



**BEST
CHILDREN'S
HOSPITALS**

USNews

& WORLD REPORT
**RANKED IN
9 SPECIALTIES
2021-22**

MEDICAL SPECIALTIES ANNUAL REPORT 2020



Riley Children's Health
Indiana University Health



Cancer

Cardiology & Heart Surgery

Diabetes & Endocrinology

Gastroenterology & GI Surgery

Neonatology

Nephrology

Neurology & Neurosurgery

Pulmonology & Lung Surgery

Urology

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Cardiology

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Critical Care: Pediatric Critical Care

Dentistry

Dermatology

Developmental Medicine

Diabetes and Endocrinology

Diagnostic Radiology

Emergency Medicine

Gastroenterology, Hepatology and Nutrition

General Pediatrics and Primary Care

Hematology/Oncology

Hospital Medicine

Infectious Diseases

Medical and Molecular Genetics

Neonatology

Nephrology

Neurology

Palliative Care

Physical Medicine and Rehabilitation

Psychiatry and Psychology

Pulmonology and Sleep Medicine

Rheumatology

Riley Medical Specialties Team Member Directory

Refer a patient



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Indiana University Health


WELCOME TO RILEY CHILDREN'S HEALTH

For nearly 100 years, Riley Children's Health has consistently raised the bar for excellence in pediatric healthcare. From delivering evidence-based, patient-centered treatment to engaging in pioneering research, Riley is proud to be one of the **nation's leading children's hospitals**. This year, our urology program and our cardiology and heart surgery program are ranked third and fifth, respectively, by *U.S. News & World Report*. An added testament to the strength of our cardiology program, Riley was also designated as the best hospital for children's heart care in the Midwest.

As evidenced by this latest edition of our annual report, Riley set the standard for healthcare leadership during a year that presented unprecedented challenges for hospitals across the United States. Not only did our care teams excel in clinical outcomes, but Riley physicians and researchers made meaningful scholarly contributions to medical science. Several pediatric specialties engaged in leading-edge COVID-19 research, and Riley physicians have been instrumental in developing clinical guidelines to treat MIS-C associated with the disease.

In addition, Riley Hospital for Children at IU Health was recently verified by the American College of Surgeons (ACS) as a **Level I Children's Surgery Center**. Our hospital is one of the few ACS-verified pediatric surgery centers in the Midwest—and the only hospital with this designation in Indiana. Riley's expertise in treating children with complex medical needs is reinforced through our longstanding ACS verification as a Level I Pediatric Trauma Center and our recognition as a Platinum Level Center of Excellence by the Extracorporeal Life Support Organization. Riley is also a partner in the Children's Hospitals' Solutions for Patient Safety (SPS) Network and was named an SPS Culture Award recipient recognizing our excellence in safety culture, error prevention strategies and patient experience. Honored for innovative improvements in patient care, Riley was a presenter at the 2020 International Hospital Federation's 44th World Hospital Congress in Barcelona, Spain.

Every day, Riley specialists and care teams honor our unwavering commitment to deliver unmatched clinical care and expertise to children and families in the Midwest and beyond. We invite you to learn more about Riley and the impact our pediatric health system is making for the children, adolescents and young adults we serve.



Elaine G. Cox, MD

Chief Medical Officer, Riley Children's Health
Professor of Clinical Pediatrics,
Indiana University School of Medicine
Connect with Dr. Cox on Doximity.



Brian E. Wagers, MD

Associate Chief Medical Officer; Physician Director of Pediatric and Maternal Quality and Safety, Riley Children's Health
Associate Professor of Clinical Emergency Medicine and Pediatrics, Indiana University School of Medicine
Connect with Dr. Wagers on Doximity.



Leadership Team

Gil Peri
President
Elaine G. Cox, MD
Chief Medical Officer
Paul Haut, MD
Chief Operating Officer
Megan Isley, DNP, MBA, RN
Chief Nursing Officer
Frank Runion
Chief Financial Officer
D. Wade Clapp, MD
Chairman, Department of Pediatrics
Frederick J. Rescorla, MD
Surgeon-in-Chief

The surgical specialties of Riley Children's Health are highlighted in a separate annual report. Visit rileychildrens.org/surgeryannualreport.



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RILEY CHILDREN'S HEALTH WELCOMES NEW PRESIDENT

Gil Peri is the new president of Riley Children's Health, assuming the leadership role of Indiana's largest pediatric health system in June 2021. An accomplished pediatric healthcare executive, Peri most recently served as president and chief operating officer of Connecticut Children's Medical Center in Hartford, Connecticut. He has held



leadership positions at other top children's hospitals, including Children's Hospital Colorado in Aurora and Nationwide Children's Hospital in Columbus, Ohio.

With more than 20 years of success creating and executing strategy differentiation, leading complex operations and partnering to achieve the best outcomes for children and adults, Peri is recognized as an inspiring leader committed to value, innovation and continual improvement.

Peri holds master's degrees in business administration and public health from the University of South Florida, where he also earned his bachelor's degree in biology. He is active within the healthcare industry and is continuing his work as an advocate for children and families.

"Our talented team is poised to take the next step to increase our impact as one of the nation's premier children's health systems recognized worldwide for delivering excellence in patient care, education and research."

– Gil Peri
President,
Riley Children's Health



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ABOUT RILEY CHILDREN'S HEALTH

Riley Children's Health, Indiana's largest and most skilled pediatric health system, provides care in more than **50** locations in communities across Indiana.

More than **300,000**
PATIENTS TREATED ANNUALLY



200 PRIMARY CARE + **400** SPECIALTY CARE
physicians across 40 specialties



Two pediatric hospital locations in central Indiana:

- Riley Hospital for Children at IU Health – Indianapolis
- Riley Children's Health at IU Health North Hospital – Carmel

Riley Children's Health Statewide Reach



AFFILIATED WITH



- One of the largest medical schools in the U.S.
- One of the busiest locations for pediatric research funded by the National Institutes of Health and other sponsors

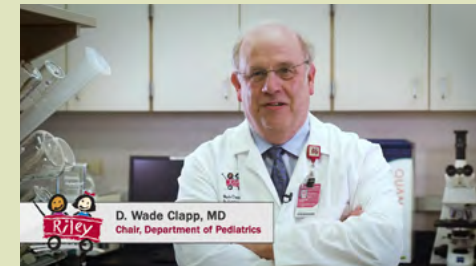
Riley Children's Health and IU School of Medicine are committed to providing excellent healthcare for children through prominence in education, training and research.

Riley Hospital for Children at IU Health is a Magnet® hospital, recognized for nursing excellence and high-quality clinical outcomes



Leader in research and innovation

- Indiana's **only pediatric** research hospital
- **Sixth-ranked children's hospital** in the U.S. for research funding
- Home to the Herman B Wells Center for Pediatric Research, the Children's Clinical Research Center and the Center for Children's Health Services Research



See how neurofibromatosis type 1 research at Riley is advancing the field.

COMPREHENSIVE CHILDREN'S HOSPITAL AND HEALTH SYSTEM OF



Indiana University Health



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RILEY HOSPITAL FOR CHILDREN AT IU HEALTH OPENS NEW MATERNITY TOWER

Featuring a new fully integrated care model, the tower contains four floors of inpatient hospital services that house a labor and delivery and antepartum unit, including birthing suites. The first patients were admitted for care in early November 2021.



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The Maternity Tower at Riley Hospital for Children at IU Health features a new coordinated care model anchored by the long-standing reputation of Riley at IU Health for delivering expert care for complicated pregnancies and at-risk newborns. Our highly skilled pediatric and adult care teams offer comprehensive, multidisciplinary services that surround patients experiencing low-risk to high-risk pregnancies with exceptional medical support.



From Indiana's only OB ICU to our midwifery program, the tower provides the highest level of care for each pregnant woman and newborn.

With 119 total NICU beds, Riley at IU Health houses the state's largest NICU providing the highest level of care.



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The Maternity Tower at Riley at IU Health is unmatched in Indiana.

rileychildrens.org/maternity

What is in the new space?

Atrium

- Original entrance to Riley Hospital for Children at IU Health when it opened in 1924



2nd floor: OB ED, Labor, Delivery and Recovery

- 24/7 in-house ICU physicians, OB ICU nurses, OB anesthesiologists, OB laborists and maternal fetal medicine coverage



3rd floor: NICU

- New Ronald McDonald Family Room
- 45 private rooms



4th and 5th floors: Mother and Baby

- 38 private rooms for mother and baby
- Gathering Room to provide a special place for families and care team



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The Maternity Tower at Riley at IU Health is unmatched in Indiana.

rileychildrens.org/maternity

HELPING TO BUILD STRONG COMMUNITIES



As one of the Midwest's largest and most comprehensive healthcare systems for children, Riley Children's Health is committed to using our expertise and resources to support populations and communities in Indiana and around the world.

Advancing care globally

Global HOPE (Hematology-Oncology Pediatric Excellence) – Riley Hematology/Oncology collaborates with Texas Children's Hospital's **Global HOPE** to treat and significantly improve the prognosis of children with cancer and blood disorders in sub-Saharan Africa.

International medical missions – Through partnerships in the Middle East, Asia and Africa, Riley Heart Center team members have traveled the globe, **volunteering their time** to treat more than 400 patients since 2006 and train local clinical teams in advanced heart care.



Pediatric surgery training overseas – Riley at IU Health is one of the few institutions in the U.S. to sponsor a surgeon to provide on-site pediatric surgery training in Africa. **Britney L. Grayson, MD, PhD**, is fulfilling a two-year commitment as a consultant pediatric surgeon and educator in Kenya.



