# Pediatric & Lifespan Data Science Conference

## Complex Patients + Precision Medicine + AI

April 10-11, 2025

CHOC Research
GO BEYOND.

A MESSAGE FROM

# Kimberly Chavalas Cripe

*Co-President & Chief Executive Officer, Rady Children's Health*

As Co-President & Co-CEO of Rady Children's Health, the parent company of Children's Hospital of Orange County, I am honored to welcome you to the Second Pediatric and Lifespan Data Science Conference.

The recent advancements of artificial intelligence are transforming the way we approach medicine, research, and patient care. These innovations are poised to impact the entire spectrum of patient care, from childhood through adulthood. At this critical moment, we have a profound opportunity and responsibility to lead the charge and foster these communities for the robust exchange of ideas and knowledge.

This conference is a testament to the dedication and expertise of our data science leaders across our health systems. They have brought together an extraordinary lineup of world-class speakers and researchers to share knowledge, spark innovation, and inspire collaboration. I am confident that the conversations and connections made here will propel us forward in our collective mission.

Thank you for being part of this important gathering. Your curiosity, expertise, and passion for discovery will help shape the future of medicine. I hope you leave feeling energized, empowered, and ready to take on the challenges ahead.

Let's lead with vision, embrace innovation, and work together to create a healthier future for all.

**Kimberly Chavalas Cripe**
*Co-President and Chief Executive Officer, Rady Children's Health*

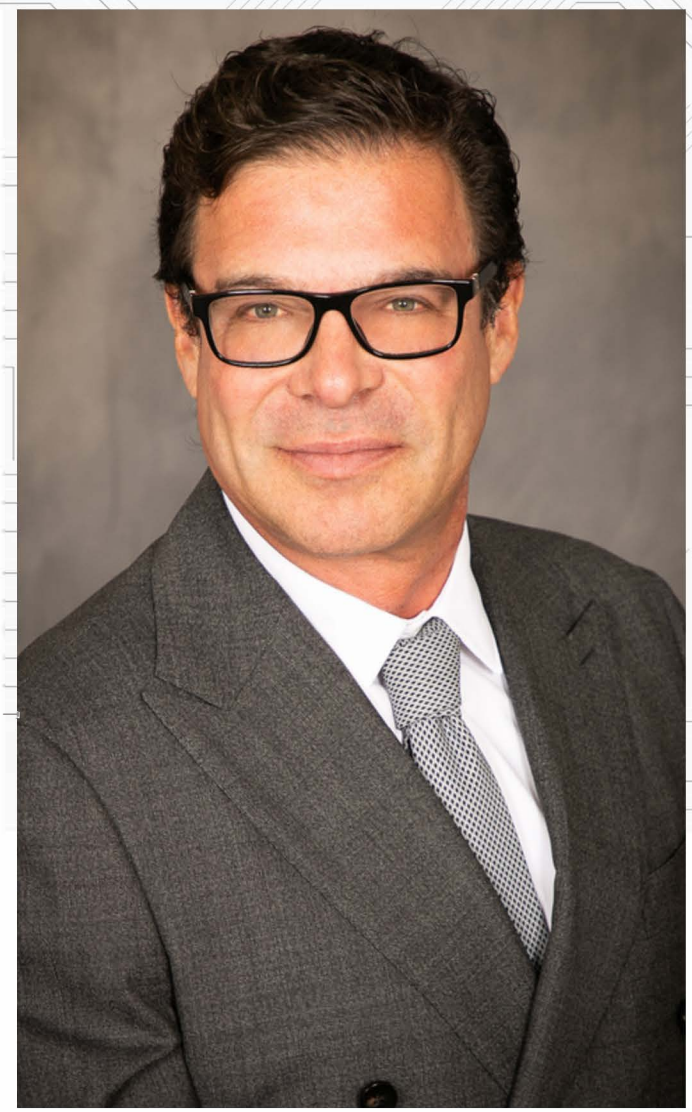


CHOC Research GO BEYOND.

A MESSAGE FROM

# Dr. Terence Sanger

*Vice President & Chief Scientific Officer, CHOC*



On behalf of the CHOC Research Institute, and the Data Science Teams at CHOC we are proud to welcome you to the second annual Pediatric & Lifespan Data Science Conference in Anaheim, California. We stand at the forefront of a transformative era where precision medicine, artificial intelligence, and cutting-edge research converge to redefine healthcare. Advancements in AI algorithms are revolutionizing our approach to diagnosing, treating, and preventing diseases in several ways. Reinforcement learning allows us to explore complex treatment options that minimize morbidity and mortality. Natural language processing has led to the development of large language models with critical healthcare applications. This intersection of genomics, real-world electronic health records, and AI for multimodal data holds incredible promise for translational research in medicine. While large datasets are essential, there have also been significant developments in n-of-1 precision medicine. These innovations enable us to tailor medical care to the individual characteristics of each patient, from childhood through adulthood.

As we navigate these technological advancements, we must embrace the challenges and opportunities they bring. By sharing our insights and expertise, we can drive real impact on the health and well-being of our communities. Our mission is clear: to decrease the morbidity of complex diseases while uncovering the answers each patient needs to thrive.

Whether this is your first year attending or you are joining us again, thank you for being a part of this conference and joining us in the noble pursuit of a better life for all.

**Terence Sanger, MD, PhD**
*Vice President, Chief Scientific Officer, CHOC*
*Child Neurology & Movement Disorders, CHOC*
*Professor of Electrical Engineering & Computer Science, UCI*
*Department of Pediatrics Vice Chair for Research,*
*UCI School of Medicine*

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# Keynote Speaker

## Dr. Aldo Faisal, PhD

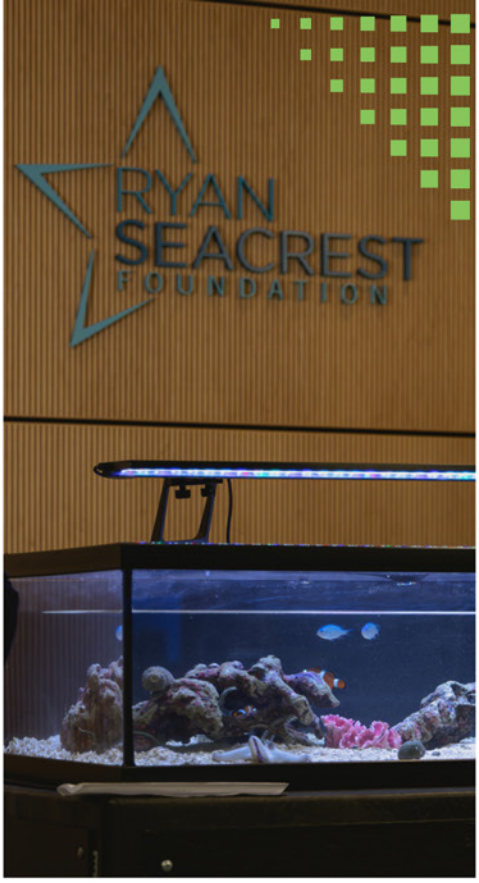
Professor of AI & Neuroscience at Imperial College London, UK

*Department of Computing* ◆ *Department of Bioengineering*

Aldo Faisal is a Professor of AI and Neuroscience at Imperial College London and Director of the $60m UKRI (UK Research and Innovation) Centres in AI for Health. He is a founding Co-Director of School of Convergence Science of Human and Artificial Intelligence at Imperial which comprises over 250 academic research groups. He holds the Chair in Digital Health at the Universität Bayreuth, Germany.

Aldo pioneered science and innovation at the interface of machine learning and human learning, such as the AI Clinician, with applications ranging from neuroscience to biomedical engineering, with applications in neurology, paediatrics, intensive care and public health. Professor Faisal is one of the few computer scientists worldwide leading clinical trials to translate his work from algorithm to bedside. He has received numerous international research prizes and awards, and spun-out his innovation to turn these into products that can be used in health and care.

He is a keen educator, his Cambridge University Press textbook Mathematics for Machine Learning is consistently in the global Amazon top 10 in the field, and he co-created one of first dedicated AI for Healthcare PhD programs integrating regulatory, ethical, human-centered AI and medicine and numerous Master programs. Aldo is an advocate for proactive adaptation of AI and healthcare regulation working with regulators and international organisations, and he has been appointed in 2024 by the German Federal Government to the German Ethics council.




### AWS Datathon Event

This year's event focuses on developing generalized healthcare computer vision models. During the Datathon, you will build models for applications in oncology, pathology, gastroenterology, dermatology, hematology, and other specialties. The Health Datathon Challenge tests your ability to create lightweight, generalizable models adaptable to various modalities and clinical applications.

Sponsored by AWS, the event includes a virtual hands-on AWS training on April 3-4. Gain experience with AI technologies, enhance soft skills, collaborate with peers, and receive coaching from AWS experts, all while making a difference in pediatric science.

