even with prevalent patient portal-based and automated telephone/SMS reminders, no show rates were significantly and equitably reduced with the model-driven intervention.

**Metrohealth has 5 predictive models running today in Epic with significantly growth opportunities!**





# MetroHealth

## Assessment of Biomarkers in Children to Help Parents Quit Tobacco (ABC Quit)

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PI: Jonathan Winickoff, MD, MPH, Massachusetts General Hospital

David Kaelber, MD, PhD, MPH

Nicholas Riley, MD, PhD

Janeen Leon, MS, RDN, LD

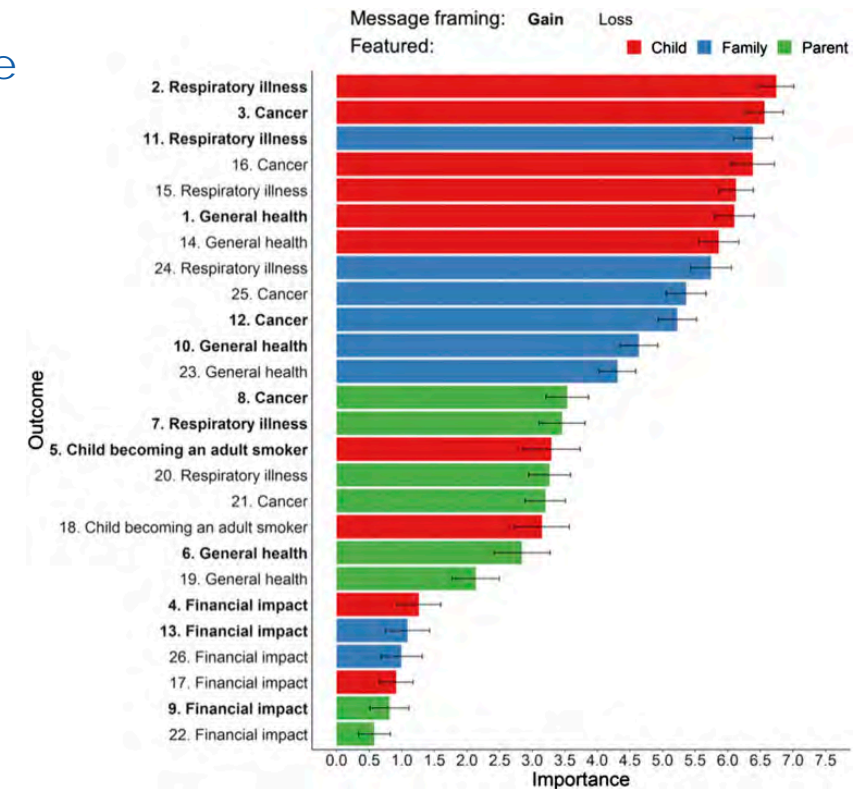
Eric Kim, MD, PhD



# Aim: Increase parental quit rates and delivery of tobacco cessation assistance

## CEASE: tobacco control intervention integrated into pediatric practice

- Prevents future poor pregnancy outcomes
- Messaging with child as motivation is persuasive
- 4× lower risk of child becoming a smoker
- Parents of young children frequently underserved in adult primary care
- Parents visit their pediatrician or family physician multiple times per year
- <3% of pediatric encounters address parental smoking cessation
- **Challenges:** scope of practice (pediatrics), time, workflow



Jenssen BP et al. Parent preferences for pediatric clinician messaging to promote smoking cessation treatment. *Pediatrics*. 2020 Jul;146(1).

Winickoff et al. Implementation of a parental tobacco control intervention in pediatric practice. *Pediatrics*. 2013 Jul;132(1):109-17.

Rosen LJ et al. Parental smoking cessation to protect young children: a systematic review and meta-analysis. *Pediatrics*. 2012 Jan;129(1):141-52

Winickoff et al. Child Health Care Clinicians' Use of Medications to Help Parents Quit Smoking: A National Parent Survey. *Pediatrics*. 2005. 115. 1013-7.