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Improving health and well-being close to home

Be Happy program – Riley at IU Health implements the **Indiana Behavioral Health Access Program for Youth** (Be Happy)—the first and only child psychiatry access program in the state. This program supports pediatric physicians and advanced practice providers in caring for youth with mental health and substance use disorders.

Kidney Camp – For nearly 20 years, Riley Nephrology has partnered with the National Kidney Foundation of Indiana to host a **summer camp** for children with kidney disease and survivors of kidney transplant. The camp was held virtually in 2020 and limited to just one day in 2021 due to COVID-19.

Project ADAM – Riley at IU Health is the first healthcare facility in Indiana to assist schools in becoming certified as “Heart Safe” through **Project ADAM**. With affiliates nationwide, the sudden cardiac arrest program is designed to promote awareness, AED training and emergency response. Riley helped certify **Indiana’s first Heart Safe school** in May 2021.

Project ECHO – Riley experts participate in **Project ECHO** (Extension for Community Healthcare Outcomes), a program that connects local primary care teams with interdisciplinary specialists to improve treatment for chronic and complex health conditions. Our pediatric physicians facilitate ECHO programming on a variety of topics, including opioid use disorder, teen vaping, and opioids and pregnancy.

Pediatric Community Outreach Mobile Education (PCOME) – Riley pediatric intensivists provide **on-site simulation training** and education to community hospital healthcare providers for the initial stabilization and management of pediatric patients.

Sudden Death in the Young Registry – Partnering with the Centers for Disease Control and Prevention and the Indiana State Department of Health, Riley at IU Health formed **this registry in Indiana** to identify causes of childhood deaths and related risk factors. The program, facilitated by the Riley cardiovascular genetics team, is a clinical service to families who have experienced a childhood death that may be attributable to heritable or genetic causes. This service also connects qualifying families to free bereavement and grief counseling services through the Riley Hope in Healing Program.



Supporting diversity, inclusion and equity in healthcare

Wee Ones program – Riley primary care providers and IU School of Medicine General and Community Pediatrics established an on-site health center for infants and children in the Indiana Women's Prison maternal and child health unit. In addition to providing medical care, the program partners with community organizations to offer educational programming for mothers.



Maternal health in Indiana – Riley maternal fetal medicine physicians work with the American College of Obstetricians and Gynecologists to address issues related to disparities in maternal health outcomes. In addition, our specialists serve on the **Indiana Maternal Mortality Review Committee** to raise awareness of issues causing pregnancy-related deaths and recommend interventions.



COVID-19 research studies – Riley infectious diseases specialists led the **TACTIC (Tracking Asymptomatic COVID-19 Through Indianapolis Communities)** and DISCOVER (evaluating the immune response to COVID-19) studies. Both projects were specifically designed to include underrepresented minority populations who were hit hardest by COVID-19 but not well represented in research studies. With specific outreach to Black and Hispanic communities, both studies had strong representation by these population groups.



Meeting the needs of diverse populations



- Audiologists with the Riley Cochlear Implant Program have implemented speech perception testing in Spanish to more accurately diagnose and treat Spanish-speaking patients with hearing loss.
- The Riley critical care team is evaluating communication between the medical team and culturally diverse families of critically ill children, specifically addressing the delivery of end-of-life care. The team is planning a quality improvement study and targeted interventions aimed at providing equitable, compassionate care to all patients and families.
- Research is underway in Riley Otolaryngology – Head & Neck Surgery to study the roles that race, ethnicity, gender and socioeconomic status have on health outcomes for children with mastoiditis.



ADOLESCENT MEDICINE

Experts in caring for the special needs of teenagers and young adults, fellowship-trained physicians at Riley Children's Health treat a wide range of adolescent health concerns, including eating disorders, reproductive health and gender health. Our adolescent medicine team routinely works with other Riley specialties, including cardiology, hematology/oncology, child development, psychiatry, endocrinology, and obstetrics and gynecology to provide comprehensive, holistic care for young people up to age 21.

Program distinctions



One of the largest divisions of its kind in the nation with high-volume clinical care, prolific grant-funded research and a robust training program



Home to the Charis Center, Indiana's most comprehensive eating disorders treatment program



The only comprehensive program in the state designed to meet the unique needs of gender-diverse adolescents



DIVISION CHIEF

> **Rachel A. Katzenellenbogen, MD**

Associate Professor of Pediatrics,
IU School of Medicine

Connect with Dr. Katzenellenbogen on Doximity.

10

board certified
physicians



See full team
member list



Improving care through research

Riley adolescent medicine specialists conduct research in a variety of areas:

- Human papillomavirus (HPV)
- HPV vaccines
- Sexually transmitted infections
- Healthcare access for youth
- Eating disorders
- Teen pregnancy prevention
- Gender health
- Long-term effects of illness and recovery on youth

90

research
publications
in 2020



9 new research
grants in 2020 plus
10 active grants

Adolescent Medicine Fellowship

Riley Adolescent Medicine offers subspecialty training through a three-year fellowship program. Fellows provide clinical care, develop their own research programs and lead resident education.



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317.274.8812

Specialized programs

Adolescent Medicine Consultation Program

Our physicians offer evaluation and treatment for any adolescent health concern requiring more specialized treatment than is typical for primary care. Common referrals include:

- Mental health and behavioral issues, including anxiety and depression
- Nutritional concerns, including eating disorders
- Co-management of chronic illness
- Evaluation for chronic symptoms that lack a diagnosis

Charis Center for Eating Disorders

With both inpatient and outpatient treatment options, the Charis Center delivers multidisciplinary medical, psychological and family services for patients with eating disorders.

10,000
outpatient
visits annually



Adolescent Gynecology and Reproductive Health

We evaluate and treat a variety of gynecological conditions, including delayed puberty, abnormal uterine bleeding, polycystic ovary syndrome, chronic pelvic pain and dysmenorrhea. We also offer menstrual management of patients with chronic health conditions. Our team provides specialized gynecology and reproductive healthcare, including long-acting reversible contraceptive options.

Riley Gender Health Program

Interdisciplinary program offers comprehensive support to children, teens and young adults who are experiencing gender dysphoria and seek supportive and affirmative care. Services include:

- Gender-affirming hormone therapy
- Psychological counseling
- Puberty-blocking medication
- Surgery referral and coordination
- Treatment for menstrual suppression



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317.274.8812

ALLERGY AND IMMUNOLOGY

The board certified allergy and immunology specialists at Riley Children's Health are expertly trained in the management and treatment of pediatric allergy, asthma and immunology issues. Our skilled team offers the latest diagnostic tools and treatments delivered in a safe and comfortable manner to children dealing with the challenges of allergic conditions.

Program distinctions



Indiana's only multidisciplinary program for eosinophilic gastrointestinal diseases



Partners with the Indiana Department of Health to analyze all abnormal newborn screenings for severe combined immune deficiencies (SCIDs)



Recognized for distinction in clinical care by Food Allergy Research and Education (FARE); perform more food challenges than any other program in the state



DIRECTOR

> Girish V. Vitalpur, MD, FAAP, FAAAAI

Associate Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Vitalpur on Doximity.

4
board certified
physicians

>
See full team
member list



Specialized programs

High-Risk Asthma Program

This collaborative program addresses the medical and social needs of children and families with severe asthma.

Center for Immune Dysregulation

Combining the expertise of specialists in pediatric rheumatology, immunology and allergy, our program provides treatment for patients with complex inflammatory conditions.

Riley allergy specialists use the latest immune modulators to manage asthma, atopic dermatitis and other allergic conditions.



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317.948.7208



Research highlights

- Riley participates in **PARK** (Preventing Asthma in High Risk Kids), a multicenter clinical study led by the National Institute of Allergy and Infectious Diseases to investigate the impact of omalizumab in preventing severe asthma and new allergies in preschool-age children.
- Our team was involved in the trials for a groundbreaking peanut oral immunotherapy product approved by the FDA in January 2020.
- Riley has also participated in peanut patch trials for toddlers.

Notable research publications

The Journal of Allergy and Clinical Immunology: January 2020

Evolving Concepts in How Viruses Impact Asthma: A Work Group Report of the Microbes in Allergy Committee of the American Academy of Allergy, Asthma & Immunology

American Journal of Respiratory Cell and Molecular Biology: March 2020

Methods in Lung Microbiome Research

Current Allergy and Asthma Reports: June 2020

Role of the Microbiome in Allergic Disease Development

Professional organization affiliations

**American Academy of Pediatrics –
Section on Allergy and Immunology**

Girish V. Vitalpur, MD, FAAP, FAAAAI

**American Academy of Allergy,
Asthma & Immunology**

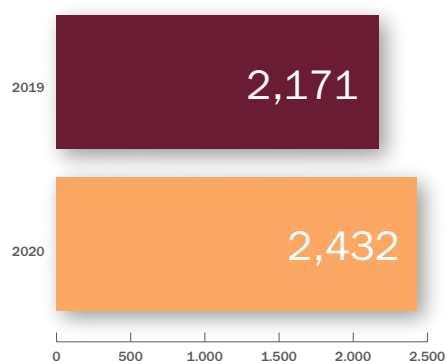
Girish V. Vitalpur, MD, FAAP, FAAAAI

Jay J. Jin, MD, PhD

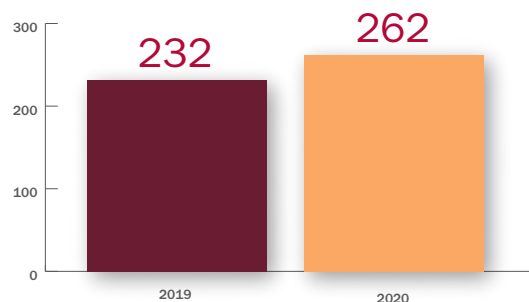
Kirsten M. Kloepper, MD, MS

Nurcicek Padem, MD, MS

New Patient Visits: 2019 – 2020



Food Challenges Conducted: 2019 – 2020



Investigating health disparities

Riley allergy and immunology specialists are studying the role of food deserts, which disproportionately affect Black children in Indianapolis, on outcomes of children with asthma.