### High School Education Event

The AI high school education event, organized by CHOC and AWS, provided students with hands-on AI project experience. Participants programmed autonomous racecars using reinforcement learning and tackled healthcare challenges by building computer vision models to classify pneumonia from chest X-rays. The event included workshops, competitions, and opportunities to earn AWS prizes and Health Impact Awards. Get excited to see students showcase their experience at the conference! This initiative inspired early interest in data science and AI, providing valuable skills and experiences. No prior programming or machine learning experience was required, making it accessible to all curious and tenacious students. The event was held at Segerstrom High School in Santa Ana on March 17, 2025.

### Seacrest Studios at CHOC

Seacrest Studios at CHOC hospital offers patients and families a vibrant, creative space to immerse themselves in radio, television, and new media activities, contributing to their experience during hospitalization. On March 27th, a 20–25-minute lecture titled "What is Artificial Intelligence and How Could It Impact Clinical Care?" was presented. The lecture covered the basics of AI, its applications in everyday life, and its potential impact on clinical care, especially in pediatric settings. The event included talks from CHOC physicians, associates and scientists, interactive Q&A sessions, and hands-on activities for the patients. Seacrest Studios events will be held bi-monthly, with pre-recorded segments and live Q&A sessions. The studio's goal is to elevate patient engagement while providing enriching and educational content.

A NOTE FROM

# LOUIS EHWERHEMUEPHA, PhD

*Director, Computational Research, CHOC, part of Rady Children's Health*

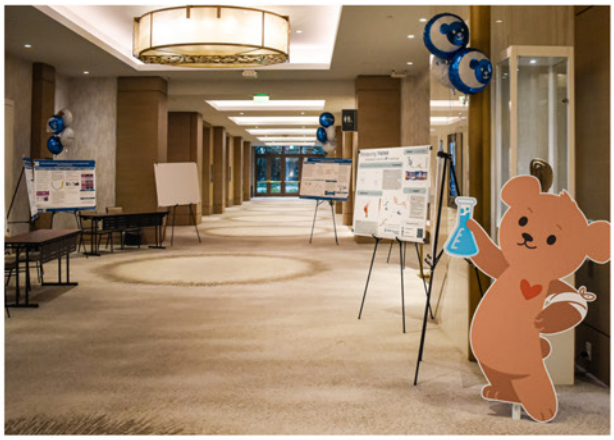
We proudly hosted the inaugural Pediatric and Lifespan Data Science Conference in 2024, setting high standards for translational impact on our patients and local communities. Our engagements with conference attendees and industry representatives have led to significant initiatives, including research on the safe use of AI in pediatrics, addressing food insecurity, supporting start-up advancements, and multiple collaborative grant applications. This is just the beginning.

We expanded the conference activities this year to include an AI educational event for high school students at Segerstrom High School in the Santa Ana Unified School District. We extend our gratitude to Mr. Adam Woods and his team for their strategic engagement. Additionally, we collaborated with CHOC's Seacrest Studio to host a radio show, engaging our beloved patients and reaching listeners beyond our hospital walls.

To maintain the momentum of this conference, we will host quarterly data science meetings on Zoom. These meetings will strengthen community connections, foster collaborations, and advance translational data science research. Open to all, they will replace our existing CHOC-UCI Data Science Seminar Series, ensuring ongoing engagement and broader participation.

We invite volunteers and leaders to help organize these meetings, ensuring this conference drives clinical impact and transforms communities in the United States, United Kingdom, and globally. Join us in this effort by volunteering to promote our commitment, goals, and values. Let us ensure our esteemed patients and families can look back with pride at the positive changes they see.

We also seek a diverse set of volunteers to join the Advisory Council of the Pediatric and Lifespan Data Science Conference. Organizing this event is a monumental task, and our commitment to providing the best experience is unparalleled. We call on organizations that share our vision to join our list of sponsors, helping to keep costs low and broaden the scope of attendees worldwide.



We are deeply grateful to Amazon Web Services and their strategic leaders, Dr. Abdul Shaikh, Brannen Henn, Blake Beltramea, and Joseph Abril, for their invaluable contributions. Our sponsors' clinical, academic, and corporate expertise have been invaluable, and their financial support ensures we deliver translational outcomes through intellectual engagements.

## A SPECIAL THANKS

We owe immense gratitude to our team that made this event possible, including Aline Rohloff, Tatiana Moreno, Joanne Rogers, Cristen Hemingway, and many other dedicated individuals. The data science leadership teams across our health system and beyond, including Dr. Steven Martel, John Henderson, and Dr. Anthony Chang, have provided tremendous feedback and engagement. Our clinical leadership teams, including Dr. Coleen Cunningham, Dr. Sandip Godambe, Dr. Charles Golden, and Dr. Michael Weiss, have offered invaluable support and advice. We also thank our colleagues from RCIGM, especially Dr. Matthew Bainbridge, Dr. Olivia Kim-McManus, and Dr. Edwin Juarez, for their transformative collaboration in precision medicine and genomic data science. Warm appreciation to Dr. Keith Feldman and all abstract reviewers for the conference. We appreciate all those who have worked tirelessly to make this event a success.

On behalf of the CHOC Research Institute, Dr. Terence Sanger, and Phuong Dao, thank you for attending this event. Please provide critical feedback to help us improve and stay connected. We look forward to continued engagement and collaboration.

## CORE PROJECT TEAM

Carol Davis-Dao, PhD
Parker Do
Cristen Hemingway
Philip Hilt
Keith Feldman, PhD
Maxine Manglicmot
Tatiana Moreno
Jorge Ramirez
Aline Rohloff
Joanne Rogers
Daniel Rucker

**Louis Ehwerhemuepha, PhD**

*Director, Computational Research, CHOC*
*Associate Adjunct Professor in Pediatrics, UCI*
*Visiting Scientist, Schmid College of Science, Chapman University*



CHOC Research GO BEYOND.

# Panel Agenda Day One

## Thursday, April 10

| Time | Description |
|---|---|
| Morning | Theme: Predicting Best Treatment Policies and Precision Medicine |
| 7:00 - 8:00 AM | Check-in and Breakfast |
| 8:00 - 8:05 AM | Welcome Note |
| 8:05 - 8:45 AM | Keynote Address |
| 8:45 - 9:00 AM | 2024 Conference Outcomes Update |
| 9:00 - 9:45 AM | Panel 1 - Enhancing Care for Complex Medical Patients with Advanced Computing and Precision Medicine |
| 9:45 - 10:15 AM | Sponsored Coffee Break |
| 10:15 - 11:00 AM | Panel 2 - Fairness in the Use of Complex Data and Algorithms for Translational Precision Medicine |
| 11:15 - 12:00 PM | Panel 3 - Harnessing Generative AI: Revolutionizing Clinical Operations and Advancing Precision Medicine |
| 12:00 - 1:00 PM | Sponsored Lunch, Coffee & Poster Presentations |
| Afternoon | Theme: Improving Clinical Outcomes Using Machine Learning and AI |
| 1:00 - 1:45 PM | Panel 4 - Incorporating Machine Learning and Large Language Models for Complex Medical Care in Global Underrepresented Communities |
| 1:50 - 2:35 PM | Panel 5 - Computing and Data Science Opportunities for Precision Management of Complex Psychiatric Conditions |
| 2:35 - 3:00 PM | Coffee Break |
| 3:00 - 3:45 PM | Panel 6 - Perspectives from Patients & Families on the Use of Data and Artificial Intelligence for Children with Complex Medical Needs |
| 4:00 - 4:40 PM | Abstract Podium Presentations |
| 4:40 - 4:50 PM | Coffee Break |
| 4:50 - 5:10 PM | Snowflake \| Sponsored Presentation: Building a Modern Precision Medicine Platform on Snowflake using OMOP, -OMICS, & AI with Jesse Cugliotta, Global Industry GTM Lead Healthcare & Life Sciences & Roshanthi Weerasinghe, Director, Clinical Research Analytics at Providence |
| 5:10 - 5:30 PM | Oracle \| Sponsored Presentation: Unlocking the Full Potential of Real-World Evidence for Better, Faster, and Intelligent Care, with Christopher B. Boone, PhD, Global VP Research Services |
| 6:00 - 9:00 PM | Rooftop Cocktails & Dinner |

# Panel Agenda Day Two

## Friday, April 11

| Time | Description |
|---|---|
| Morning | Theme: Care Optimization, Advanced Analytics, and AI for Complex Medical Patients |
| 7:00 - 8:00 AM | Breakfast |
| 8:00 - 8:05 AM | Welcome Address |
| 8:05 - 8:50 AM | Panel 7 - Future of AI in Medicine: Distinguishing Hype from Reality |
| 9:00 - 9:45 AM | Panel 8 - Administrative and Provider Insights on Data Science for Complex and Precision Care Delivery |
| 9:45 - 10:00 AM | Sponsored Coffee Break |
| 10:00 - 10:45 AM | Panel 9 - Population Health and Payor Perspectives on Data Science Modernization for Care Management |
| 11:00 - 11:25 PM | Panel 10 - From Conference Insights to Impact: The Path Ahead for Precision Medicine |
| 11:25 - 11:45 PM | Datathon Updates and Presentations |
| 11:50 - 12:00 PM | Closing Remarks |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# Panel Descriptions

**Panel 1 | Enhancing Care for Complex Medical Patients with Advanced Computing and Precision Medicine**
**April 10, 9:00 - 9:45 AM**

This panel will explore how precision medicine, integrating genomics and other complex data modalities, can meet the needs of patients with complex diseases. It will cover applications targeting both individuals and homogeneous patient groups, highlighting the role of advanced computing and algorithms.