Winickoff et al. A National Survey of the Acceptability of Quitlines to Help Parents Quit Smoking. *Pediatrics*. 2006. 117. e695-700.

## 868 dyads of child $\leq 12$ with blood sample and currently smoking parent

### (e)CEASE (control)

- Pre-visit questionnaire (MyChart, Welcome, etc.)
- Automated delivery of nicotine replacement
- Automated enrollment in Ohio Quitline
- Automated enrollment in NCI's SmokefreeTXT
  
- Clinician sees questionnaire results in EHR
- Clinician can request additional cessation assistance
- Clinician provided with talking points
- Clinician can document/bill easily

### (e)CEASE + BIO (intervention) adds

- Blood sample analyzed for cotinine
- BIO counselor assists in result interpretation
- BIO counselor assists in cessation in household
- Repeat cotinine at 12 months
  
- Clinician sees cotinine results in EHR

Compare 1) quit & cessation assistance rates, 2) tobacco exposure and 3) cost per quit

## Pre-visit questionnaire for parents

Automatically assigned based upon child eligibility

### Smoking Screener Survey

For an upcoming appointment with **Bernard Aaron, MD** on 5/26/2021

\* Indicates a required field.

\* Who in your family smokes tobacco products like cigarettes, cigars like black and mild, or hookah?

Only me    Only someone else    Me and someone else    Nobody    Prefer not to answer

## Questionnaire delivers motivational message

No clinician intervention necessary

For an upcoming appointment with **Brian Jenssen, MD** on 6/7/2021

Message from Lil's provider:

We see that you smoke. Your child's doctor and nurse practitioner want you to know that **quitting smoking will improve Lil's health** by preventing respiratory illnesses like coughs, colds, and wheezing. **Quitting is hard but we are here to help.**

**When you quit smoking:**

- Lil may be healthier.
- You may live longer - by 10 years!
- Lil will be less likely to become a smoker.
- If you are pregnant or have a newborn, your baby will have a much lower risk of Sudden Infant Death Syndrome (SIDS).
- You could save more than \$4,000 a year.

## Questionnaire offers connection to treatment

### Smoking Screener Survey

For an upcoming appointment with **Bernard Aaron, MD** on 5/26/2021

\* Indicates a required field.

Based on your responses, you are eligible for these 3 treatment options. Would you like to sign up for:

\* FREE nicotine patch and/or gum. It can DOUBLE your chances of quitting smoking. The medication is covered by your insurance with no co-pay and will be delivered to you.

Yes No

\* FREE Quitline. It offers telephone coaching to help you quit smoking with no judgement. It has a proven record of increasing your chances of staying smoke free for good.

Yes No

\* FREE SmokefreeTXT Program. It offers interactive text messages to help you quit smoking. Standard message rates apply.

Yes No

Back

Continue


Finish later

Cancel



# Clinical decision support for providers

Integrated into Epic navigator



Foster Father completed Smoking Screener Survey on 5/19/2021 - [View](#)  
Is a smoker and accepted treatment. Others in household also smoke.  
Information added to AVS - "Helping others Quit Smoking"

[Talking to parents](#)  
[Treatment information](#)

---

**Foster Father Selected Treatment Options**

- Nicotine Replacement Therapy ⓘ [Optional: Print Rx ⓘ](#)
- Free Quitline ⓘ
- SmokefreeTXT ⓘ

---

**Counseling and billing** [More info](#)

Counseling provided    Counseling NOT provided

- Counseled Foster Father on 5/20/2021
- Secondhand smoke exposure discussion, smoking status, and selected treatments added to note.
- Discussion is billable.

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Secondhand smoke exposure added to the problem list on 5/20/2021

# Challenges

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## Cotinine testing

- Standard of care is lead/CBC at age 1 and 2
- Other blood samples used as available
- Retained for 2 weeks pending consent/randomization
- Initially sending samples to research lab in Minnesota
- Eventually to analyze at Metro

## Informatics and operational

- Electronic pre-visit questionnaires uncommon at MH
- Documentation in child's chart
- eReferral to Quitline from child's chart, or...?
- Nicotine replacement "prescription"

# CCIRE Research Informatics Resources



David Kaelber  
CMIO



Yasir Tarabichi  
*Director Clinical  
Research  
Informatics*



Janeen Leon  
*Associate Director  
Research  
Informatics*

The MetroHealth CTSC  
Research Informatics team is  
housed in CCIRE.