CARDIOLOGY

Expert cardiologists at Riley Children's Health provide the full continuum of care from fetuses and premature infants to adults with congenital heart disease. Heart care is managed by a highly skilled team, including cardiologists, cardiovascular surgeons, cardiovascular critical care specialists, cardiovascular anesthesiologists, neonatologists, cardiovascular geneticists and adult cardiologists specializing in congenital heart disease. We also have inpatient and outpatient nursing and advanced practice providers who are specifically dedicated to the care of cardiac patients.

**RANKED 5TH
IN THE NATION**



DIVISION CHIEF

> **Larry W. Markham, MD, FAAP, FACC**

Phillip Murray Professor of Pediatric Cardiology; Professor of Pediatrics and Medicine, IU School of Medicine

Connect with Dr. Markham on Doximity.

25

board certified
physicians



See full team
member list

Program distinctions



Ranked among the top five pediatric heart programs in the nation by *U.S. News & World Report* and the No. 1 program in the Midwest



National leader in patient outcomes with mortality rates below benchmark*



Integrated care model with subspecialty care coordination and novel approaches to cardiac intensive care, inpatient navigation and home monitoring



Only formalized comprehensive adult congenital heart disease program in Indiana

Specialized programs

Cardiovascular Genetics Program

Fully integrated CV genetics program provides testing, evaluation and consultation for the full spectrum of heritable heart conditions:

- Aortopathy
- Pulmonary hypertension
- Cardiomyopathy
- Familial lipid disorders
- Inherited arrhythmia
- Congenital heart disease/syndromes

Offering unique capabilities for clinical and research-based genetic testing, Riley CV geneticists use **chromosome microarray (CMA)** and **exome sequencing/exome-based molecular genetic testing** to assess the genetic causes of congenital heart disease.

Riley CV genetics by the numbers

- **More than 750** unique patient evaluations since program launch in 2014
- **Volume increase:** 87 evaluations in 2014 – 2015 to 163 evaluations in 2020
- **91% of evaluations** in children age 3 and under
- **More than 90%** of patients have been evaluated by a geneticist (unique aspect of Riley's program)



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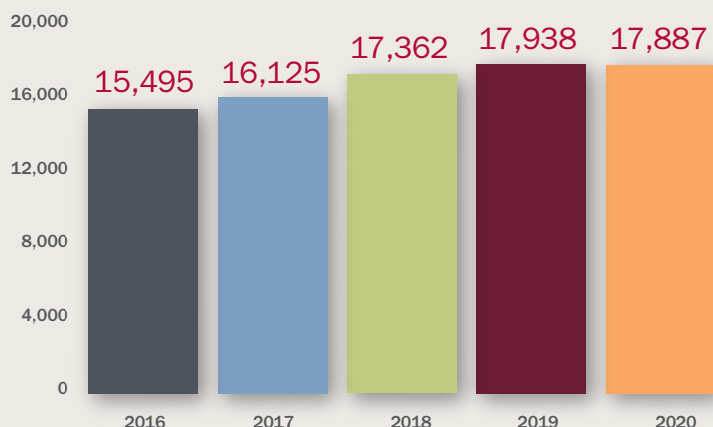
317.944.8906

* Source: Society of Thoracic Surgeons (STS) | Congenital Heart Surgery Data Summary, Table 1.6 July 2016 – June 2020.

Fetal Cardiology Program

Performing nearly 2,000 evaluations in 2020, Riley cardiologists specializing in fetal echocardiography deliver in-depth diagnostic imaging, evaluation and consultation to patients across Indiana.

Riley Echocardiogram Interpretations: 2016 – 2020



Notable research publications

The Journal of Pediatrics: July 2020

Comprehensive Clinical Genetics Approach to Critical Congenital Heart Disease in Infancy

Pediatric Cardiology: October 2020

Characterization of the Rate of Aortic Dilation in Young Patients with Thoracic Aortic Aneurysm

Journal of Perinatology: February 2020

Comparison of “Post-Patent Ductus Arteriosus Ligation Syndrome” in Premature Infants After Surgical Ligation vs. Percutaneous Closure

Research highlights

- Grant-funded study to determine the metabolic derangements in children with single ventricle heart disease and heart failure
- Participant in the first-ever Food and Drug Administration-funded multicenter clinical trial focused on cardiac treatment in Duchenne muscular dystrophy

44

research
publications
in 2020



Home Monitoring Program

(For infants with single ventricle/complex physiology, with expansion of program to heart failure and transplant patients)

Implemented upon discharge after initial intervention, the Riley Home Monitoring Program uses a unique web-based iPad component to assist parents in tracking wellness and enable cardiologists to evaluate data in real time. Parents can contact an on-call provider 24/7. Our program allows patients to go home sooner and has contributed to continuous improvement in median length of stay following the Norwood procedure.

Home Monitoring Program outcomes

0% inter-stage mortality for the past five years; less than 5% for the past 10 years

89% survival from birth to first birthday

Greater than 75% without growth failure by Stage 2 intervention

Less than 1% readmission rate for major or serious adverse events through Stage 2 intervention

What parents say:

89% Program helped them feel more comfortable leaving the hospital

86% Home monitoring increases confidence in providing care at home



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317.944.8906

CHILD PROTECTION PROGRAM

The Riley Children's Health Child Protection Program offers multidisciplinary clinical services and education to improve the evaluation and care of maltreated children. Our program's team of board certified physicians provides evidence-based consultation in cases of suspected child maltreatment. These consultations are objective assessments to help determine the extent of injury and whether medical cause or accidental mechanism accounts for the injury pattern.

Program distinctions



Only physicians in Indiana who are board certified in child abuse pediatrics



Consults with the Indiana Department of Child Services (DCS) on about 6,000 cases of suspected child maltreatment each year



Home to one of only 31 ACGME-accredited child protection fellowship programs in the nation



DIVISION CHIEF

> Roberta A. Hibbard, MD
Professor Emeritus of Pediatrics,
IU School of Medicine

Connect with Dr. Hibbard on Doximity.

6
board certified
physicians

>
See full team
member list

Riley Child Protection Program

Estimated number of children served by our program each year

400 Child abuse consults

500 Pediatric Center of Hope

1,500 Crisis counseling

6,000 DCS consults

Specialized programs

Child Abuse Consultation Service

Our team facilitates comprehensive medical evaluations for children alleged to have been physically abused or neglected.

Pediatric Center of Hope

Riley child abuse specialists provide comprehensive medical evaluation for children alleged to have been sexually abused.

Foster Care Bridge Program

Riley offers a multidisciplinary program to serve as a bridge—providing comprehensive healthcare and acquiring appropriate resources for children entering and making transitions within the foster care system until a permanent medical home is identified.

Crisis Counseling Services

These services bridge the gap from the time a child is identified as a possible child sexual abuse victim to when formal ongoing counseling may become available.

Docs InCASE Program

In collaboration with 15 pediatric practices across the state, we facilitate pediatric care and coordination in advancing the medical role in child protection.



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317.274.2617



Research study topics

- Value and impact of child abuse consultations
- Impact of screening for child maltreatment in the emergency department
- Use of chest CT in recognizing rib fractures
- Differentiation of rickets and classic metaphyseal lesions through radiology



6

research
publications
in 2020



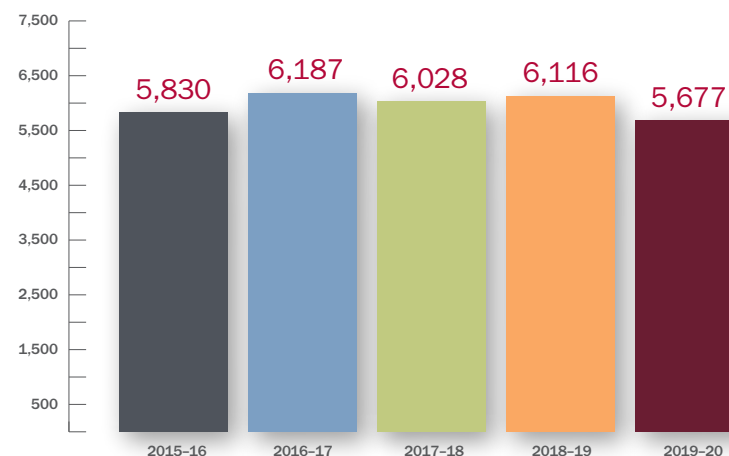
Riley child protection specialists are active in numerous national and local organizations, including:

- American Academy of Pediatrics Council on Child Abuse and Neglect
- USA Gymnastics Safe Sport Committee
- U.S. Department of Health and Human Services Children's Justice Act Task Force
- Ray E. Helfer Society
- Local and state child fatality review teams and child advocacy centers

Riley physician experts developed and presented continuing medical education on COVID-19's impact on child maltreatment in 2020. Key findings included:

- Some institutions have noted an increase in reporting, while others have seen a decrease.
- Overall, the number of reports has decreased, but the severity of the injuries children have sustained during this time has increased.

