Division Details

RESEARCH AND TRAINING DETAILS

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Significant Accomplishments

Enhanced Registry for ImproveCareNow

Our Division recently completed the implementation of an electronic health record (EHR)-linked “enhanced” registry for ImproveCareNow, a 54-center quality improvement and research network of gastroenterologists, researchers, patients and families that focuses on improving outcomes of children with inflammatory bowel disease (IBD). This effort is supported by a 3-year, $12-million grant from the Agency for Healthcare Research and Quality (AHRQ). The registry has allowed ImproveCareNow to create tools and processes to capture data directly from the EHR, which can be then uploaded to the registry to improve the quality of information obtained during the patient encounter, and support quality improvement. The registry helps automate pre-visit planning and population management activities and supports creation of mobile applications to increase patient participation in chronic care. The registry data supports novel research by generating estimates of the comparative treatment effects of biologic agents and allowing simulations. The data also can be used to generate ad hoc queries for cohort identification or for clinical trial feasibility. The registry, now in its third year, has grown from 6,000 to more than 10,000 individuals and the number of centers in the network more than doubled. At the same time, the overall remission rate of patients in the network increased from 73 percent to 77 percent. Next year, the registry architecture will be extended to include adult patients with IBD.

Finding New Indications for Established Drugs

We continue to focus on design, development and application of network-based approaches to understand human disease and to accelerate drug discovery. Focusing on rare or orphan disorders, we are using the emerging tools of network medicine to explore the molecular complexity of these diseases. Our goal is to identify novel rare disease genes and more potential drug targets using algorithms and developed software.
systems we designed to help biomedical researchers form novel hypotheses from high-throughput data. One of our current focus areas is to find new indications for existing drugs. Our ultimate goal is to move drug repositioning from a serendipitous event to a systematic, comprehensive and rational search for drug repositioning candidates.

**Reconstructing Critical Events of Embryonic Development**

Jun Ma, PhD, focuses on the fundamental question of how an embryo develops the initial, elaborate patterns that later lead to the formation of organ structures. His team uses the fruit fly *Drosophila* as a model organism to study how the mother provides positional cues to the embryo and how cells in the embryo interpret such cues to form the initial spatial patterns. They have developed quantitative tools that allow them to investigate and reconstruct the critical events of early embryonic development at an increasingly fine resolution of both space and time. Their study, which is funded by the National Institutes of Health and the National Science Foundation, will not only advance the fundamental knowledge of how biological systems operate but also will reveal insights critical to our understanding of the molecular basis of human diseases including birth defects and cancer.

**Research Highlights**

**Research IT & Security (Michal Kouril, PhD and Nicholas Hunt)**

Research IT has expanded the IT infrastructure to accommodate the increasing demands by investigators for storage of data, hosting of databases and web based applications, and access to servers. Security has been tightened by moving servers into a more secure Research Network Environment. Regular internal and external security scans have been implemented; vulnerabilities that are identified are being promptly addressed. A disaster recovery plan has been formalized and is being implemented over the next year.

In cooperation with hospital Information Services, network connectivity has been increased to 10Gb to prepare for projects such as clinical Exome sequencing, which will generate 10s of TB of data that must be stored and processed in a short time. Additional examples of successful collaborations include research PACS publishing to increase the ability of investigators to access research images and eConsent management with user facing portals which improves the ease with which consent to participate in research studies can be obtained from potential subjects.

**Network Approaches to Study Human Diseases (Jason Lu, PhD)**

Jason Lu, PhD, focused on developing network-based approaches to study a variety of human diseases. He developed a network-based approach that combines proteomics experiments and computational predictions to discover the subspecies in High Density Lipoprotein (HDL). If the subspecies that are responsible for the cardiovascular protective functions are successfully identified, they may serve as more accurate biomarkers to assess the risk of developing cardiovascular diseases. The expression level of these subspecies can also be elevated to reduce the risk of cardiovascular diseases.

Jason has also predicted the protein interaction networks in bacterial pathogen *Pseudomonas aeruginosa*, and the human-*Pseudomonas* interaction networks. These networks are important in enabling network pharmacology where new antibiotic drug targets can be identified to treat *Pseudomonas* infection. His [webserver](#) has been linked by the comprehensive database *Pseudomonas*.