**Featured speakers:**
Moderator: Olivia Kim-McManus, MD (UC San Diego Neurosciences, RCH/Rady Children's Institute for Genomic Medicine)
Clara Lajonchere, PhD (UCLA Institute for Precision Health & UCLA David Geffen School of Medicine)
David Talby, PhD (John Snow Labs)
Matthew N. Bainbridge, PhD (Rady Children's Institute of Genomic Medicine)
Sarah Biber, PhD (The NIA National Alzheimer's Coordinating Center at the University of Washington)

**Panel 2 | Fairness in the Use of Complex Data and Algorithms for Translational Precision Medicine**
**April 10, 10:15 - 11:00 AM**

This panel will address the ethical considerations and challenges of using AI and complex data in precision medicine. It will discuss how to support innovation while ensuring fairness for diverse populations with varying biological, social, and environmental factors.

**Featured speakers:**
Moderator: Almaas A. Shaikh, MD, MPH, FACS (Orange County Health Care Agency)
Cyril Rakovski, PhD (Chapman University)
Deepti Pandita, MD, FACP, FAMIA (UCI)
Dursun Delen, PhD (Oklahoma State University)
Lindsey Jarrett, PhD (Center for Practical Bioethics)

**Panel 3 | Harnessing Generative AI: Revolutionizing Clinical Operations and Advancing Precision Medicine**
**April 10, 11:15 - 12:00 PM**

This panel will examine the impact of large language models on healthcare operations, including medical chatbots and administrative tasks. It will discuss successes and challenges in applying generative AI across IT, research, and healthcare administration, with a focus on data protection and HIPAA compliance.

**Featured speakers:**
Moderator: John Henderson, MBA (CHOC, part of Rady Children's Health)
Jesse Cugliotta (Snowflake)
Josh Howell (Rubrik's Healthcare)
Katie Kalvoda (Advance OC)
Rod Tarrago, MD (AWS)

# Panel Descriptions

**Panel 4 | Incorporating Machine Learning and Large Language Models for Complex Medical Care in Global Underrepresented Communities**
**April 10, 1:00 - 1:45 PM**

This panel will explore the application of AI in developing and underrepresented communities worldwide. It will address the challenges and opportunities of incorporating AI in these settings, emphasizing the interconnectedness of healthcare challenges between developed, developing, and underdeveloped communities.

**Featured speakers:**
Moderator: Vijaytha Muralidharan, MD (Sandwell & West Birmingham NHS Trust, NHS UK)
Abdul Shaikh, PhD, MHSc (AWS)
Joan Devin, PhD (Rotunda Hospital, Dublin, Ireland)
Rungsun Rerknimitr, MD, FRCP, London, FASGE (Chulalongkorn University, Bangkok, Thailand)
William D. Paiva, PhD (Oklahoma State University, Center for Health Systems Innovation)

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**Panel 5 | Computing and Data Science Opportunities for Precision Management of Complex Psychiatric Conditions**
**April 10, 1:50 - 2:35 PM**

This panel will discuss the potential of precision medicine in treating complex psychiatric conditions. It will highlight the unique challenges posed by data quality and availability in mental health and the role of AI in addressing these issues.

**Featured speakers:**
Moderator: Heather Huszti, PhD (CHOC, part of Rady Children's Health)
Charles Golden, DO, FAAP (CHOC, part of Rady Children's Health & UCI)
Hoang Nguyen, MD (CHOC, part of Rady Children's Health)
Houda Hachad, PharmD (Clinical Operations, Aranscia)
Juliet Edgcomb, MD, PhD (UCLA)

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**Panel 6 | Perspectives from Patients and Families on the Use of Data and Artificial Intelligence for Children with Complex Medical Needs**
**April 10, 3:00 - 3:45 PM**

This panel will feature families sharing their experiences with the healthcare system. They will discuss challenges that could be addressed using data and AI, and their hopes for the future of medical technology.

**Featured speakers:**
Moderator: Charles Golden, DO, FAAP (CHOC, part of Rady Children's Health & UCI)
Sandra Schultz, MHA, CPXP (CHOC, part of Rady Children's Health)
Family Guests: Chris Haros, Ishia Knowles, Sherri & Sarah Faulkner

# Panel Descriptions

**Panel 7 | Future of AI in Medicine: Distinguishing Hype from Reality**
**April 11, 8:05 - 8:50 AM**

This panel will feature international experts discussing the future of AI in medicine. They will provide insights on separating realistic advancements from hype and offer recommendations for assessing immediate value and anticipating future developments.

**Featured speakers:**
Moderator: Terence Sanger, MD, PhD (CHOC, part of Rady Children's Health & UCI)
Aldo Faisal, PhD (Imperial College London, UK)
Matthew Howard, PhD (AWS)
Rodrigo Gameiro, MD, JD, MPH (MIT, Laboratory for Computational Physiology)
Christine Swisher, PhD (Oracle Health Data Intelligence & Life Sciences)

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**Panel 8 | Administrative and Provider Insights on Data Science for Complex and Precision Care Delivery**
**April 11, 9:00 - 9:45 AM**

Hospital administrators and providers will respond to issues raised by patients and families. They will focus on the utility of AI in direct patient care and clinical decision support, addressing challenges faced by both patients and healthcare providers.

**Featured speakers:**
Moderator: Moderator: Steven Martel, MD, FAAP (CHOC, part of Rady Children's Health)
John Henderson, MBA (CHOC, part of Rady Children's Health)
Kristine Ashcraft, MBA (YouScript)
Michael Rothman, PhD (Space Labs Healthcare)

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**Panel 9 | Population Health and Payor Perspectives on Data Science Modernization for Care Management**
**April 11, 10:00 - 10:45 AM**

This panel will provide insights from payors on the challenges and opportunities of precision medicine and AI in population health management. They will discuss how data science can improve access to care and overall health outcomes.

**Featured speakers:**
Moderator: Arta Bakshandeh, DO, MA (Alignment Healthcare)
Archie Dey (SCAN)
Michael Weiss, DO, FAAP (CHOC, part of Rady Children's Health & UCI)
Kathleen Linder (CalOptima Health)

# Panel Descriptions

**Panel 10 | From Conference Insights to Impact: The Path Ahead for Precision Medicine**
**April 11, 11:00 - 11:25 AM**

This panel will synthesize the conference presentations and discussions, identifying the most impactful challenges that can be addressed using AI and precision medicine. They will make recommendations for future clinical and community health initiatives.

**Featured speakers:**
Moderator: Sandip Godambe, MD, PhD, MBA (CHOC, part of Rady Children's Health)
Aldo Faisal, PhD (Imperial College London, UK)
Louis Ehwerhemuepha, PhD (CHOC, part of Rady Children's Health)
Steven Martel, MD, FAAP (CHOC, part of Rady Children's Health)
Terence Sanger, MD, PhD (CHOC, part of Rady Children's Health & UCI)

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**Panel 11 | Datathon Updates and Presentations**
**April 11, 11:25 - 11:45 AM**

The top three teams from the Datathon challenge will present their updates, alongside our Diamond Level sponsor, Amazon Web Services.

# Podium Presentations

## Moderator: Keith Feldman, PhD

| Speaker | Title |
|---|---|
| Moderator | Opening |
| Reza **Rezaei, MSc** | Enhancing Prostate Cancer Prediction with a Multi-Phase Language Model Pipeline: Leveraging SFT and GRPO |
| Britanny **Winckler, MD, MBA** | Variation in Admission and Treatment Decisions for Previously Immunocompetent Pediatric Patients Presenting to the ED with Febrile Neutropenia |
| Chloe **Martin-King, PhD** | Computer Vision for Endoscopy Tissue Phenotype Classification in Pediatric Inflammatory Bowel Disease |
| Moderator | Closing |

Reza Rezaei, MSc is a PhD student in Computational and Data Science at Chapman University in Orange, California. He has an extensive background in leveraging data to drive insights and decision-making, supported by his master's degree in computational and behavioral economics from Chapman University. His expertise in SQL has enabled him to efficiently query complex datasets and transform raw data into actionable insights, adhering to rigorous data management principles.

Dr. Britanny Winckler, MD, is a pediatric hospitalist at Children's Hospital of Orange County. She currently serves as the Co-Division Director of Research and Quality Improvement and holds an appointment as an Assistant Clinical Professor at the University of California, Irvine School of Medicine.

Chloe Martin-King has a PhD and MS in Computational and Data Sciences from Chapman University in Orange, California. She builds and trains computer vision models for segmentation, classification, automatic detection, and restoration. Before joining CHOC in November 2021, she worked as a postdoctoral scholar in the Radiomics Lab at USC's Keck School of Medicine.