Physical and Sexual Abuse Consultations by Year



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317.274.2617

CRITICAL CARE CARDIAC CRITICAL CARE

The pediatric cardiovascular intensive care unit (CVICU) at Riley Hospital for Children at IU Health provides expert care for critically ill newborns, infants, children and adolescents with congenital and acquired heart disease. In addition to 18 beds for CVICU patients, our unit also includes an eight-bed specialized neonatal ICU.

Program distinctions



Ranked among the top five pediatric heart programs in the nation by *U.S. News & World Report* and the No. 1 program in the Midwest



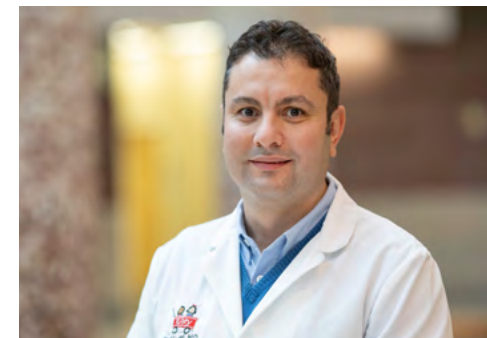
Only program in Indiana to offer pediatric heart transplantation and mechanical circulatory support capability



Indiana's only pediatric hospital with a formal extracorporeal cardiopulmonary resuscitation (ECPR) program



**RANKED 5TH
IN THE NATION**



DIRECTOR

> **Riad Lutfi, MD**

Associate Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Lutfi on Doximity.

7

board certified physicians

(plus multiple board certified neonatologists
and physicians in other specialties)



See full team
member list

Leading-edge technologies

- **Continuous renal replacement therapy (CRRT)** – In addition to a multidisciplinary CRRT program, Riley at IU Health has added aquapheresis to remove excess fluid accumulation in critically ill neonates and children.
- **Etiometry software** – All CVICU rooms are equipped with this FDA-approved software visualization application to collect, store and present ICU data in near real time.
- **Advanced modalities for respiratory support** – We offer high-frequency oscillator ventilation and inhaled nitric oxide.

High-volume pediatric ECMO center

- **55 patients** treated with ECMO in 2020
- Overall survival rate for Riley pediatric ECMO patients over the past five years: **63.4%** (above the national average)

The ECMO program at Riley at IU Health is **one of only 10 pediatric programs worldwide** to be designated a Platinum Level Center of Excellence by the Extracorporeal Life Support Organization.



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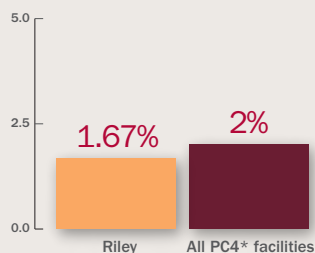
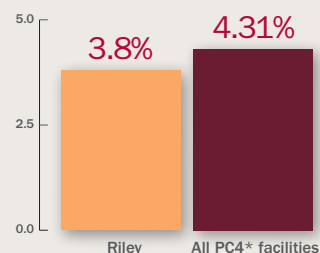
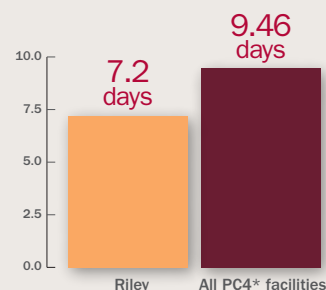
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877.247.1177

(IU Health 24/7 Transfer Center)

Risk-adjusted CVICU
Surgical MortalityRisk-adjusted CVICU
Medical MortalityPostoperative Severity –
Adjusted CVICU Length of Stay

(Charts reflect 2020 outcomes.)

Note: Risk adjustment is a methodological approach incorporating unique patient characteristics that impact patient outcomes and are unrelated to the quality of care delivered by the care team or hospital.

Additional 2020 outcome measures

Alternative complications	Cases	Out of	Riley	All PC4* facilities
Unplanned extubation per 100 days	5	1,974	0.25 per 100	0.32 per 100
SSI per 100 surgical procedures (surgical site infections)	2	625	0.32 per 100	1.20 per 100
CLABSI per 1,000 line days (central line-associated bloodstream infection)	4	3,015	1.33 per 1,000	1.20 per 1,000
CAUTI per 1,000 catheter days (catheter-associated urinary tract infection)	1	1,226	0.82 per 1,000	0.64 per 1,000

Major Complications, Unadjusted: 2020

Riley
22.2%

All PC4* facilities (Aggregate all)
24.4%

* Pediatric Cardiac Critical Care Consortium



14

research
publications
in 2020

Research highlights

- Riley physicians formed the Collaborative Research in Pediatric Cardiac Intensive Care (CoRe-PCIC) network in 2015. Riley at IU Health is the coordinating center for the network, which includes 20 U.S. sites participating in ongoing clinical research projects.
- Our specialists are involved in the **Pediatric Cardiac Critical Care Consortium (PC4)**, which uses registry data from more than 60 congenital heart programs to evaluate best practices and drive improvements in care.



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877.247.1177

(IU Health 24/7 Transfer Center)

CRITICAL CARE

PEDIATRIC CRITICAL CARE

The PICU at Riley Hospital for Children at IU Health is one of the highest acuity centers in the U.S. according to the Children's Hospital Association. Our 47-bed PICU treats children with a variety of complex illnesses and provides advanced supportive modalities, including ECMO, inhaled nitric oxide, continuous renal replacement therapy and high-frequency oscillatory ventilation. All pediatric medical and surgical subspecialties are represented, providing a collaborative care model for a large volume of high-acuity diseases and injuries.

Program distinctions



Platinum Level ECMO Center of Excellence by the Extracorporeal Life Support Organization; one of just 10 programs worldwide with this designation



Only pediatric program in Indiana with a formal Extracorporeal Cardiopulmonary Resuscitation Program (ECPR)



Indiana's only pediatric hospital with a dedicated burn ICU



DIVISION CHIEF

> **Mara E. Nitu, MD, MBA**

Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Nitu on Doximity.

21
board certified
physicians

>
See full team
member list

Specialized programs

Procedural Sedation Team

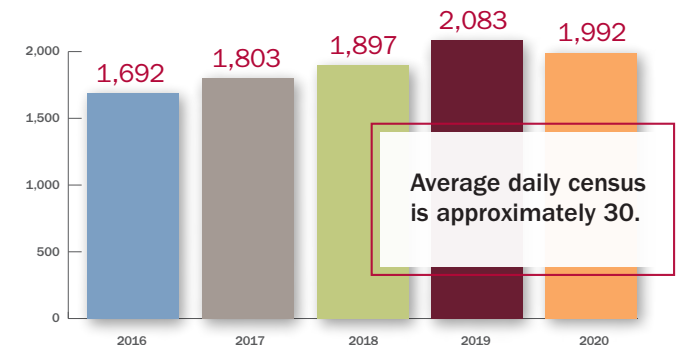
- Performing 1,231 sedations in 2020, Riley's program has an excellent safety record with outcomes better than or equal to most sedation centers, according to the Pediatric Sedation Research Consortium.

Patient safety outcomes

Central line-associated blood stream infections (CLABSI): **1.1 infections per 1,000** central line days

Maintained an unplanned extubation rate of **0.49 events per 100** mechanical ventilation days—well below the national benchmark of 0.95.

PICU Annual Admissions: 2016 – 2020



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Quality and safety initiatives

- Hospitalwide respiratory therapist-driven nitric oxide weaning protocol led to a significant **reduction in unnecessary iNO use** and significant cost savings. **Published in Respiratory Care**
- High-flow nasal cannula management protocol in the PICU resulted in significant **reduction in pediatric ICU length of stay** and hospital length of stay. **Published in Respiratory Care**
- Multiple initiatives to **reduce pressure injuries** for critically ill children implemented, including multidisciplinary “Safety Rounds” performed twice weekly in the PICU.
- PICU Up! early mobility program focuses on early involvement of physical and occupational therapy to **improve mobility and muscle strength**, and promotes liberation from mechanical ventilation and **prevention of ICU delirium**.

48

research
publications
in 2020

Research highlights

- Riley intensive care specialists are actively participating in **17 clinical trials and observational studies**. Select study topics: Acute respiratory distress syndrome, resuscitation and extracorporeal life support, sepsis and organ dysfunction, care of the critically ill immunocompromised child.
- **New England Journal of Medicine: July 2020**
Multisystem Inflammatory Syndrome in U.S. Children and Adolescents
- With funding from the National Heart, Lung and Blood Institute, **Courtney M. Rowan, MD, MS**, is conducting research on prognostic biomarkers for respiratory failure following hematopoietic stem cell transplant.

Leader in education and training

Riley's rapidly expanding PICU simulation program provides hands-on training for medical students, residents, nurses and other medical professionals. Opportunities for simulation training are also extended to Riley's cardiac ICU and transport teams, as well as regional emergency departments.

Professional organization affiliations

EXECUTIVE COMMITTEE

International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE)

Kamal M. Abulebda, MD

COMMUNICATIONS CHAIR, PediECMO SUBGROUP

Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)

Matthew L. Friedman, MD

EXECUTIVE COMMITTEE, HEMATOPOIETIC STEM CELL TRANSPLANTATION AND CELLULAR THERAPY SUBGROUP

Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)

Courtney M. Rowan, MD, MS

CO-CHAIR, PEDIATRIC VENTILATOR WEANING AND LIBERATION GUIDELINES

Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)

Samer M. Abu-Sultaneh, MD, FAAP

VICE CHAIR, ICU LIBERATION COMMITTEE

Society of Critical Care Medicine

Samer M. Abu-Sultaneh, MD, FAAP

Courtney M. Rowan, MD, MS, is also a member of the Pediatric Acute Lung Injury Consensus Committee charged with writing PARDS guidelines.