**Data Warehousing & Software Development (Keith Marsolo, PhD)**
The data warehousing group completed the implementation of a federated query tool for the Ohio Pediatric Asthma Repository (OPAR), a network made up of all Ohio children’s hospitals that is collecting data on asthma-related hospital admissions and corresponding treatment. This tool allows investigators in the network to run cohort identification and feasibility queries on their own center’s data as well as data from the entire network. In addition, the team continues to support the institutional research biorepository, finalizing functionality that will allow investigators at CCHMC to search for and request available biosamples from within the de-identified i2b2 warehouse.

The software group continues to support the quality improvement networks that are part of the Best Evidence for Advancing Child Health in Ohio Now (BEACON) collaborative, which focuses on improving outcomes in childhood obesity, children’s mental health and preterm births in Ohio. The group is completed development of patient registries for eosinophilic esophagitis and bone marrow transplant and the “drug dashboard” for kidney transplant that pulls together adherence data from electronic pill bottles, clinical data and pharmacogenomics information to support pre-clinic planning. Initial efforts have begun to integrate this dashboard in the EHR and disseminate it to other institutions.

**Division Publications**


46. Pestian J, Matykiewicz P, Holland-Bouley K, Standridge S, Spencer M, Glauser T. Selecting anti-
61. Xie H, Sun X, Piao Y, Jegga AG, Handwerger S, Ko MS, Dey SK. Silencing or amplification of


Faculty, Staff, and Trainees

Faculty Members

John Hutton, MD, Professor
  Leadership Director, Division Chief

Bruce Aronow, PhD, Professor
  Research Interests Gene Expression Analysis, Gene Regulation, Clinical Genomics, Functional Genomics of Development and Disease

Anil Jegga, MS, DVM, Assistant Professor
  Research Interests Gene Regulatory Networks, Biomedical Ontologies, Integrative Genomics

Michal Kouril, PhD, Assistant Professor
  Research Interests Computational Support, High-performance computing, Parallel Programming, High-end Data Storage

Long Jason Lu, PhD, Assistant Professor
  Research Interests Bioinformatics, Machine Learning, Integrative Genomics, Biological Networks, Computational Modeling, Software Development

Jun Ma, PhD, Professor
  Research Interests Development, Transcription, Morphogen Gradient, Embryo, Robustness, Quantitative Studies

Keith Marsolo, PhD, Assistant Professor
  Research Interests i2b2, Data Integration, Data Warehousing and Data Management

John Pestian, PhD, MBA, Professor
  Research Interests Natural Language Processing, Clinical Decision Support, Suicide Research, Pathology Research, Psychiatric Research

S. Andrew Spooner, MD, FAAP, Associate Professor
  Leadership Chief Medical Information Officer
  Research Interests Decision Support, Pharmacy Information Systems

Imre Solti, MD, PhD, MA, Assistant Professor
  Research Interests Computational Linguistics
Michael Wagner, PhD, Associate Professor

Leadership Faculty Liaison

Research Interests Machine Learning, Proteomics, Genome-wide Association, Parallel Computing, Computational Infrastructure, Bioinformatics

Joint Appointment Faculty Members

Judith Dexheimer, PhD, Instructor (Emergency Medicine)

Research Interests Clinical Decision Support, Informatics

Eric Hall, PhD, Assistant Professor (Neonatology & Pulmonary Biology)

Research Interests Clinical Informatics, Knowledge Discovery Tools, Data Mining and Warehousing

Eric Kirkendall, MD, Assistant Professor (Hospital Medicine)

Research Interests General Pediatrics, Clinical Informatics

Kakajan Komurov, PhD, Assistant Professor (Experimental Hematology & Cancer Biology)

Research Interests Bioinformatics, Cancer Biology

Mario Medvedovic, PhD, Associate Professor (UC Environmental Health)

Research Interests Biostatistics

Jarek Meller, PhD, Associate Professor (UC Environmental Health)

Research Interests Protein Modeling

Matthew Weirauch, PhD, Assistant Professor (Rheumatology)

Research Interests Transcriptional Regulation, Bioinformatics, Functional Genomics

Yan Xu, PhD, Associate Professor (Neonatology & Pulmonary Biology)