MetroHealth Research  
Informatics is the lead  
informatics site in the CTSC  
renewal applications!

**Use us EARLY (@ grant writing) and use of OFTEN for ANY non-standard technology requests (i.e anything other than items such as computer/printer issues; login/password issues); And we can help escalate quickly IF we are engaged!**



# Using Research Informatics Tools to Recruit Diverse Patient Populations



The NEW ENGLAND  
JOURNAL of MEDICINE

February 28, 2022

ORIGINAL ARTICLE

## Reliever-Triggered Inhaled Glucocorticoid in Black and Latinx Adults with Asthma

E. Israel, J.-C. Cardet, J.K. Carroll, A.L. Fuhlbrigge, L. She, F.W. Rockhold, N.E. Maher, M. Fagan, V.E. Forth, B.P. Yawn, P. Arias Hernandez, J.M. Kruse, B.K. Manning, J. Rodriguez-Louis, J.B. Shields, B. Ericson, A.D. Colon-Moya, S. Madison, T. Coyne-Beasley, G.M. Hammer, B.M. Kaplan, C.S. Rand, J. Robles, O. Thompson, M.E. Wechsler, J.P. Wisnivesky, M.D. McKee, S.P. Jariwala, E. Jerschow, P.J. Busse, **D.C. Kaelber**, S. Nazario, M.L. Hernandez, A.J. Apter, K.-L. Chang, V. Pinto-Plata, P.M. Stranges, L.P. Hurley, J. Trevor, T.B. Casale, G. Chupp, I.L. Riley, K. Shenoy, M. Pasarica, R.A. Calderon-Candelario, H. Tapp, A. Baydur, and W.D. Pace

MetroHealth was a lead site **NATIONALLY** in recruiting African-American/Black and Hispanic/Latino patients for this asthma study.

**Research out to the Research Informatics team for a Research Informatics Consult if you need help recruiting anyone (especially diverse populations) for any of YOUR studies!**



SCHOOL OF MEDICINE  
CASE WESTERN RESERVE  
UNIVERSITY



MetroHealth

# REDCap Update

https://redcap.metrohealth.org/redcap/index.php



Log In



Please log in with your user name and password. If you are having trouble logging in, please contact [IS Service Desk 216-957-3280](tel:216-957-3280).

Username:

Password:

**NEW REDCap server went live in December 2021, EXTERNALLY FACING – now surveys are available to EVERYONE on the internet**

**The firewall issue preventing exporting data from REDCap is 100% FIXED!!!!!!!!!!!!!!!**

**Patient texting functionality through REDCap for minimal cost should be available by the end of Q2 2022.**

**(Dr. Tarabichi and Dennis Aimes coordinating)**



# TriNetX Update (over 93 million patients AND “line level” data access)

COVID-19 Research Network | 93,352,439 Patients

● 66 of 67 Online | Last Update: 10 hours ago

EMEA Collaborative Network | 11,419,812 Patients

● 18 of 18 Online | Last Update: 18 hours ago

Global Collaborative Network | 93,299,722 Patients

● 74 of 76 Online | Last Update: 10 hours ago

LATAM Collaborative Network | 2,431,636 Patients

● 4 of 5 Online | Last Update: 3 days ago

Linked | 4,626,015 Patients

● 8 of 8 Online

MetroHealth System | 1,319,220 Patients

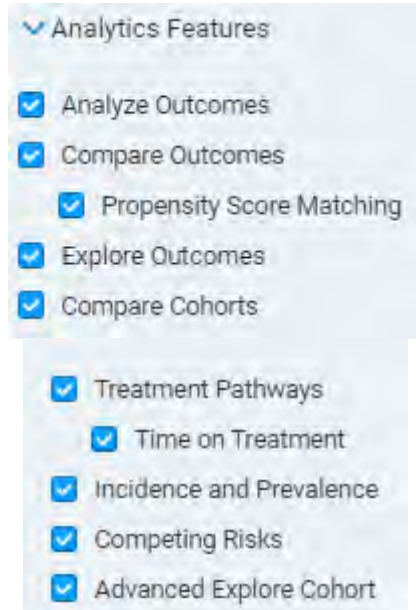
● 1 of 1 Online | Last Update: 9 days ago