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DENTISTRY

The pediatric dentists at Riley Children's Health have years of experience providing comprehensive dental care to children of all ages, including those with developmental, emotional, behavioral and cognitive impairments. We offer a full range of pediatric dental services, which include sealants, restorations, fluoride and limited orthodontics for children and adolescents.

Program distinctions



Nationally recognized faculty with diverse expertise in dental care for children with special medical, emotional and psychological needs



Indiana's only pediatric dental residency program

7

research publications in 2020



DIVISION CHIEF

> **Brian J. Sanders, DDS, MS**

Chair of Pediatric Dentistry,
IU School of Dentistry

Connect with Dr. Sanders on Doximity.

4

board certified
pediatric dentists



See full team
member list

Care coordination for complex needs

Riley dentists treat children with complex medical conditions, including physical disabilities, craniofacial anomalies, genetic disorders, liver and kidney disease, and patients with congenital and acquired heart problems. We work closely with Riley specialists to optimize outcomes for these medically compromised patients.

The Riley Dental Center is a high-volume practice. With **17 dentists** and **14 residents on staff**, the team sees as many as **130 patients a day**.

Our pediatric dentists—faculty members of Indiana University School of Dentistry—collaborate with other Riley at IU Health specialists such as oral surgeons, otolaryngologists, ophthalmologists and plastic surgeons to manage conditions and improve children's overall health.



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317.944.3865



Research highlights

Study topics:

- Dental radiology dosimetry and implications with the young patient
- Sedation in the pediatric and adolescent patient and implications for the practice of dentistry
- Impact of COVID-19 on the provision of dental care

Select research publications

Annals of Dentistry and Oral Health: March 2020

Pediatric Phantom Dosimetry Using a Hand-held Portable Dental Radiology Device

Pediatric Dentistry: January 2020

Pediatric Phantom Dosimetry Evaluation of the Extraoral Bitewing

Journal of Patient Safety: December 2020

Preventing Dental Surgical Fires: Characterizing Nasal-Cannulated Supplemental Oxygen Pooling in an In Situ Dental Procedure

Pediatric Dentistry: July 2020

Success Rates of Pulpotomies Performed by General Dentists Versus Pediatric Dentists: A Claims Data Analysis



Remodeled in 2020, the dental center at Riley was expanded from 12 chairs to 17.



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317.944.3865

DERMATOLOGY

Board certified pediatric dermatologists at Riley Children's Health provide high-quality care and the latest treatments for common dermatological conditions, such as eczema and acne, and more complex disorders of the skin. Through expert diagnosis and interventions, our goal is to improve quality of life for children with skin disease.

Program distinctions



Nationally recognized experts in vascular anomalies with a dedicated multidisciplinary program that provides leading-edge care for children with vascular birthmarks



Only pediatric dermatologists in Indiana who offer laser and excisional surgery in the outpatient surgical setting and in the office



Extensive experience in the latest treatments for children with atopic dermatitis and other skin disorders



DIVISION CHIEF

> Anita N. Haggstrom, MD
Associate Professor of Dermatology and Pediatrics, IU School of Medicine

Connect with Dr. Haggstrom on Doximity.

2
board certified
physicians

>
See full team
member list

Specialized programs

Vascular Lesions Program

Riley provides high-quality, multidisciplinary care for patients with complicated vascular tumors and malformations; unique access to a coordinated care model with specialists from dermatology, hematology/oncology, interventional radiology, otolaryngology, plastic surgery and physical therapy. Program provides treatment for children with:

- Congenital hemangiomas
- Infantile hemangiomas
- Kaposiform hemangioendothelioma
- Venous malformation
- Lymphatic malformation
- Other complex vascular syndromes

Riley dermatologists perform pulsed-dye laser treatment, a specialized surgical procedure targeting birthmarks and port wine stains.



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317.944.7744



Research highlights

- **Anita Haggstrom, MD**, was involved in a national research effort to optimize treatment for infantile hemangiomas during the COVID-19 pandemic. Related publication: **Pediatric Dermatology: May 2020**
- Clinical studies focus on optimal management of patients with infantile hemangiomas and include recently completed studies involving the use of oral and topical beta-blockers.
- Ongoing clinical trials use novel inhibitors of the pathway involved in vascular malformation development to discover new potential therapies for patients with venous and lymphatic malformations.

7
research
publications
in 2020



Professional organization affiliations

BIRTHMARKS RESEARCH GROUP CO-LEADER
Pediatric Dermatology Research Alliance
Jenna L. Streicher, MD

BIRTHMARKS RESEARCH GROUP
STUDIES COMMITTEE MEMBER
Pediatric Dermatology Research Alliance
Anita N. Haggstrom, MD

Society of Pediatric Dermatology
Anita N. Haggstrom, MD
Jenna L. Streicher, MD



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317.944.7744

DEVELOPMENTAL MEDICINE

Developmental pediatricians and other clinicians at Riley Children's Health use clinical expertise and resources to care for infants and children with neurodevelopmental disabilities, including those who may have co-occurring emotional or behavioral concerns. Our specialists develop personalized treatment plans to ensure each child receives the care they need. We work in teams comprised of physicians, pediatric nurse practitioners, speech pathologists, dietitians, a genetic counselor, social workers and other professionals.

Program distinctions



Home to the only psychologist in Indiana trained in the **Early Start Denver Model** behavioral therapy program for children with autism



One of only eight neurodevelopmental disabilities residency training programs worldwide



Home to the only physicians in Indiana trained in neurodevelopmental disabilities and genetic counseling

Specialized programs

- Early Evaluation Autism Program
Learn more at medicine.iu.edu.
- Deaf and Hard of Hearing Program
- Down Syndrome Program – led by **Marilyn J. Bull, MD**, internationally recognized expert in the field
- Spina Bifida Clinic
- Regulating Together and PEERS group therapy programs
- Parent Child Interaction Therapy Program

From June through December 2020, our team conducted **112** screenings through the Telehealth Autism Spectrum Disorder-Peds (TAP) process, providing virtual autism assessment and diagnosis for children during the COVID-19 pandemic.



CO-DIVISION CHIEF

> **Celanie K. Christensen, MD, MS, FAAP**

Assistant Professor of Clinical Pediatrics and Neurology, IU School of Medicine

Connect with Dr. Christensen on Doximity.



CO-DIVISION CHIEF

> **Angela M. Tomlin, PhD, HSPP**

Professor of Clinical Pediatrics, IU School of Medicine

Connect with Dr. Tomlin on Doximity.

19

board certified
physicians

(with seven also board
certified in a subspecialty)



See full team
member list



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317.944.4846

(Riley Pediatric Care Center)

Leading-edge technologies

We offer the latest genetic testing, including exome sequencing and genome sequencing. In addition, we have a genetic counselor embedded within our division and collaborate with **Riley Medical and Molecular Genetics**.

Notable research publications

New England Journal of Medicine: June 2020

Down Syndrome

Autism Research: April 2020

A Magnetic Resonance Spectroscopy Study of Superior Visual Search Abilities in Children with Autism Spectrum Disorder

Pediatrics: August 2020

A Statewide Tiered System for Screening and Diagnosis of Autism Spectrum Disorder

17

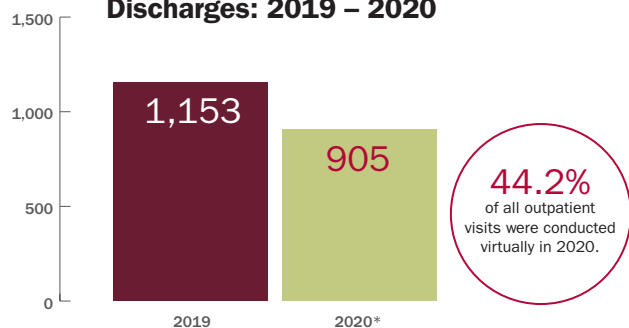
research
publications
in 2020



Leadership Education in Neurodevelopmental Disabilities (LEND)

Riley at IU Health is part of a system of graduate-level interdisciplinary leadership training programs that are federally funded through the Health Resources & Services Administration's Maternal and Child Health Bureau. In existence for more than 50 years, **LEND** produces leaders and innovators in the field of autism and other neurodevelopmental and related disabilities.

Complex Care Inpatient Service Hospital Discharges: 2019 – 2020



* COVID-19 impacted inpatient service assignments in 2020.

Nationally recognized transportation safety program

The IU School of Medicine Department of Pediatrics **Automotive Safety Program** provides in-hospital support for specialized car seat needs. The program also offers national education and training related to safe transportation of children, with a focus on children with special healthcare needs.



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317.944.4846

(Riley Pediatric Care Center)

DIABETES AND ENDOCRINOLOGY

Diabetes and endocrinology specialists at Riley Children's Health deliver expert care for infants, children and adolescents with diabetes and other endocrine disorders. Our physicians have received additional subspecialty training in pediatric endocrinology and pediatric diabetology. In addition, 10 certified diabetes care and education specialists provide a wide range of resources and support to patients and their families.



Program distinctions



Ranked among the top pediatric diabetes and endocrinology programs in the nation by *U.S. News & World Report*



Active in clinical and translational research studies for diabetes and endocrine disorders



Only comprehensive care center in the Midwest for congenital adrenal hyperplasia



DIVISION CHIEF

> **Linda A. DiMeglio, MD, MPH**

Professor of Pediatrics,
IU School of Medicine

Connect with Dr. DiMeglio on Doximity.