Research Interests Bioinformatics; Systems Biology

Trainees

Jacek Biesiada, PhD, 2000, University of Silesia, Poland

Brian Connolly, PhD, 2002, Florida State University, Gainesville, FL, USA

Louise Deleger, PhD, 2009, Pierre et Marie Curie University, Paris, France

Feng He, PhD, 2009, Fudan University, Shanghai, China

Rebekah Karns, PhD, 2012, University of Cincinnati, Cincinnati, OH, USA

Hailong Li, PhD, 2013, University of Cincinnati, Cincinnati, OH, USA

Qi Li, PhD, 2011, University of Pittsburgh, Pittsburgh, PA, USA

Junbo Liu, PhD, 2000, Fudan University, Shanghai, China

Yizhao Ni, PhD, 2010, University of Southampton, Southampton, UK

Mayur Sarangdhar, PhD, 2011, University of Hull, Hull, UK

Haijun Zhai, PhD, 2010, University of Science and Technology of China, Hefei, Anhui Province, China

Division Collaboration

Adherence Psychology » Dr. Ahna Pai

Dr. Marsolo and team completed the development of a registry that captures patient reported outcomes and medication adherence data from patients who have received a bone marrow transplant.

Allergy & Immunology/Gastroenterology, Hepatology & Nutrition; » Dr. Pablo Abonia and Dr. Marc
Dr. Marsolo and team completed the development of a multi-center registry focused on Eosinophilic Esophagitis. This registry allows patients to complete registry forms and patient reported outcome/quality of life surveys from home, saving time in the initial clinic visit. This study was the first to pilot a new consent management system developed by BMI that enables patients to electronically consent through a web browser.

**Behavioral Medicine and Clinical Psychology » Dr. Jennie Noll**

Dr. Kouril, as Co-Investigator on an R01 grant studying Internet and media use in the teenage population is leading efforts to develop hardware and software that will allow naturalistic observation of adolescents’ “Internet Footprint”.

**Biomedical Informatics » Dr. Bruce Aronow, Dr. Anil Jegga, and Dr. Jason Lu**

Dr. Ma collaborates with Drs. Aronow, Jegga, and Lu to investigate the pathological mechanisms of polyglutamine-mediated neurodegenerative disorders through the use of a fruit fly disease model.

**Center for Technology Commercialization » Dr. Nicole Robinson**

Dr. Pestian collaborates with the CTC looking for novel approaches to disseminate the laboratories innovations.

**Clinical Pharmacology » Dr. Sander Vinks**

Dr. Marsolo and his team have completed the development of a "Drug Dashboard" that pulls electronic health record data, medication adherence data from electronic pill bottles (MEMS caps) and pharmacokinetic and pharmacogenetic information into a single interface along with care recommendations that can be used by clinicians when conducting pre-visit planning. Dr. Vinks was asked to present this application at an "all Epic" town hall meeting as an example of the type of clinical informatics projects being done at Cincinnati Children’s.

**Developmental Biology » Dr. James Lessard and Dr. Steven Potter**

Dr. Aronow’s group collaborates with Drs. Potter and Lessard along with an international consortium on the use of genomics analyses to gain insight into the normal or abnormal development of the kidney and lower urinary tract.

**Emergency Medicine » Dr. Judith Dexheimer**

Dr. Solti is collaborating with Dr. Dexheimer in developing an automated eligibility screening system for ED clinical trials.

**Emergency Medicine » Dr. Jackie Grupp-Phelan**

Dr. Pestian and his team are collaborating with Dr. Grupp-Phelan in the development of decision support tools to measure the likelihood of repeated suicide attempts.

**Gastroenterology, Hepatology & Nutrition » Dr. Jorge Bezerra**

Dr. Jegga collaborates with Bezerra Lab to understand the molecular basis of biliary atresia, a rare condition in newborn infants which if unrecognized could lead to liver failure. He provides bioinformatic support that includes data analysis, data-mining and hypothesis generation using systems biology-based approaches.

**Gastroenterology, Hepatology & Nutrition » Dr. Jorge Bezerra**

Dr. Aronow serves as the Bioinformatics Core Director on the Digestive Health Center: Bench to Bedside Research in Pediatric Digestive Disease grant project. His role is to aid or supervise in strategic planning, experimental designs, data analysis, and to generate a data portal for the genomics data and sample characterizations.

**Heart Institute » Dr. Stephanie Ware**

Dr. Marsolo and his team completed the first phase of an application to automate the processing and analysis of samples used in genetic and viral testing by the Heart Institute Diagnostic Lab (HIDL). This application has
significantly streamlined the lab’s workflow and more easily allows queries to be run on previous test results, enabling both quality assurance and future research.