Research | 86,904,727 Patients

● 57 of 58 Online | Last Update: 10 hours ago

US Collaborative Network | 77,528,735 Patients

● 48 of 48 Online | Last Update: 10 hours ago



Increased data, new analytic tools, “line level” data requests, amazing research opportunities

Email me for your account TODAY! (MetroHealth is #1 user in the WORLD!)

[COVID infection rates, clinical outcomes, and racial/ethnic and gender disparities before and after Omicron emerged in the US.](#) Wang L, Berger NA, **Kaelber DC**, Davis PB, Volkow ND, Xu R. medRxiv. 2022 Feb 22:2022

[Comparison of mRNA-1273 and BNT162b2 Vaccines on Breakthrough SARS-CoV-2 Infections, Hospitalizations, and Death During the Delta-Predominant Period.](#) Wang L, Davis PB, **Kaelber DC**, Volkow ND, Xu R. JAMA. 2022 Feb 15

[COVID-19 breakthrough infections, hospitalizations and mortality in fully vaccinated patients with hematologic malignancies: A clarion call for maintaining mitigation and ramping-up research.](#) Wang L, **Kaelber DC**, Xu R, Berger NA. Blood Rev. 2022 Jan 31

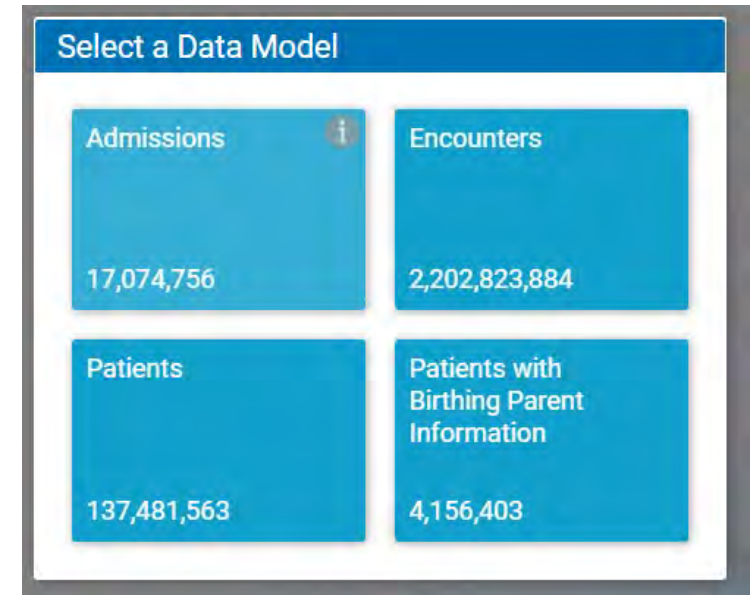
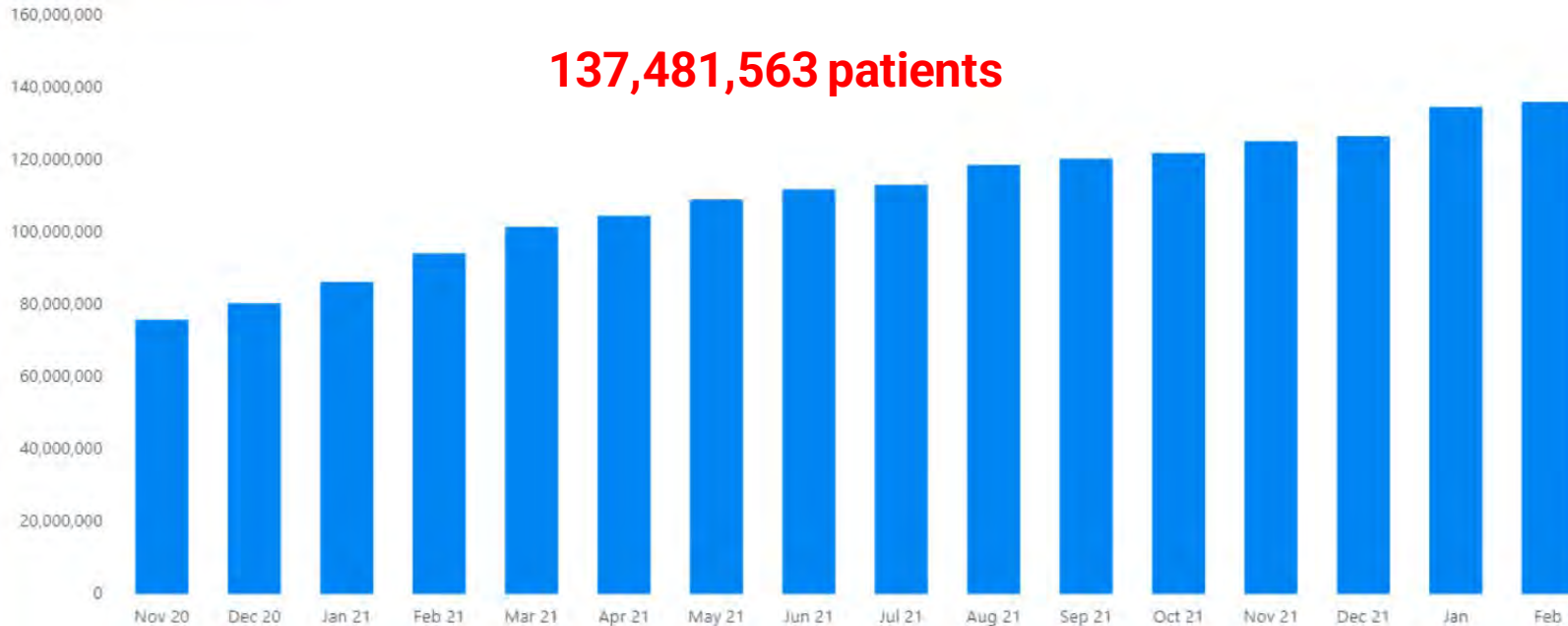
[COVID infection severity in children under 5 years old before and after Omicron emergence in the US.](#) Wang L, Berger NA, **Kaelber DC**, Davis PB, Volkow ND, Xu R. medRxiv. 2022 Jan 13:2022

[Comparison of outcomes from COVID infection in pediatric and adult patients before and after the emergence of Omicron.](#) Wang L, Berger NA, **Kaelber DC**, Davis PB, Volkow ND, Xu R. medRxiv. 2022 Jan 2



# Cosmos Update (>137 million patients and SDoH data now too!)

Cosmos Population Growth



4 different data models (including 4+ million patients with birthing parent information)  
Epic SDoH wheel and Social Vulnerability Index now included

“Line level” data “sandbox” expected to be available by the end of 2022

# Wrap-up/Questions/Discussion

## The MetroHealth System/CCIRE has:

1. Epic EHR with more breadth, depth, and longevity of data (especially among a diverse population) than almost any other healthcare system.
2. Epic EHR with implemented functionality and usability that places it in the top 1% of all healthcare systems in the world.
3. “Dream team” of clinical informaticists.
4. Unique deidentified population health tools (Epic Cosmos Data Network, Explorys, Epic’s Slicer-Dicer, and TriNetX) and imbedded geo-coding and SDoH metrics.
5. Nationally recognized informatics expertise in informatics data sciences (big data) and informatics implementation sciences.

Let us work even closer together to  
**GROW RESEARCH and MAKE AMAZING RESEARCH  
DISCOVERIES!**