16

board certified
physicians



See full team
member list

Specialized programs

- Comprehensive Care Center for Congenital Adrenal Hyperplasia
- Endocrine Diseases Newborn Screening Program
- Type 1 Diabetes Program (including early-stage Type 1 diabetes)
- Type 2 Diabetes Program
- Youth Diabetes Prevention Program
- Prader-Willi Syndrome Program
- Metabolic Bone Disease Program
- Muscular Dystrophy Program
- Hip Hop Obesity Program
- Gender Health Program
- Disorders of Sex Development Program
- Turner Syndrome Program
- Late Endocrine Effects of Cancer Therapy Program
- Telehealth Endocrine and Diabetes Program

Riley's diabetes program is accredited by the Association of Diabetes Care and Education Specialists.



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317.944.3889

Leading-edge technologies

More than 50% of our Type 1 diabetes patients are using advanced technologies:

- Continuous glucose monitors
- Insulin pumps
- Hybrid closed-loop insulin delivery systems

Riley endocrinologists are pioneering research focused on improving the use of these latest technologies in people with diabetes, including utilization of these systems in very young children and those with newly diagnosed diabetes.

Engaged in research to improve clinical care

Our research teams are currently recruiting or following children and adults enrolled in more than 30 diabetes and endocrine-related clinical and observational studies.

- Research study site for **breakthrough therapy teplizumab**; efforts underway to get FDA approval as first prevention treatment for Type 1 diabetes
- Leading study site for **novel glucagon formulations**, including inhaled and soluble liquid glucagon
- Investigating connections between the **microbiome and beta cell stress** and the development and progression of Type 1 diabetes
- Involved in studies of **novel growth hormone formulations** for children with short stature; new therapies for children with precocious puberty; and studies to improve bone health in children with rare bone diseases

75

research
publications
in 2020



Notable research publications

JAMA: February 2020

Effects of Iron Isomaltoside vs Ferric Carboxymaltose on Hypophosphatemia in Iron-Deficiency Anemia: Two Randomized Clinical Trials

New England Journal of Medicine: November 2020

Golimumab and Beta-Cell Function in Youth with New-Onset Type 1 Diabetes

Diabetes Care: August 2021

The Women's Leadership Gap in Diabetes: A Call for Equity and Excellence



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317.944.3889

DIAGNOSTIC RADIOLOGY

The pediatric radiology and interventional radiology team at Riley Children's Health specializes in the diagnosis of medical conditions in infants, children and adolescents. Our 20 fellowship-trained radiologists use advanced radiologic technologies tailored to the needs of children:

- Computed tomography (CT) scanners that allow organs to be viewed in different planes or as three-dimensional images
- 3T and 1.5T magnetic resonance imaging (MRI) scanners offering both advanced imaging sequences and fast-imaging techniques that reduce the need for sedation in young children
- Fluoroscopy rooms that use advanced low-dose fluoroscopy equipment and can reduce X-ray dosage by as much as 70%
- Digital radiology (DR) units that produce high-quality images quickly and shorten exam times
- Ultrasound units specifically designed for pediatric imaging
- On-site interventional radiology suite

Program distinctions



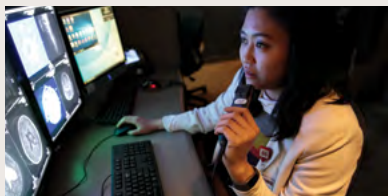
3 Tesla fetal MRI program provides advanced imaging for diagnosis and treatment of congenital brain and body anomalies



Siemens SOMATOM Force CT scanner delivers exceptionally fast temporal resolution for imaging complex congenital heart disease in very small patients



Home to the only pediatric neurointerventional radiologist in the state



Riley at IU Health offers the only pediatric radiology fellowship training program in Indiana.



DIVISION CHIEF

> **Matthew L. Cooper, MD**

Assistant Professor of Clinical Radiology and Imaging Sciences, IU School of Medicine

Connect with Dr. Cooper on Doximity.

18

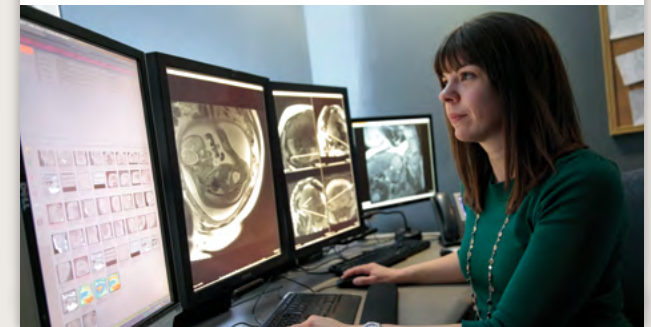
board certified
physicians



See full team
member list

Riley Radiology is accredited by the American College of Radiology in:

- Ultrasound
- MRI
- CT
- Nuclear medicine



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317.962.3580

Leading-edge technologies and procedures

EOS X-ray technology

Provides the highest quality images with the lowest possible dose of radiation.

SPECT/CT

Allows a cross-sectional rendering of nuclear medicine images. The CT image is fused to the nuclear medicine image for precise localization of areas on the SPECT image, allowing for a more accurate diagnosis.

MRI

Perfusion MRI allows for brain tumor pathology and outcome prediction, and functional MRI maps brain structure and function for safer surgery.

Professional organization affiliations

CHAIR, PROFESSIONALISM COMMITTEE

Radiological Society of North America

Brandon P. Brown, MD, MA, FAAP

82

research
publications
in 2020



Radiology Exam Volume: 2019 – 2020	2019	2020
CT	8,769	7,691
Fluoroscopy	4,319	5,816
Interventional radiology	3,575	2,315
MRI	11,204	8,293
Nuclear medicine	1,053	822
Radiographs	61,761	57,471
Ultrasound	15,264	12,342
TOTAL EXAMS	105,945	94,750



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317.962.3580

EMERGENCY MEDICINE

Riley Emergency Medicine pairs clinical skill with compassion to care for some of the youngest and most critically ill children in Indiana. With expertise extending beyond emergency medicine, our team includes physicians with subspecialties in quality and safety, out-of-hospital care, disaster medicine, informatics, and point-of-care ultrasound.

Program distinctions



Recognized by Indiana's EMSC* program as "pediatric advanced" (associated with reduced morbidity and mortality in critically ill children)



One of a select number of hospitals in the nation—and the only one in Indiana—to be verified by the American College of Surgeons as a Level I Pediatric Trauma Center



More than 80% of physicians certified in point-of-care ultrasound—accelerates diagnosis and management of illness, and improves accuracy and patient safety



DIVISION CHIEF

> **Elizabeth Weinstein, MD, FACEP, FAAEM, FAAP**

Professor of Clinical Emergency Medicine and Pediatrics, IU School of Medicine

Connect with Dr. Weinstein on Doximity.

32

board certified
physicians



See full team
member list

Riley emergency medicine physicians with specialized expertise train colleagues across the hospital in the use of ultrasound for peripheral IV placement in children.



AMERICAN COLLEGE OF SURGEONS
Verified Trauma Center

ACS-verified trauma centers provide:

- Hospital resources for trauma care
- Full spectrum of trauma services from prehospital phase through rehabilitation
- Injury prevention programs

Engaged in quality improvement and patient safety

Riley Emergency Medicine focuses heavily on rapid sepsis identification and initiation of treatment, resulting in a **pediatric mortality rate from sepsis of 2.5%** in 2020.



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* Designated by the Indiana Emergency Medical Services for Children Pediatric Facility Recognition Program



Advancing pediatric emergency medicine through research

Riley at IU Health is participating in several multicenter research initiatives, including two national Pediatric Emergency Care Applied Research Network (PECARN) studies:

- Bedside Exclusion of Pulmonary Embolism in Children Without Radiation (BEEPER)
- Pediatric Dose Optimization for Seizures in Emergency Medical Services (PediDOSE)

Active in groundbreaking research to improve clinical practice, PECARN is the largest emergency medicine pediatric research network in the United States.

11+

peer-reviewed
articles published
in 2020



Training the next generation of specialists

- Riley at IU Health is **one of only four programs in the nation** to offer combined residency training in emergency medicine and pediatrics.
- We are the **only program nationally** to offer both the combined residency and a fellowship in pediatric emergency medicine.
- We also offer a fellowship in pediatric emergency medicine **point-of-care ultrasound**.



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(IU Health 24/7 Transfer Center)

GASTROENTEROLOGY, HEPATOLOGY AND NUTRITION

Through a variety of multidisciplinary programs, gastroenterology (GI) specialists at Riley Hospital for Children at IU Health provide expert care for patients with inflammatory bowel disease (IBD), liver disease, obesity, allergic eosinophilic GI disorders, motility disorders, cystic fibrosis, short bowel syndrome, aerodigestive disorders and nutritional disorders.



DIVISION CHIEF

> **Jean P. Molleston, MD**

Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Molleston on Doximity.

Program distinctions



Nationally ranked among
the top 25 pediatric
gastroenterology programs
by U.S. News & World Report



Exceptional liver
transplant outcomes
(See statistics on this page.)



Three full-time pediatric
psychologists specially trained
to treat psychological conditions
related to GI disease

19

board certified
physicians



See full team
member list

Specialized programs

Eosinophilic GI Disorders Program

This program offers multidisciplinary management of allergic intestinal diseases, as well as research opportunities.

Aerodigestive Program

Leveraging multispecialty expertise, this program coordinates evaluation and management of airway and esophageal disorders in children.