**Hematology/Oncology » Dr. John Perentesis**

Dr. Pestian and his team are collaborating with clinicians and scientists to develop methods to identify the clinical needs of end-of-life patients. Drs. Pestian and Solti are collaborating with Dr. Perentesis in detecting Adverse Drug Reactions in the electronic health record notes of patients enrolled in clinical studies. Drs. Solti and Perentesis are collaborating to automate the clinical trial eligibility screening of cancer patients along the aims of Dr. Solti’s NIH Grant.

**Hematology/Oncology » Dr. John Perentesis and Dr. Jordan Wright**

Drs. Pestian and Solti are collaborating with Dr. Perentesis and Dr. Wright on the clinical trial announcement grant. Their collaboration efforts focus on extracting eligibility criteria for oncology patients.

**Human Genetics » Dr. William Nichols**

Dr. Marsolo and his team are creating an i2b2-based web portal that will allow external users to browse phenotypic and genotypic information on patients with pulmonary arterial hypertension (PAH). Once a cohort has been identified, users will be able to send a request for data and samples to the PAH biorepository, which will then service the request.

**Human Genetics » Dr. Daniel Prows**

Dr. Aronow is a leading expert in the design and analysis of DNA microarrays, including Incyte and Affymetrix technologies. His collaboration efforts with Dr. Prows include microarray design, oversight in all aspects of microarray analysis, including data sorting and data analysis. Additionally, Dr. Aronow oversees the in-depth \textit{in silico} analyses and generates appropriate figures, tables and the related text for manuscript preparation.

**James M. Anderson Center of Excellence; Emergency Medicine » Dr. Evaline Alessandrini**

Dr. Marsolo and the i2b2 team have worked with colleagues in Emergency Medicine to identify and extract data from the electronic health record so that it can be uploaded into the expanded version of the Pediatric Emergency Care Applied Research Network (PECARN) registry. The i2b2 team has successfully transmitted a full month’s worth of emergency department data to the coordinating center and is working to pilot test a de-identification process for a larger extract.

**James M. Anderson Center of Excellence; Emergency Medicine » Dr. Evaline Alessandrini, Dr. Holly Brodzinski, and Dr. Judith Dexheimer**

Drs. Pestian and Solti are collaborating with the members of the Anderson Center and Emergency Medicine in the appendicitis risk stratification project. The divisions are developing an automated system to determine the risk of appendicitis in abdominal pain patients.

**James M. Anderson Center of Excellence » Yiscah Bracha**

Dr. Marsolo and the i2b2 team completed an initial pilot with colleagues in the Anderson Center in their efforts to operationalize Epic-based outcome measures, including some that were part of the institution’s Care Coordination and Outcomes (CCO) project. These data are used to populate dashboards and control charts displayed using the institution’s Performance Measurement and Reporting System (PMRS).

**James M. Anderson Center of Excellence » Dr. Eric Kirkendall, Dr. Stephen Muething, and Dr. Uma Kotagal**

Drs. Pestian and Solti are collaborating with Drs. Kirkendall, Muething, and Kotagal in developing and EHR-based patient safety and predictive modeling research agenda.

**James M. Anderson Center of Excellence » Dr. Carole Lannon**

Dr. Marsolo and his team are developing the second phase of an infrastructure for data collection, reporting and
analysis that is being used by quality improvement networks that are part of the State of Ohio's BEACON initiative (Best Evidence for Advancing Childhealth in Ohio Now), including the Ohio Perinatal Quality Collaborative, where Dr. Lannon is co-PI.

James M. Anderson Center of Excellence » Dr. Stephen Muething

Dr. Marsolo and his team have completed the development of a data collection and reporting infrastructure that is being used by the newly expanded Solutions for Patient Safety collaborative, a network that is focused on reducing serious safety events.

James M. Anderson Center of Excellence; Gastroenterology, Hepatology & Nutrition » Dr. Peter Margolis and Dr. Shehzad Saeed

Dr. Marsolo and his team deployed an i2b2-based registry to support the quality improvement and research efforts of the ImproveCareNow Network, which focuses on improving the outcomes of children with Inflammatory Bowel Disease (IBD). This registry supports two methods of data collection: 1) manual data into an i2b2-based web form, or 2) direct entry into the electronic health record, after which it can be transferred to the registry via file upload. Also included are automated pre-visit planning, population management and monthly quality reports. These reports can be generated on demand and allow investigators to see data on patients from their own site as well as aggregate numbers from the collaborative as a whole.