Podium Presentation

## Enhancing Prostate Cancer Prediction with a Multi-Phase Language Model Pipeline: Leveraging SFT and GRPO

**Reza Rezaei, MSc**[1], Dorna Davani-Davari, PhD[1], Shahryar Fazli, PhD[1], Cyril Rakovski, PhD[1]

[1]Chapman University, Schmid College of Science and Technology, Orange, CA

Background: While structured clinical variables, a significant portion of relevant information is frequently recorded in unstructured clinical notes. These notes capture subtle contextual cues, coexisting conditions, physician assessments, and patient-reported symptoms that traditional risk models often miss. As a result, relying solely on structured data can yield incomplete prognostic insights. Recent advancements in large language models (LLMs) offer the potential to bridge this information gap by extracting details from unstructured medical notes. LLMs can synthesize textual data into clinically meaningful features, ultimately strengthening survival predictions.

Methods: We developed a locally hosted LLM training pipeline with two primary optimization phases. First, we performed supervised fine-tuning (SFT) as a cold start using locally generated synthetic prostate cancer diagnosed notes (based on the MIMIC dataset) to preserve patient privacy while aligning the model with real-world physician-labeled data. Subsequently, we refined the SFT model via pure reinforcement learning (RL), combining an optimized Group Relative Policy Optimization (GRPO) algorithm with a chain-of-thought (CoT) language consistency reward. Then, we merged the LLM-extracted features with structured patient data (e.g., demographics, comorbidities) and trained multiple machine learning classifiers.

Results: Among the tested models, random forests delivered the highest accuracy (71%) and precision (62%), while XGBoost stood out for their recall performance (51%), aiding high-risk patient identification. The combination of LLM-derived features with structured clinical data facilitated a more robust risk assessment and deeper insights into survival determinants.

Future work will focus on extending the framework to other cancer types and further improving explainability for integration into clinical practice.

Podium Presentation

## Variation in Admission and Treatment Decisions for Previously Immunocompetent Pediatric Patients Presenting to the ED with Febrile Neutropenia

Ricardo Aguilar, MS[1], Brianna Leyden, MD[1], **Britanny Winckler, MD, MBA[1]**, Jennifer Lusk, MD[1]

[1]Children's Hospital of Orange County, Orange, CA

Background: Patient volumes limit studies of immunocompetent pediatric patients with febrile neutropenia; no guideline consensus exists. Extrapolating serious bacterial infection (SBI) risk from other populations leads to resource overutilization. We quantified practice variation in emergency department (ED) disposition for immunocompetent pediatric patients with febrile neutropenia and evaluated which factors increase admission odds and the association of disposition and SBIs.

Methods: We performed a retrospective study using the de-identified multicenter database Cerner Real-World Data. ED patients ages 2 months – <18 years from January 2016-June 2023 with an absolute neutrophil count (ANC) < 1500 and temperature > 38° C were included. A logistic regression mixed effects model determined the variance partition coefficient (VPC), the proportion of variance explained by health systems differences, and what factors increase admission odds. Univariate analysis (chi-squared and Fisher's exact tests) examined the association of ED disposition and rates of sepsis/SIRS or SBIs (bacteremia, bacterial meningitis, or urinary tract infection) within 5 days of presentation.

Results: Of 5,544 qualifying ED encounters — 60.6% at an Academic/Children's center, 28.2% Integrated Delivery Network (IDN), 11.1% other — 41.9% resulted in admission. Median patient age was 1.43 years, with 53.8% male and 60.1% White. Neutropenia was classified as 57.2% mild, 30.3% moderate, and 12.5% severe. Estimated VPC is 8%. Diagnoses of sepsis/SIRS ($p<0.001$), bacteremia ($p<0.001$), and bacterial meningitis ($p = 0.002$) were more likely in admitted encounters. Only bacteremia was associated with discharged encounters. Multiple factors increased admission odds: diagnoses of sepsis/SIRS (OR 14.02), pancytopenia (5.49), thrombocytopenia (5.13), and anemia (5.06); if antibiotics were given (4.75); system characteristics; and after the COVID-19 pandemic (1.55).

Podium Presentation

## Computer Vision for Endoscopy Tissue Phenotype Classification in Pediatric Inflammatory Bowel Disease

**Chloe Martin-King, PhD[1]**, Ali Nael, MD[1], Louis Ehwerhemuepha, PhD[1], Blake Calvo, BS[2], Quinn Gates, MS[1], Jamie Janchoi, BS[1], Elisa Ornelas, BA[1], Melissa Perez, MBA BSHA[1], Andrea Venderby, BS[2], John Miklavcic, PhD[2], Peter Chang, MD[3], Aaron Sassoon, MD[1], Brian Rubio[4], Ghislaine Barragan, BS[5], Kenneth Grant, MD[1]

[1]Children's Hospital of Orange County Orange, CA, [2]Chapman University, Orange, CA, [3]University of California, Irvine, CA, [4]California State University, Fullerton, CA, [5]University of San Diego, San Diego, CA

Background: With the advent of computer vision algorithms, we hypothesize that histopathology images from endoscopic biopsies may be utilized for automated classification of histologic phenotypes, thus guiding Crohn's disease (CD) and ulcerative colitis (UC) diagnosis and treatment. The aim of our study is to assess whether artificial intelligence (AI) can be used to improve pediatric inflammatory bowel disease (IBD) outcomes by aiding pathologists with accurate detection of abnormal tissue sections.

Methods: Three 2D convolutional neural networks (CNNs) with multiple instance learning (MIL) were developed to classify histopathology tissue sections as normal vs. abnormal, and as containing active inflammation and/or chronic changes/architectural distortion.

Results: The abnormal vs. normal classification model achieved an accuracy of 0.84, area under the receiver operating characteristic curve (AUC-ROC) of 0.91, and F1-score of 0.79. Precision, sensitivity, and specificity were 0.85, 0.74, and 0.91, respectively. The accuracy for predicting active inflammation was 0.85, AUC-ROC was 0.92, and F1-score was 0.78. The accuracy for predicting chronic changes/architectural distortion was 0.86, with an AUC-ROC of 0.93, and F1-score of 0.76

Conclusion: The findings resulting from this study are significant primarily because they indicate that there is strong AI-interpretable signal present in endoscopic whole slide imaging, even with the necessary, weakly supervised method of MIL.

# Poster Presentation Index

Posters listed in submission order.

| Poster # | Presenting Author | Poster Title |
|---|---|---|
| 1 | Theresa **Ezedom** | The Antimalarial Activity of Ethanol Extract of Andrographis Paniculata Impacted Cytokines Immunomodulation |
| 2 | Harry **Pellman** | Comparing QIIV and LAIV influenza protection in a pediatric practice in the 2018-2019 season |
| 4 | Stanley **Galant** | Determining the presence of small airway dysfunction, an exacerbation risk, feasible by oscillometry is common in well controlled young asthmatics |
| 5 | Jennifer **Barrows** | Feasibility of Remote Patient Monitoring to Improve Asthma Outcomes in Children |
| 6 | Shahryar **Fazli** | Enhancing Lung Cancer Prognosis Using Fine-Tuned Language Models and Structured Clinical Data |
| 7 | Celina **Mainardes Furquim** | Study of Dosimetric Reproducibility of Peripheral Dose Assessment in Pediatric Radiotherapy |
| 8 | Jeremy **Wayland** | Enhancing VUR Risk Prediction through Virtual Patient Sampling and Topological Representation Learning |
| 9 | Sanjida **Mowla** | Differences in Healthcare Resource Utilization by Race/Ethnicity and Neighborhood Deprivation among Moderate to Late Preterm Infants with Respiratory Distress Syndrome, Northern California, 2019-2023 |
| 10 | Chloe **Martin-King** | Computer vision for pediatric malformations of cortical development classification: Comparing magnetic resonance imaging series and series combinations |
| 11 | Michael **Sayer** | Utilization of Machine Learning Models to Predict Cardiac Inflammatory Immune Related Adverse Events in Patients Receiving Immune Checkpoint Inhibitors |
| 12 | Britanny **Winckler** | The Role of Geography and Social Drivers of Health in Readmission Risk |
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Poster #1

## The Antimalarial Activity of Ethanol Extract of Andrographis Paniculata Impacted Cytokines Immunomodulation

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Malaria is a life-threatening infection which constitutes an important global health issue and its pathogenesis involves excessive production of cytokines which modulate the host's cell to favour causative parasite survival. Therefore, assessing the antimalarial activity of active phytocompounds in conjunction with ability to inhibit cytokine immunomodulatory property could provide a platform for the discovery of more efficient novel drugs. Hence, this study investigated the in silico and experimental antiplasmodial activity of the methanol extract of Andrographis paniculata (MEAp), and the consequent changes in levels of pro-and anti-inflammatory cytokines, using documented methods. Results showed that MEAp exhibited good in vitro antiplasmodial property (IC50= 8.0 µg/mL) and selectivity with cytotoxicity (CC50) > 100 µg/mL. (SI= 19.0) when tested against clinical isolates of Plasmodium falciparum. It also, demonstrated good in vitro malaria curative property (400 mg/kg=97.8±0.1%, LD50 ≥ 5,000 µg/mL) in murine model which compared well with the standard ACT (98.1±0.5%).In addition, computational results indicate that linoleic acid chloride strongly inhibited PfLDH parasite protein, and glycogen synthase kinase 3ß and vimentin, vital regulators of the pro- and anti- inflammatory cytokines production, which substantially contributed to the observed decrease in levels of serum pro-inflammatory cytokines (TNF-α 96%, IFN-γ 32%) and increases in IL-10 (122%) and IL-4 (392%), the anti-inflammatory cytokines in MEAp-treated mice. Put together, we demonstrated that MEAp possessed antimalarial activity that impacted cytokine immunomodulation, and linoleic acid chloride was identified as the active compound which computationally inhibited PfLDH, GSK3ß and vimentin indicating that linoleic acid chloride is a promising candidate for drug discovery against malaria and associated cytokine immunomodulation.