Motility Program

Available testing includes esophageal manometry, antroduodenal motility studies, colonic motility studies, anorectal manometry, EndoFLIP and more.

Inflammatory Bowel Disease (IBD) Program

Our well-established IBD program is part of the national **ImproveCareNow** Network.

Parenteral Support and Intestinal Rehabilitation (PAIR) Program

The PAIR program provides access to novel lipids for children with intestinal failure and new medical therapies, including intestinal growth factors.

Pediatric Liver Program

Our team provides expert diagnosis and management of children with a variety of liver diseases, including elevated liver enzymes, fatty liver, viral hepatitis, cholestatic liver disease, metabolic liver disease, hepatomegaly and neonatal jaundice.

Liver Transplant Three-year Patient Survival*

Riley Children's Health **100%**

National average 92.78%

* Three-year transplant period: July 1, 2015 – Dec. 31, 2017. Data source: srtr.org; center: IU Health



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317.944.3774

Leading-edge technologies and procedures

- **FibroScan** to perform transient elastography of the liver; measures fibrosis and steatosis
- **Nasopharyngeal endoscopy** to evaluate issues with swallowing and eosinophilic esophagitis
- **IB-Stim** to decrease functional abdominal pain associated with IBS
- **EndoFLIP** to measure the area and pressure across the inside of the esophagus to determine the cause of dysphagia
- **Gastric pacemaker** to treat gastroparesis

Notable research publications

Journal of Pediatric Gastroenterology and Nutrition: July 2020

Clinical and Practice Variations in Pediatric Acute Recurrent or Chronic Pancreatitis: Report from the INSPPIRE Study

Hepatology: September 2020

Reproductive Health and Liver Disease: Practice Guidance by the American Association for the Study of Liver Diseases

Gastroenterology: November 2020

Progression of Fatty Liver Disease in Children Receiving Standard of Care Lifestyle Advice

Journal of Pediatric Gastroenterology and Nutrition: September 2020

Analysis of Using the Total White Blood Cell Count to Define Severe New-onset Ulcerative Colitis in Children

Journal of Pediatric Gastroenterology and Nutrition: December 2020

Oral Glutathione and Growth in Cystic Fibrosis: A Multicenter, Randomized, Placebo-controlled, Double-blind Trial

Riley Gastroenterology, Hepatology and Nutrition participates in **multicenter national registries** for cholestatic liver disease, fatty liver, drug-induced liver injury, cystic fibrosis liver disease, inflammatory bowel disease, eosinophilic GI disorders, recurrent/chronic pancreatitis, intravenous lipid formulations and liver transplantation.

Riley GI and hepatology specialists are active in many national and international organizations, including:

- North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN)
- American Neurogastroenterology and Motility Society
- American Association for the Study of Liver Diseases (AASLD)
- Consortium of Eosinophilic Gastrointestinal Disease Researchers (CEGIR)
- ImproveCareNow Network (ICN)
- American Society for Parenteral and Enteral Nutrition (ASPEN)
- INSPPIRE Pediatric Pancreatitis Research Project

39

research
publications
in 2020



Research highlights

Clinical trials in 2020:

- Bile acid reuptake inhibitor therapy for biliary atresia and for pruritus in liver disease
- Biologic drugs for IBD and eosinophilic esophagitis
- Drug therapy for Hepatitis B and for IBS



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GENERAL PEDIATRICS AND PRIMARY CARE

Riley Children's Health is committed to providing exceptional and comprehensive pediatric primary care. Serving newborns, children, adolescents and young adults, our board certified pediatricians, internal medicine/pediatricians and family medicine physicians see children in offices across Indiana. Our program is anchored by the general and community pediatrics division of Indiana University School of Medicine.

Program distinctions



Team-based primary care (including care coordination, social work and lactation support) focusing on access, quality care and integrated mental health services



Evidence-based follow-up for premature infants born with complex conditions



Patient- and family-centered diagnostic support for toddlers with developmental concerns related to autism spectrum disorder



Unique care coordination system to support children with medical complexity and their families

General Pediatrics managed care for more than 10,000 patient visits in 2020. IU School of Medicine CHOICE mental health services were integrated into nearly 800 primary care visits, and more than 500 virtual visits were conducted.



DIVISION CHIEF

> Dorota A. Szczepaniak, MD, FAAP
Associate Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Szczepaniak on Doximity.

29

board certified
physicians*



See full team
member list

* In general and community pediatrics division of IU School of Medicine

For a full list of Riley community-based primary care providers, visit
rileychildrens.org/findprimarycare.



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888.IUHEALTH

Specialized programs

Early Autism Evaluation Hub

This system is the nation's largest statewide primary care network that trains and supports clinicians in the delivery of **early diagnoses for autism** in children ages 18 to 48 months.

Center for Youth and Adults with Conditions of Childhood (CYACC)

Supporting youth ages 11 to 22 with complex medical needs, this center trains healthcare teams across Indiana in healthcare processes related to the **transition to adulthood**.

Early Years Program

This multidisciplinary program supports babies with complex medical needs in transitioning from the NICU to outpatient care. Riley general pediatricians partner with specialists to facilitate these programs:

- The **Infant Growth and Development Program** provides support each month to more than 60 infants who are discharged from the NICU with feeding challenges.
- The **Infant Breathing Program** supports the developmental needs of children with bronchopulmonary dysplasia.

For more details on this program, see *Pulmonology and Sleep Medicine*.



Notable research publication

Pediatrics: August 2020

A Statewide Tiered System for Screening and Diagnosis of Autism Spectrum Disorder

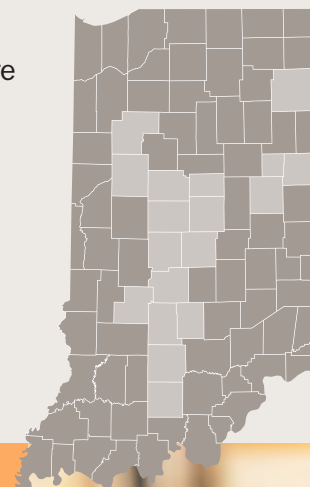
“...Riley Children’s Health in Indiana has a state-funded program that works with adolescents and their parents to develop goals in adulthood and arrange peer supports, social services, and other wraparound services needed for success.”

– “How the Health System Overlooks Young Adults with Chronic Conditions”

JAMA Health Forum: June 2021

Community-based primary care

Riley Children’s Health primary care pediatricians, internal medicine/pediatricians and family medicine physicians focus on meeting the highest quality, safety, educational and care standards. Our practice teams provide effective, evidence-based care that is personalized to meet the needs of each child.



More than
300
primary care
providers
throughout
Indiana

Riley participates in the Children with Medical Complexity Care Coordination, a 10-state collaborative to improve care coordination for children with complex health needs. The training and support team provides resources and information to primary care nurses embedded at Riley and two other health systems. The collaborative serves 300 children.



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888.IUHEALTH

HEMATOLOGY/ONCOLOGY

Riley Hematology/Oncology delivers patient- and family-centered care for children and adolescents with cancer and blood disorders. Treating patients from throughout the Midwest and beyond, our physicians see more than 300 new oncology patients and over 700 new hematology patients each year. We manage more than 10,000 outpatient visits annually, including a comprehensive telehealth program offering virtual visits to patients throughout the region.



DIVISION CHIEF

> **Jamie L. Renbarger, MD, MS**

Caroline Symmes Professor of Pediatric Cancer Research, IU School of Medicine
Connect with Dr. Renbarger on Doximity.

Program distinctions



Ranked among the top 25 pediatric cancer programs in the nation by *U.S. News & World Report*



One of the few pediatric cancer programs in the region to offer precision genomics to treat children with relapsed or aggressive cancer



Availability of clinical trials through

- **CureWorks**
- **Children's Oncology Phase 1 Consortium**
- **Pacific Pediatric Neuro-Oncology Consortium**



Offers pediatric stem cell transplant, CAR-T cell therapy and immune effector cell therapy for pediatric patients



Part of the Indiana University Simon Cancer Center, designated by the National Cancer Institute as a Comprehensive Cancer Center

Stem Cell Transplant and Immunotherapy Volume: 2020

18 allogeneic stem cell transplants with
100% 100-day survival rate

25 autologous stem cell transplants
7 CAR-T cell infusions

Helping children live longer

80% overall five-year survival rate

More than **90%** five-year survival rate for leukemia patients



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Specialized programs

Precision Genomics (PG) Program

Innovative approach identifies DNA, RNA and proteins in cancer cells that can be precisely targeted with different treatments.

Neurofibromatosis Program

This world-class program provides comprehensive care for pediatric and adult patients with neurofibromatosis (NF1, NF2 and Schwannomatosis) and enhances bidirectional integration with translational and preclinical research infrastructure.

For details on NF1 research at Riley, [view this video](#).

Bone Marrow Failure Program

Our program includes an internationally known NCI-funded research laboratory employing functional genomics and super-resolution imaging to understand the mechanistic origins of genomic instability in Fanconi anemia and other bone marrow failure/cancer predisposition syndromes.

Comprehensive Sickle Cell Program

This program offers access to Indiana's only stem cell transplant center for nonmalignant transplants.

Hemostasis and Thrombosis Program

We provide multidisciplinary care to pediatric patients with bleeding and clotting disorders. Our team partners with the **Herzog Laboratory at IU School of Medicine**, a leader in research for alternative forms of treatment for children with hemophilia.

Of the children with brain and spinal tumors evaluated through Riley's PG program, actionable variants were identified in **87%** of cases with about **50%** of children receiving precision genomics-directed therapy.