James M. Anderson Center of Excellence; Pulmonary Medicine » Dr. Peter Margolis and Dr. Michael Seid

Dr. Marsolo serves as a consultant to Drs. Margolis and Seid on the design of the technical infrastructure needed to support their growing C3N (Clinical Collaborative Care Network). This infrastructure includes personal health records, the ability to visualize and display patient-specific health and outcomes data, the ability to conduct N of 1 trials, and social networking and data sharing functionality.

Neonatology and Pulmonary Biology; Hospital Medicine » Dr. Kristin Melton and Dr. Eric Kirkendall

Dr. Solti works in collaboration with Drs. Melton and Kirkendall to automate adverse event detection in the Neonatal Intensive Care Unit by using electronic health record data and natural language processing techniques to find harm that is not usually identified by other means. The project is funded by an NIH R21 (PI Solti) grant.

Neonatology and Pulmonary Biology; Biostatistics and Epidemiology » Dr. Laurel Bookman and Dr. Jareen Meinzen-Derr

Dr. Solti and his team have worked in collaboration with Dr. Bookman (Neonatology) and Dr. Meinzen-Derr (Biostatistics and Epidemiology) to develop a classification algorithm for Tongue-Based Airway Obstruction risk.

Neonatology and Pulmonary Biology » Dr. Yan Xu

Dr. Lu and his team work closely with Dr. Xu in developing statistical models to analyze gene expression during the development of mouse models with the goal of understanding the role of SREBP network in surfactant lipid homeostasis and lung maturation.

Nephrology » Dr. Prasad Devarajan

Drs. Aronow and Wagner serve as Co-Investigators on Dr. Prasad Devarajan’s Pediatric Center Excellence in Nephrology grant entitled “Critical Translational Studies in Pediatric Nephrology”, where the goal is to support basic, translational, and clinical research on critical pediatric kidney diseases that have major unmet needs. The overarching theme of the Cincinnati Children’s PCEN is to conduct innovative and high-impact bench-to-bedside studies on three critical but underserved pediatric kidney diseases. The three areas of focus at Cincinnati Children’s include acute kidney injury, focal segmental glomerulosclerosis, and lupus nephritis. Dr. Aronow serves as the Bioinformatics Core lead and Dr. Wagner is part of the proteomics core led by Dr. Ken Greis.
Dr. Pestian and his team are collaborating with Dr. Byars on innovations in neuropsychology research. Dr. Byars focuses on identifying optimal drug therapy for patients with epilepsy and ADHD.

Dr. Pestian and his team are collaborating with the Neurology team for the on-going development of CHRISTINE, a clinical decision support system for identifying optimal drug therapy for patients with epilepsy and ADHD.

Dr. Wagner, in his role of informatics lead on an NICHD contract ("Cincinnati MRI Imaging Neuronal Development", Dr. Holland, PI), collaborates with the PI and Dr. VanNest (Division of Neurology) to build and disseminate a database of fMRI images of normally developing brains.

Dr. Pestian and his team are collaborating with Dr. Sorter in the development of decision support tools to measure the likelihood of repeated suicide attempts.

Dr. Lu serves as a Co-Investigator on Dr. Clancy’s R01 grant entitled “MR Predictors of Infection, Inflammation and Structural Lung Damage in CF”, where the goal is to develop new tools needed to monitor early lung disease, and to bring new therapies to infants and toddlers with Cystic Fibrosis. On this grant project, the team uses new imaging and blood-based technologies to improve our ability to monitor lung status in young children with CF.

Dr. Jegga collaborates with the Dey Lab in their mission to understand the signaling networks that influence uterine biology in the context of embryo-uterine interactions during pregnancy and delivery. He is specifically focusing on the miRNA-based regulation of labor and pre-term birth.

Dr. Wagner, as Director of the Informatics Core of the NIAMS-sponsored Cincinnati Core Center for Rheumatic Diseases (Dr. Thompson, PI), collaborates closely with Investigators Drs. Thompson and Harley on genome-wide analyses of variants contributing to juvenile rheumatic disease.