Poster #2

## Comparing QIIV and LAIV Influenza Protection in a Pediatric Practice in the 2018-2019 Season

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Both Live-attenuated Influenza Vaccine (LAIV, Astra Zeneca) and inactivated influenza vaccines (IIV and later QIIV, Sanofi Pasteur) have been available for children over age 2 since 2007. Because of lack of efficacy of LAIV against the H1N1pdm09 strain in 2015 both the American Academy of Pediatrics (AAP) and the Centers for Disease Control (CDC) recommended against using LAIV in the 2016-2017 and 2017-2018 influenza seasons in the United States (1, 2).

Although no definite reason for the lack of efficacy has been determined, the manufacturers of LAIV believed the problem of adequate H1N1pdm09 influenza protection from LAIV vaccination was resolved from generated data showing adequate antibody response with the H1N1 strain change from A/Bolivia to 2009 A/Slovenia/2903/2015.

A Southern California pediatric group reports on comparing breakthrough cases of influenza after children were vaccinated with either LAIV or QIIV during the 2018-2019 influenza season. Breakthrough categories studied included total cases, influenza types A and B, and various age groups. LAIV performed at least as well as QIIV in all categories studied.

Poster #4

## Determining the presence of small airway dysfunction, an exacerbation risk, feasible by oscillometry is common in well controlled young asthmatics

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Background: Although current asthma guidelines have proven effective, many children still experience poor asthma control, increased risks of exacerbations and loss of lung function. One possibility could be the failure to recognize the peripheral airways as major sites of airway obstruction. Oscillometry, a point of care lung function test, is an effort-independent, effective measurement of peripheral airway dysfunction (SAD), associated with asthma control status, and risk of exacerbation in children. Although SAD is most prevalent in children with uncontrolled asthma, it may be seen in well-controlled asthma. The purpose of this study was to establish in young, well controlled asthmatics the feasibility of measuring SAD, its frequency, and association with prior exacerbations.

Methods: This is a post-hoc analysis of a study comparing a new Airwave Oscillometer (AOS) the C2 with the FDA-approved device C100. 53 patients from the Allergy-Immunology Department, ages 2 to 7 years, with a diagnosis of asthma, were evaluated. AOS indices included resistance R7, frequency dependence resistance R7-R19, reactance area (AX), and reactance X7. SAD was identified by a Z score > 1.645 RSD. Chi-Square Tests also evaluated the distributional difference between SAD positive and SAD negative groups. Asthma severity and control were based on National Asthma Education and Prevention Program 2020 guidelines.

Results: Most patients could successfully perform the AOS test, including 88% of those 2-4 years old. Nearly half (49.1%) of the children had SAD, despite 86.8% being well controlled. Although 44 % had a prior exacerbation, there were no significant differences between the SAD cohorts.

Conclusion: Our data suggests that SAD determination is feasible, and common in very young, well-controlled children, a potential risk of future exacerbations. Future prospective studies evaluating the SAD exacerbation risk biomarker in young, well-controlled asthmatics is necessary.

Poster #5

## Feasibility of Remote Patient Monitoring to Improve Asthma Outcomes in Children

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Background: Asthma can be well-controlled with the use of inhaled corticosteroids (ICS), but most children and adolescents do not adhere to recommended treatment, leading to exacerbations,[1,2] emergency department visits, hospitalizations, and deaths.[3] Remote patient monitoring (RPM) has demonstrated potential to increase ICS adherence and improve asthma outcomes,[4] but few studies have been conducted in young people, and lack of research in minority groups may contribute to health disparities. The purpose of this pilot study was to evaluate the feasibility of RPM in children and adolescents who receive asthma care at an urban mobile clinic serving a predominantly Hispanic population.

Methods: A convenience sample of 20 children aged 5 to 17 years with high-risk asthma participated in RPM for 6 months. The digital platform included a Bluetooth-enabled sensor, mobile application, and clinician dashboard. Feasibility evaluation included recruitment, retention, and participant and provider satisfaction. ICS adherence and asthma-related outcomes were assessed monthly and analyzed descriptively.

Results: Twenty out of 24 eligible participants (83%) were recruited over 4 months and 19 (95%) completed the study. A majority (60%) were male and of Hispanic/Latino ethnicity. Participants found RPM helpful with a mean satisfaction rating of 4.6 out of 5. While some encountered practical challenges, 10 out of 14 respondents (71%) indicated they would continue using RPM. Providers rated their mean satisfaction 4 out of 5, but RPM was not perceived as consistently meeting patient needs, nor was it well-integrated with the clinical workflow. RPM was helpful in alerting them to patients experiencing exacerbations, prompting early intervention. Overall mean ICS adherence was 53% and emergency department visits decreased from 10 at baseline to 5 during the RPM intervention.

Conclusion: RPM is feasible in underserved and minority children with asthma, but implementation requires additional support from clinical staff. Further research is needed to determine efficacy.

Poster #6

## Enhancing Lung Cancer Prognosis Using Fine-Tuned Language Models and Structured Clinical Data

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Background: Lung cancer survival prognosis relies on structured clinical variables, images and medical notes, yet existing models struggle to fully utilize unstructured text. Conventional methods often fail to capture nuanced insights from clinical narratives, leading to incomplete risk assessments. With advancements in natural language processing, fine-tuned language models offer a promising avenue for improving survival prediction by extracting critical information from medical notes.

Methods: We fine-tuned a foundational language model (LLM) using supervised fine-tuning (SFT) with synthetic clinical data, ensuring privacy while enhancing adaptability to real-world physician-labeled notes. The model outputs were integrated with structured patient data including demographics and comorbidities—using multiple machine learning classifiers. We trained and evaluated logistic regression, support vector machines (SVM), artificial neural networks (ANN), and ensemble models such as random forests and XGBoost. Fine-tuning and training were conducted locally on GPU-powered systems, ensuring computational efficiency and data security.

Results: The LLM improved the interpretability of unstructured data, enabling a more context-aware prognosis model. Among machine learning models, SVM achieved the highest accuracy (68%) and precision (60%), while random forests demonstrated strong recall (49%), making it particularly useful for identifying high-risk patients. ANN balanced predictive performance across metrics, while logistic regression maintained competitive interpretability with a 60% AUC-ROC score. The combination of structured data with LLM-extracted features enhanced model robustness and provided deeper clinical insights into survival determinants.

Conclusion: This study introduces a privacy-conscious, scalable framework that integrates structured clinical data with fine-tuned language models to improve lung cancer prognosis. By leveraging synthetic data for training and physician-labeled records for validation, our approach bridges the gap between machine learning and real-world clinical workflows. Future work will focus on expanding model generalization across cancer subtypes and further optimizing interpretability in clinical decision-making.

Poster #7

## Study of Dosimetric Reproducibility of Peripheral Dose Assessment in Pediatric Radiotherapy

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Radiation therapy is essential in cancer treatment, curing or controlling the disease in many patients (INCA, 2023). In pediatrics, exposure to ionizing radiation can cause long-term sequelae due to increased cellular sensitivity and prolonged life expectancy (HALL, 2000). The high rate of cell multiplication amplifies the effects of radiation, requiring rigorous monitoring of peripheral doses (HENDERSON et al., 2007; MUTIC; KLEIN, 1999). This study evaluated the reproducibility of peripheral dosimetry data in pediatric radiotherapy, focusing on the dose received by sensitive organs.

A water-filled mannequin was used, with thermoluminescent dosimeters (TLDs) positioned at six anatomical sites (thyroid, breast, heart, abdomen, ovaries, and testes), some covered with gelatinous bolus for superficial dose measurement. The mannequin was irradiated five times with a 6 MV anterior cranial beam and a 5 cm x 5 cm field, applying 1500 MU per irradiation. Two irradiations were performed without the arms and three with the arms. After each irradiation, the TLDs were removed, identified, and sent to INCA-RJ for reading. Even without an anthropomorphic internal structure, the mannequin is lightweight, easy to handle, and low-cost (SOBOLL, 2010).

The thyroid and abdomen showed high reproducibility (CV% = 0.85% and 4.09%), while the testes exhibited high variability (CV% = 34.78%). The presence of the arms increased the dose to the heart by 34.75%. The thyroid received the highest average dose (7.63 cGy), and the testes, the lowest (0.27 cGy).

The results indicate reproducibility in regions such as the thyroid and abdomen, but greater variability in the heart and testes. It is concluded that the polyethylene mannequin is feasible for peripheral dose studies, but low-dose regions, such as the testes, require greater experimental control or Monte Carlo simulations. The study reinforces the need to optimize pediatric radiotherapy protocols to reduce radiation exposure.

Poster #8

## Enhancing VUR Risk Prediction through Virtual Patient Sampling and Topological Representation Learning

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Background: Accurate prediction of urinary tract infection (UTI) risk is essential for effective treatment of children with vesicoureteral reflux (VUR). Prior studies have identified high-grade VUR, female gender, and bladder and bowel dysfunction (BBD) as major UTI risk factors. Recent multicenter studies across four academic centers further highlighted reflux grade, gender, and circumcision as key UTI risk predictors. Building on these insights, this study employs virtual patient sampling and representation learning to enhance robustness of UTI risk prediction.

Methods: Two datasets were analyzed: one with 751 subjects having at least 0.75 years of follow-up and another subset of 526 subjects followed for at least 1.75 years. Both datasets included 60 variables on demographic and clinical characteristics. After excluding columns with more than 85% missing data, 46 predictor variables were kept for downstream analysis. We generated virtual patient representations by sampling from independent normal distributions over existing variable observations. This produced 1000 cohorts (per data split) of diverse virtual patients. Presto, a topology-based representation learning algorithm, was then applied to analyze the distribution of virtual cohorts. The final cohort representation per split was selected by comparing topological descriptors across cohorts. A logistic regression model was trained and evaluated on the selected year 1 cohort, with performance tested on validation, test, and year 2 cohorts.

Results: The model achieved 100% accuracy, precision, recall, and F1-score on the year 1 validation and test sets for UTI prediction. It also maintained 99% accuracy on the year 2 cohort, with 84% accuracy in predicting patients who developed UTIs after one year.

Discussion: Virtual patient sampling with representation learning effectively handles missing data, enabling robust clinical modeling with more descriptive patient representations and facilitating more nuanced risk score calculations.

Poster #9

## Differences in Healthcare Resource Utilization by Race/Ethnicity and Neighborhood Deprivation among Moderate to Late Preterm Infants with Respiratory Distress Syndrome, Northern California, 2019-2023

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Healthcare resource utilization (HCRU) disparities are well-documented among extremely and very preterm infants but understudied in mature preterm infants despite their burden on healthcare. To address this gap, this study assessed the HCRU differences by race/ethnicity and neighborhood deprivation index (NDI) in moderate (32-33 weeks) and late preterm infants (34-36 weeks) with respiratory distress syndrome (ICD-10-CM P22.0 and requiring >12 hours of respiratory support during birth hospitalization) in Northern California (2019-2023). HCRU was evaluated during birth hospitalization [respiratory support, hospital length of stay (LOS), NICU LOS] and one-year post-discharge [emergency department (ED) visits, hospitalization]. This study included 1,674 infants (37.5% White, 22.4% Hispanic, 17.4% Asian, and 7.4% Black; 15.0% Q1 [least deprived], 29.9% Q2, 29.6% Q3, and 25.3% Q4 [most deprived]). Most Black and Hispanic infants lived in high deprivation areas (43.6% and 37.1%). While respiratory support duration, hospital and NICU LOS did not differ by race/ethnicity or NDI ($p>0.05$) during hospitalization, differences occurred post-discharge. Black and Hispanic infants had higher risk of respiratory/infectious respiratory ED visits (Black, aOR=1.72 [95% CI=1.05-2.81]; Hispanic, aOR=2.18 [95% CI=1.56-3.06]; ref=white; adjusted for gestational age, infant sex, and NDI).

Hispanic infants had higher risks of respiratory/infectious respiratory hospitalizations (aOR=2.53 [95% CI=1.11-5.78]). For NDI, there were differences in respiratory ED visits (Q2, aOR=1.67 [95% CI=1.01, 2.75]; Q3, aOR=1.89 [95% CI=1.15, 3.11]; Q4, aOR=2.22 [95% CI=1.34-3.67]; ref=Q1; adjusted for gestational age, infant sex, and race/ethnicity). While no significant HCRU differences by race/ethnicity or NDI were detected during hospitalization, disparities emerged post-discharge, notably in Black and Hispanic infants. Findings highlight the need to explore factors affecting long-term outcomes.

Poster #10

## Computer vision for pediatric malformations of cortical development classification: Comparing magnetic resonance imaging series and series combinations

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Background: Malformations of cortical development (MCDs) are abnormalities of the brain cortex resulting from genetic, infectious, vascular, or metabolic causes leading to neurodevelopmental delay and epilepsy, which is often intractable. Detection of MCD in MRI is important, particularly for pre-surgical evaluation, but may be difficult due to the size of the malformation, and time and expertise required.

Methods: 3D convolutional neural networks (CNNs) were used to classify imaging from patients with and without MCDs. The models were applied to different MRI series as well as pairs of series.

Results: MRI studies from 238 patients with MCDs and 111 control patients were used to develop single- and multi-series 3D-CNNs to classify imaging from patients with and without MCDs. For each model, tenfold cross-validation was utilized, and results were reported. The best-performing model in terms of area under the receiver operating characteristic curve (AUC- ROC), 0.95, was a multi-series model that incorporated both T1 magnetization prepared rapid gradient echo (MPR) Axial (Ax) and T1 MPR Sagittal (Sag), which achieved an accuracy of 0.88.The best-performing model in terms of accuracy, 0.90, utilized solely T1 MPR Ax, and achieved a validation AUC-ROC of 0.94. Out of the three series compared: T1 MPR Ax, T1 MPR Sag, and T2 fluid attenuated inversion recovery (Flair) Ax, utilizing T1 MPR Ax achieved the best results in terms of model metric values in both single- and multi-series models.

Discussion: Results suggest that certain MRI series are better than others at detecting which MRIs contain MCDs. Models that utilized T1 MPR Ax outperformed models that utilized other series. T2 Flair Ax also demonstrated promise. Furthermore, this preliminary study indicates there is potential for AI-based automatic MCD classifiers to be incorporated into clinical workflow to provide guidance and confidence to clinicians.

Poster #11

## Utilization of Machine Learning Models to Predict Cardiac Inflammatory Immune Related Adverse Events in Patients Receiving Immune Checkpoint Inhibitors

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Introduction: Immune Checkpoint Inhibitor (ICI) induced cardio-inflammatory immune related adverse events (irAEs) are rare but serious complications from ICI therapy.[1] The development of clinical assessment tools to identify at risk patients would allow for more effective prevention strategies, improving clinical outcomes. We implemented various machine learning (ML) models to predict these events amongst patients receiving ICI therapy.

Methods: A cohort of patients receiving ICI therapy from January 1, 2010 to December 31, 2023 was identified from TriNetx.[2] Cardiac irAEs were defined as the occurrence of relevant diagnosis codes within 90 days of ICI Initiation. Utilizing patient demographic data, ICI therapy exposures, comorbidity information, and medication usage histories, we created and optimized ML models on training data. Models were created using Caret, specifically elastic net logistic regression and multiple tree-based approaches (xgbTree, ranger).[3,4] On a reserved testing data set, we predicted the occurrence of cardiac irAEs and assigned patients to risk tiers (low, medium, high). Model performance was assessed using conventional metrics and incidence of cardiac irAEs was compared between assigned tiers.

Results: Within TriNetx, we identified 96,838 patients receiving ICI therapy representing a diverse patient population, with approximately 2% of patients experiencing cardiac irAEs. Model performance on testing data was comparable with all approaches (AUC= 0.66- 0.68, Balanced Accuracy= 0.64- 0.67). Each model emphasized distinct features to make classifications, as observed with feature importance and SHAP values. Comparing cardiac irAE rates amongst assigned risk strata, patients identified as high risk were significantly more likely to experience cardiac irAEs compared to lower tiers.

Discussion/Conclusion: Our results demonstrate the potential of using ML methods to identify patients at risk of cardiac irAEs while receiving ICI patients. Follow up studies can implement time serious approaches, to harness longitudinal data that incorporates real-time labs, new diagnoses, and new therapy to refine predictions further.

Poster #12

## The Role of Geography and Social Drivers of Health in Readmission Risk

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Background: Patients from certain neighborhoods or with social drivers of health (SDoH) can experience worse outcomes and increased readmissions/cost. Our hospital's readmission risk tool incorporated demographics and clinical characteristics to direct case management interventions, showing decreased readmission rates (RR) and costs. The effect of integrating SDoH or geography via composite indices of area-level deprivation (e.g., Childhood Opportunity Index (COI) or Social Vulnerability Index (SVI)) into this tool is unknown. We aimed to determine if SDoH, COI, or SVI can predict readmission risk.