Dr. Marsolo provides consultation and advice to the Biomedical Informatics staff that supports the institutional biorepository software used by the Cincinnati Children's biobank and other investigators. Included in this effort has been the development of tools to support the Better Outcomes for Children (BOfC) project, which collects residual clinical samples for research purposes from patients who have provided consent. Dr. Marsolo and his team created an application that allows biobank staff to scan a clinical sample and determine whether it can be retained for research purposes. This functionality was added to allow investigators to search for and request samples using the institution's de-identified i2b2 warehouse.

Drs. Hutton, Marsolo, Solti, and Wagner are providing informatics support for Cincinnati Children’s participation in the electronic MEDical Records and GEnomics (eMERGE) Network. Cincinnati Children's Hospital Medical Center, in collaboration with colleagues from Boston Children's, is looking at correlations between EMR-derived phenotypes and genotypes. Dr. Marsolo and his team have been working to establish a federated SHRINE network between Cincinnati Children’s and Boston Children’s, allowing de-identified queries to be executed between the two institutions.
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<td>Test a Practical User Interface to Grid Logistic Regression Across Clinic Sites</td>
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**Current Year Direct** $5,068,027

**Industry Contracts**

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**Service Collaborations**

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<td>MARSOLO, K</td>
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Funded Collaborative Efforts

ARONOW, B

**Immunobiology of IFRD1, a Gene Modifying CF Lung Disease**
National Institutes of Health
Karp, C
08/01/09-07/31/13
5%

**Global Gene Expression Atlas of Craniofacial Development**
National Institutes of Health
Potter, S
09/21/09-04/30/14
5%

**Genetic Analysis of Murine Chronic Hypoxia-Induced Pulmonary Hypertension**
National Institutes of Health
Nichols, W
04/01/10-03/31/14
5%

**Risk Stratification and Identification of Immunogenetic and Microbial Markers of Complicated Disease Course in Pediatric Crohn’s Disease**
Crohn’s & Colitis Foundation (Emory University)
Denson, L
07/01/09-12/31/12
5%

**Critical Translational Studies in Pediatric Nephrology**
National Institutes of Health
Devarajan, P
09/21/12-08/31/17
4%

**Transflammation: Its Role in Direct Reprogramming**
National Institutes of Health (University of Maryland)
Lutzko, C
03/01/13-02/28/14
5%

**Genotype-phenotype Associations in Pediatric Cardiomyopathy**
National Institutes of Health (University of Miami)
Ware, S
04/01/13-03/31/16
5%

JEGGA, A

**Cincinnati Cell Characterization Core**
National Institutes of Health
Malik, P
05/11-04/30/16
5%

**Biological Basis of Phenotypes and Clinical Outcomes in Biliary Atresia**
National Institutes of Health
Bezerra, J
09/1/09-08/31/14
5%

**Digestive Health Center: Bench to Bedside Research in Pediatric Digestive Diseases - Biomedical Informatics Core**
National Institutes of Health
Bezerra, J
07/1/07-05/31/17
10%

**NextGen Dissection of the Genomic Basis of Kidney Development**
National Institutes of Health
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**NHLBI Progenitor Cell Biology Consortium Systems Biology Bioinformatics Core**
National Institutes of Health (University of Maryland)

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**KOURIL, M**

**Cincinnati Center for Clinical and Translational Sciences and Training**
National Institutes of Health

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**Abused and Non-abused Females’ High-risk Online Behaviors: Impact on Development**
National Institutes of Health

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**LU, L**

**Role of SREBP Network in Surfactant Lipid Homeostasis and Lung Maturation**
National Institutes of Health

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**MR Predictors of Infection, Inflammation and Structural Lung Damage in CF**
National Institutes of Health

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**Cincinnati Center for Clinical & Translational Sciences & Training**
National Institutes of Health

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**Building Modular Pediatric Chronic Disease Registries for QI and CE Research**
Agency for Healthcare Research and Quality

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**Open Source Science: Transforming Chronic Illness Care**
National Institutes of Health

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**National Biological Sample and Data Repository for Pulmonary Arterial Hypertension**
National Institutes of Health

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**Better Outcomes for Children: GWAS and PheWAS in eMERGEII**
National Institutes of Health

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**Impact of Initial Therapy and Response on Long Term Outcome in Children with CAE**
National Institutes of Health

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