Methods: We performed a single-center retrospective study of admissions data from 2019 – 2023 including patients 1 month – 18 years admitted to acute care units. We excluded patients with an unspecified home address. We extracted encounter data from the medical record, mapped patients to their home census tract (smaller than a zip code), and assigned COI 3.0 and SVI. A LASSO logistic regression model examined SDoH, demographics, and medical history and the odds of 7- and 30-day readmissions. We applied the L1 penalty to select features. A general linear F-test compared this model with remaining covariates to a model including COI and SVI ($p<0.05$).

Results: There were 39,973 encounters for 26,281 patients. 30-day RRs ranged from 0 to 15.050 per 1000 children over 613 census tracts. Demographics, clinical characteristics, and RRs significantly varied by COI rank. All demographics, encounter characteristics, and SDoH diagnoses were selected for both 7- and 30-day models. Selected medical diagnoses differed between 7- and 30-day models. Neither COI nor SVI accounted for significant variance in either model.

Conclusions: We demonstrated that SDoH diagnoses affect readmissions; measures of area-level deprivation do not. Next steps include incorporating SDoH into the institution's readmission risk tool to evaluate effects on readmissions/cost.

Poster #13

## Artificial Intelligence for Automatic Detection and Classification Disease on the X-Ray Images

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Detecting and classifying diseases using X-ray images is challenging in medicine and research. With the recent increased interest in X-ray images and artificial Intelligence (AI), early detection of diseases has become critical to prevent further spread and control outbreaks. Advances in computer vision and deep learning methods promise quicker and more accurate diagnosis of chest X-ray images (CXR). This work focuses on quickly detecting lung diseases using the Deep Learning pre-trained VGG-16 algorithm to extract deep features and classify images. The model's effectiveness in identifying and classifying by three categories in X-ray images: COVID-19, Pneumonia, and Normal conditions. A histogram-oriented gradient (HOG) method was first applied to evaluate the model and find the shape of the region of interest (ROI). Then, the ROI will be used to enhance the accuracy of lung detection, followed by data pre-processing and augmentation. Next, a pre-trained VGG-16 model will be used for deep feature extraction and classification. Using GRAD-CAM computer vision methods, I created heat maps that superimposed the original image disease on the original X-ray images.

This work developed an algorithm based on X-ray images that automatically detects and highlights affected areas in patients' lungs and classifies them into three disease categories, with an accuracy of more than 90%. The proposed framework shows improved diagnostic accuracy compared to popular deep learning models in detecting diseases, such as ResNet50, InceptionV3, DenseNet, and InceptionResNetV2.

Poster #14

## Enhancing Thrombosis Classification in Adults via Synthetic Data and Reinforcement Learning: A MIMIC-IV-Aligned Study

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Background: Distinguishing provoked from unprovoked thrombosis is critical for determining anticoagulation duration in adults diagnosed with acute deep vein thrombosis (DVT) or pulmonary embolism (PE). Challenges persist due to variability in clinical documentation and limited labeled datasets, particularly for adult populations where risk factors (e.g., malignancy, surgery) differ from pediatric cases.

Methods: We propose a reinforcement learning (RL) framework leveraging synthetic data generation and expert-guided optimization. Using three open-source large language models (LLMs: Llama-3.1-8B, Qwen-2.5-7B, and Mistral-7B), we generated 2,000 synthetic medical notes structurally aligned with the MIMIC-IV database (patients ≥18 years), replicating adult-specific risk factors (e.g., recent surgery, cancer history, etc.). A thrombosis specialist defined clinical reward criteria (e.g. prioritize accurate identification of transient triggers, absence of malignancy, correct classification, etc.) to fine-tune each model via Group Relative Policy Optimization (GRPO), a reinforcement learning method that normalizes rewards across patient subgroups to enhance training stability. Model performance will be validated on 100 clinician-annotated MIMIC-IV notes, with evaluation metrics including accuracy, F1-score, and AUC-ROC.

Discussion/Conclusion: This study addresses data scarcity in clinical NLP by integrating synthetic data generation with GRPO-driven fine-tuning, tailored for adult thrombosis classification. GRPO's group-based reward normalization and KL divergence constraints improve training efficiency compared to traditional RL methods. While synthetic data adhered to MIMIC-IV's ethical guidelines, prospective validation in diverse clinical settings is needed. This framework has the potential to reduce diagnostic variability and inform evidence-based anticoagulation strategies, ultimately improving care for adults with thrombosis.

Poster #15

## Utilization of Cerner Real-World Data to Characterize Adoption of Novel Gene Therapies for the Treatment of Spinal Muscular Atrophy Type 1

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Background: Spinal muscular atrophy (SMA) is a neuromuscular disease characterized by progressive muscle weakness resulting from degeneration of the anterior horn cells in the spinal cord. Disease modifying therapies targeting the SMN1 or SMN2 genes have been monumental in modifying the course of this disease. While there has been substantial literature reporting the efficacy of these novel gene therapies, information on real-world adoption of these gene therapies is limited. This study aims to assess the true clinical utilization of these novel therapies for treatment of SMA type 1.

Methods: A retrospective observational study was conducted using Cerner Real-World Data (CRWD), a multi-center electronic health record database. Access to this database was approved through our institutional review board (CHOC IRB: 2008107). All patients with ICD-10 codes of G12.0, 12.1, 12.8, 12.9 under 12 months of age were identified from January 1, 2017 to June 30, 2023. The first encounter in which nusinersen (Spinraza), onasemnogene abeparvovec (Zolgensma) or risdiplam (Everysdi) was prescribed was recorded. If a patient had subsequent treatment with an additional SMA therapy, this was also recorded. Descriptive analysis was performed to characterize the prescribing practices for these therapies.

Results: A total of 158 unique patients were identified. 94, 36 and 28 patients were initially started on Spinraza, Everysdi and Zolgensma respectively. 58 (62%), 33 (92%) and 25 (89%) remained on Spinraza, Everysdi and Zolgensam respectively. 36 patients (38%) on Spinraza later transitioned to either Everysdi or Zolgensma. 3 patients (8%) on Everysdi later transitioned to either Spinraza or Zolgensma. 3 patients (11%) that had received Zolgensma later transitioned to either Spinraza or Everysdi.

Poster #16

## From Discharge Notes from MIMIC-IV Database to Insights: A RAG-Driven Approach to Data Insight

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Background: Accessing relevant clinical information from unstructured discharge notes is a major task in medical informatics. Traditional NLP methods often struggle with contextual understanding, resulting in retrieval of incomplete or incorrect data. However, recent efforts in Retrieval-Augmented Generation (RAG) models provide an exciting mechanism for combining structured and unstructured clinical data to better support medical decisions. We investigate the potential of a RAG model-based approach to extract ADHD-related insights from the document after pulling the data from a MIMIC-IV database, with a focus on ADHD patient discharge summaries.

Methods: We obtained and preprocessed discharge summaries from MIMIC-IV, specifically from patients with ADHD (using ICD-9 & ICD-10 codes). We shall implement a Retrieval-Augmented Generation Network (RAGN) with (Medi-llama model and chain-of-thought prompting) to enhance medical information retrieval and response generation. The classification of ADHD patient severity will be performed based on keywords into High Severity (presence of suicide attempts, substance abuse, schizophrenia, bipolar depression, HIV infection) or Low Severity (presence of ADHD along with anxiety/depression but without history of suicide attempts and substance abuse).

Result: In total, 2,223 unique patients and 4,842 discharge notes were analyzed. We hope to find the frequency of hospitalization, and the medication class (stimulant, non-stimulant) for each patient, having as a guiding principle in determine ADHD patient severity condition.

We anticipate our results will show that RAG-based models can facilitate the retrieval of clinically relevant information within free-text discharge notes, serving as an effective way to incorporate unstructured medical data into analytical pipelines. Such a strategy would enhance clinical decisions, automate patient stratification, and personalized treatment strategies.
We will evaluate the model's performance using F1-score, Precision, Recall and ROC curve.

References/Disclosures: No conflicts of interest to disclose. This work was supported in part by publicly available MIMIC-IV datasets.

Poster #17

## Predicting Rising-Risk Patients: A Machine Learning Approach to Early Healthcare Intervention

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Identifying "rising-risk" patients—those not yet high-risk but likely to deteriorate—is critical for proactive clinical intervention and resource management. While high-risk patients are recognized due to their existing healthcare utilization, predicting those on track to become high-risk remains challenging. Proactively identifying rising-risk patients can prevent costly medical events, improve care quality, and mitigate future high-cost episodes. In this study, we leveraged Real-World Evidence (RWE) from Electronic Health Records (EHR) at CHOC hospital to develop a predictive model for identifying rising-risk patients. The dataset included 1,214,394 datapoints from pediatric patients with inpatient, emergency, and outpatient encounters from 2016-2023. A binary classification model was built using the XGBoost algorithm to predict rising-risk status, training on data from 2016-2021 and testing on 2022 data. Features included demographics (age, sex, race), insurance, zip-code-based socioeconomic determinants, BMI, lab results, prior diagnoses, and hospital resource utilization. We also developed four specialized models for rising-risk prediction within specific care categories: inpatient care, emergency department visits, sick visits, and specialty care visits. The primary model achieved an AUC of 0.65, precision of 0.51, and recall of 0.66. The specialized models demonstrated AUCs ranging from 0.66 to 0.72. ROC curves were plotted to determine the optimal threshold for deployment. Feature importance analysis revealed that BMI, age, lab results (e.g., hemoglobin, BUN), hospital resource utilization, and socioeconomic factors were critical drivers of rising-risk. There remain opportunities to enhance model performance. Incorporating census tract-based social determinants and additional laboratory biomarkers could improve predictive accuracy, enabling more targeted interventions and potentially improving clinical outcomes.

Poster #18

## LLMs & Personas: Crafting Better Pediatric Medical Questions

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Background: Large Language Models (LLMs) are increasingly used to generate and evaluate medical questions, but relying solely on synthetic data presents challenges, especially in pediatrics. Real-world pediatric question collection is costly and slow, making medical LLM benchmarking challenging. This study investigates whether persona-based prompting improves the relevance and quality of synthetic pediatric medical questions. We compare six LLMs—GPT-4, Claude-3, Gemini, Mistral, DeepSeek, and LLaMA-3—to determine which model generates the most relevant and high-quality pediatric medical questions for evaluating LLMs in general pediatrics.

Methods: Each LLM generated 1,000 pediatric questions, split evenly between standard and persona-based prompts. The personas included five medical roles—nurse, pediatrician, pediatric intensivist, neonatologist, and pediatric emergency physician—with 100 questions per role. Other LLMs evaluated the questions on a 5-point scale for relevance (alignment with pediatric medicine) and quality (accuracy, detail, clarity, complexity). Statistical tests included ANOVA for score comparisons, t-tests for persona vs. non-persona differences, Intraclass Correlation Coefficient (ICC) for rating consistency, and chi-square tests to detect biases in model scoring patterns.

Results: Persona-based prompting improved pediatric question quality, with GPT-4 outperforming all models. Each LLM generated 1,000 questions, split between standard and persona-based prompts across five medical roles. Statistical analyses confirmed that personas enhanced relevance and complexity, though GPT-4 remained the top performer.

Conclusion: Persona-based prompting improves synthetic pediatric medical questions, with GPT-4 performing consistently well across all conditions. Future work should refine persona effectiveness, explore additional medical roles, and assess the impact of LLM updates.

Poster #19

## Evaluating AI-Based Summarization of CVICU Clinical Notes Using the Mistral Language Model

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Background/Objective: Effective communication of patient information between providers is crucial in critical care settings to ensure patient safety and continuity of care. In this study, we evaluate the use of large language models (LLM) for summarization of progress notes of pediatric patients admitted in the cardiovascular intensive care unit (CVICU).

Design/Methods: A sample of CVICU progress notes from 385 patients were retrieved and concatenated to create a single body of text per patient encounter. Summaries were generated using the Mistral LLM available in the Amazon Web Services (AWS) API. The readability of the generated summaries were assessed using metrics such as Flesch Reading Ease, Flesch-Kincaid Grade Level, Gunning Fog Index, SMOG Index, Automated Readability Index, and Dale-Chall Score. Additionally, cosine similarity scores were calculated to gauge alignment between summaries and the original notes. The prompt for generating these summaries was formed using the contents from the iPASS system, a structured hand-off communication framework widely used in healthcare.

Results: The quantitative analysis indicates that AI-generated summaries are more challenging to read than the original concatenated notes, with a Flesch Reading Ease score of 29.25 compared to 56.89 for original notes. Summaries require a college-level reading ability (Flesch- Kincaid Grade 15.24), whereas original notes are accessible at a 9th-grade level (Flesch-Kincaid Grade 8.98). A cosine similarity score of 0.6 suggests moderate alignment, indicating that while key information is retained, some details may be simplified or omitted.

Conclusions: The Mistral LLM effectively condenses complex clinical information, though at a readability level suited for trained professionals. Future work includes manual annotation, with up to 3 pediatric physician raters evaluating a subset of 35 summaries for readability, accuracy, and dependability.

References/Disclosures: No

Poster #20

## Enhancing Single-Cell RNA Analysis for Temporal Adjustments

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Background: Multicellular programs (MCPs) describe coordinated gene expression across cell types, offering key insights into disease mechanisms. Single-cell RNA sequencing (scRNA-seq) enables MCP identification, but temporal confounding limits accuracy when analyzing data across time points. The DIALOGUE algorithm identifies MCPs but lacks temporal adjustments, reducing biological interpretability [1].

Methods: To address this, we integrated Gaussian Process Regression (GPR) into DIALOGUE to model gene expression changes over time [2]. We applied this to endometrial scRNA-seq data spanning the G1, S, and G2 cell cycle phases [3]. Given the dataset's limited time points, we used Palantir pseudotime for a continuous measure of cellular progression [4]. We then compared MCP-associated gene correlations between the original DIALOGUE model and our GPR-enhanced version.

Results: Limited discrete time points (G1, S, G2) restricted temporal analysis, yielding weak MCP-gene expression correlations ($r \approx 0$). Incorporating Palantir pseudotime significantly improved correlation using GPR, enhancing detection of meaningful gene expression dynamics. While pseudotime mitigated some limitations, true longitudinal measurements remain ideal.

Discussion/Conclusion: Integrating GPR into DIALOGUE improves MCP identification by addressing temporal confounding, enabling a more accurate representation of multicellular interactions over time. This advancement may enhance understanding of disease progression and tissue development. Future work will apply this method to datasets with more time points for further validation. Our findings underscore the importance of well-structured longitudinal experimental designs for accurate temporal modeling in biological studies.

Poster #21

## Mapping of brain connectivity in pediatric Dystonia: integrating of electrophysiology and advanced imaging techniques

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Deep brain stimulation (DBS) has been an important treatment for movement and has been validated as an effective treatment for this kind of neuromovement disorder, including Dystonia, which is a form of dyskinetic cerebral palsy (CP) is associated with white matter injury. Deep brain stimulation (DBS) evoked potentials (EP) and intrinsic signals calculated from the transfer function (TF) represent the electrophysiological connectivity. Here, EP measures the transmission of external signals, whereas TF measures the transmission of intrinsic brain signals. Diffusion Tensor Imaging (DTI) quantifies brain anatomic connectivity.

We validate diffusion-tensor imaging (DTI) anatomical connectivity in the brain using electrophysiological recordings obtained during deep brain stimulation (DBS) surgery in 16 patients with dystonia. Results show that EP and TF amplitude increase and EP time to peak decreases with DTI Fractional Anisotropy (FA). The results demonstrate that DTI anatomical measures correlate with physiological connectivity. Our findings indicate that DTI-based structural metrics can effectively predict electrical connectivity, reinforcing the role of multimodal data integration in brain network modeling.

Poster #22

## Deaths due to isolated extremity gunshot wounds in children and young adults

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Background: Isolated extremity gunshot wounds (GSW) cause a significant number of deaths annually despite exsanguinating extremity hemorrhage being potentially treatable, and thus the deaths preventable.

Aims: We sought to compare differences between children and young adult decedents of isolated extremity GSW (E-GSW) to decedents from other site GSW (O-GSW) in terms of demographics, incident circumstances, and disposition.

Methods: A retrospective analysis of the National Violent Death Reporting System (NVDRS) database was performed for years 2012-2021. E-GSW decedents were compared to O-GSW decedents in patients 0-25 years old. Variables analyzed included race, sex, incident, EMS (Emergency Medical Services) response, transportation to the emergency department (ED) and survival times. Analysis was conducted using bivariate inferential statistics: chi square and Wilcoxon rank-sum.

Results: Of 40,746 firearm injuries, 39,878 (97.9%) were O-GSW and 868 (2.1%) were E-GSW. African Americans comprised the majority of both cohorts but more commonly E-GSW (75.3% vs 66.6%, $p<0.0001$). More E-GSW were male (90.3% vs 87.1%, $p=0.006$) and in single homicides (89.9% vs 86.1%, $p=0.0001$). Both groups were admitted to the hospital at similar rates (12.1% vs 12.8%, $p=0.34$). 72.0% E-GSW survived minutes after injury and 20.9% of E-GSW decedents survived hours. 66.1% of E-GSW was transported to the ED compared to 53.4% of O-GSW. A subgroup analysis was performed for decedents <18 years old and mirrored these trends.

Conclusions: This national analysis demonstrated disparities in race and sex among young decedents of isolated E-GSW compared to O-GSW. One-fifth of decedents with E-GSW survived hours and had higher transport rates to the ED, representing a window of intervention to prevent deaths. Targeted intervention programs such as Stop the Bleed training may help improve survival after isolated extremity gunshot wounds.

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