Advancing clinical care through research

Riley Hematology/Oncology is currently active in:

40
Phase I and II
clinical trials

84
oncology
trials

5
hematology
trials

CureWorks partnership expands clinical trial options

A unique collaboration among Riley at IU Health and four other elite children's hospitals:

- Supports member hospitals in launching and participating in exclusive clinical trials
- Streamlines immunotherapy production, clinical trial enrollment and trial coordination
- Expands access to the latest treatments, allowing patients to get advanced care closer to home

Notable research publications

Nature Medicine: January 2021

Cabozantinib for Neurofibromatosis Type1-related Plexiform Neurofibromas: A Phase 2 Trial

Cancers: August 2020
Systems Biology Approach Identifies Prognostic Signatures of Poor Overall Survival and Guides the Prioritization of Novel BET-CHK1 Combination Therapy for Osteosarcoma

52

research
publications
in 2020



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HOSPITAL MEDICINE

Through implementation of best practices and participating in leading-edge research, Riley Hospital Medicine sets the standard for inpatient pediatric care and targets continuous quality improvement. Our team of more than 30 physicians continually strives to improve care through collaboration with inpatient specialists and primary care providers, community outreach, and the education and training of future healthcare providers.

Program distinctions



Unique coverage model that combines academic medicine with community-based care; encompasses five different sites in diverse healthcare system



Largest pediatric hospitalist program in Indiana



Only pediatric hospital medicine fellowship in the state and one of the longest-running programs in the nation



DIVISION CHIEF

> **Kimberly S. Schneider, MD, FAAP**

Assistant Professor of Pediatrics,
IU School of Medicine

Connect with Dr. Schneider on Doximity.

10

board certified
physicians*



See full team
member list

* Physicians board certified in pediatric hospital medicine
(board eligible specialty since 2019)

A partner in high-quality inpatient care

In addition to caring for general pediatric patients, Riley Hospital Medicine serves as the primary admitting service for the following Riley medical specialties:

- Neurology
- Rheumatology
- Diabetes and Endocrinology
- Toxicology
- Medical and Molecular Genetics
- Psychiatry and Psychology
- Adolescent Medicine

Riley hospitalists provide exceptional inpatient care through effective care coordination, co-management and efficient transition of care.



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877.247.1177

(IU Health 24/7 Transfer Center)



Research highlights

Select study topics:

- **Reducing Variability in the Infant Sepsis Evaluation (REVISE 2.0)** – National project to reduce unnecessary testing and hospitalization for febrile infants under three months of age; project is lead initiative for optimizing care for these patients in Indiana.
- **Glucose gel implementation** – Implementing use of glucose gel in newborns with transient hypoglycemia to prevent NICU transfer and encourage bonding with the mother.
- **Eat, sleep, console** – Project to minimize medications used for infants with neonatal abstinence syndrome who are experiencing withdrawal.



10

research
publications
in 2020



Select research publications

Pediatrics: July 2020

Electronic Documentation in Pediatrics: The Rationale and Functionality Requirements

BMJ Global Health: December 2020

Improving Maternal, Newborn and Child Health Outcomes Through a Community-Based Women's Health Education Program: A Cluster Randomized Controlled Trial in Western Kenya

Respiratory Care: September 2020

Implementation of a High-Flow Nasal Cannula Management Protocol in the Pediatric ICU

Academic Pediatrics: August 2020

POPCoRN One-Pagers: Educational Materials for Pediatric Providers Caring for Adults



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INFECTIOUS DISEASES

The Ryan White Center for Pediatric Infectious Diseases and Global Health at Riley Children's Health helps children and families affected by infectious diseases overcome or manage these conditions. In addition to prevention and diagnosis, Riley specialists focus on treatment and ongoing care of children with infectious diseases. The center offers services designed to provide complete care for children with infectious diseases and to prevent infection and its complications in children.

Program distinctions



National leader in global pediatric infectious diseases research



Largest pediatric infectious diseases program in Indiana, with comprehensive inpatient and outpatient services; state's largest center for pediatric HIV care



Only pediatric infectious diseases program in the state with specialized expertise in caring for immunocompromised patients



Robust pediatric infection prevention, antimicrobial stewardship and travel medicine programs



DIVISION CHIEF

> Chandy C. John, MD, MS

Ryan White Professor of Pediatrics,
IU School of Medicine

Connect with Dr. John on Doximity.

11

board certified
physicians



See full team
member list

Specialized programs

Immunocompromised Host Infectious Diseases Consult Service

Services range from pretransplant evaluations to treatment of opportunistic infections in children with primary or acquired immune deficiencies.

HIV Program

A multidisciplinary team of physicians, social workers and pharmacists provides comprehensive care to more than 60 children receiving highly active antiretroviral therapy, with a viral suppression rate of greater than 95%.

COVID-19 Program and MIS-C Program

Our team specializes in the evaluation, care and follow-up of children with COVID-19, particularly children with persistent illness or symptoms following the illness. In addition, we offer a program with specialists from infectious diseases, cardiology and rheumatology to treat children affected by multisystem inflammatory syndrome. The MIS-C clinic is also the only multidisciplinary clinic in Indiana where patients diagnosed with MIS-C can be seen by a pediatric cardiologist, rheumatologist and infectious diseases specialist in the same visit.

International Travel Program

Riley infectious diseases specialists provide health services before and after international travel, including preventive medicine, vaccinations, travel education and support for parents of internationally adopted children.



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Research highlights

Major international studies

- **Malarial impact on neurobehavioral development (MIND)** – Assesses the effect of severe malaria in children on long-term cognitive, behavioral and functional outcomes
- **Zinc for prevention in sickle cell anemia (ZIPS)** – Studies zinc or placebo supplementation to prevent infection in Ugandan children with sickle cell anemia
- **Malaria prophylaxis to enhance children's development** – Determines if specific malaria chemoprevention regimens in a mother and child result in improved cognitive outcomes in the child
- **Instrument to assess adolescent risk for disengagement from HIV care** – Developing a tool to identify adolescents in Kenya at high risk for disengagement
- **Neurodevelopmental screening in children born to HIV-infected mothers in Kenya** – Supports development of a tool for neurodevelopmental screening and implementation of screening programs

Clinical trials and research based at Riley

- **Musculoskeletal infections** – Assesses use of next-generation sequencing for pathogen identification in pediatric musculoskeletal infections
- **DOMINIC** – Establishes a noninvasive diagnostic blood testing approach to confirm the presence or absence of invasive mold infections in high-risk children with newly identified possible pulmonary invasive mold infections

COVID-19 studies

TACTIC (Tracking Asymptomatic COVID-19 Through Indianapolis Communities)

DISCOVER (Development of Immunity after SARS-CoV-2 Exposure and Recovery)

POSCOR (Prevalence of SARS-CoV-2 Infection in Children Assessed for Other Respiratory Infection)

75

research
publications
in 2020



Professional organization affiliations

COMMITTEE ON INFECTIOUS DISEASES

American Academy of Pediatrics

Chandy C. John, MD, MS

EARLY CHILD DEVELOPMENT TASK FORCE
GLOBAL EARLY CHILDHOOD DEVELOPMENT PROJECT
ADVISORY COMMITTEE

American Academy of Pediatrics

Megan S. McHenry, MD

FORUM ON MICROBIAL THREATS

National Academies of Sciences, Engineering
and Medicine

Chandy C. John, MD, MS

FOGARTY INTERNATIONAL CENTER ADVISORY BOARD

National Institutes of Health

Chandy C. John, MD, MS

NORTH AMERICAN LEAD

leDEA East Africa TB Sentinel Research Network

Leslie A. Enane, MD

Notable research publications

New England Journal of Medicine: December 2020

**Malaria Chemoprevention in the Postdischarge
Management of Severe Anemia**

JAMA Network: January 2020

**Comparison of Risk of Recrudescent Fever in Children
with Kawasaki Disease Treated with Intravenous
Immunoglobulin and Low-Dose vs High-Dose Aspirin**

New England Journal of Medicine: June 2020

**Hydroxyurea Dose Escalation for Sickle Cell Anemia
in Sub-Saharan Africa**



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MEDICAL AND MOLECULAR GENETICS

Offering evaluation and management of a wide variety of genetic conditions, Riley Medical and Molecular Genetics is Indiana's largest provider of genetics services. We provide genetic assessment, testing, treatment and counseling for individuals or families touched by inherited conditions, chromosomal disorders or other genetic disease.

Program distinctions



One of the first human genetics departments in the nation; robust tradition through IU School of Medicine of training geneticists/genetic counselors and offering counseling services



Largest genetics program in the region; only board certified biochemical geneticists in the region



Sophisticated condition management, including infusions for enzyme replacement therapy, drug therapy directed to the underlying genetic disease and the latest diagnostic testing



Subspecialty expertise in pediatric neurology, cancer, maternal fetal medicine, cardiovascular genetics and biochemical genetics

Specialized programs

- Undiagnosed and Rare Disease Program
- The Center for Ehlers-Danlos Syndromes (supported by the Ehlers-Danlos Society)
- Ocular Genetics Program
- Deaf and Hard of Hearing Program
- Bone Dysplasia Program

Launched in 2020, this program aims to identify the underlying genetic etiology in cases for which there is a genetic suspicion and clinical testing is unable to reveal a cause.

- Aortopathy Program
- Cardiomyopathy Program



DIRECTOR

> **Stephanie M. Ware, MD, PhD**
Professor of Pediatrics and Medical and Molecular Genetics, IU School of Medicine
Connect with Dr. Ware on Doximity.

14

board certified
physicians



See full team
member list



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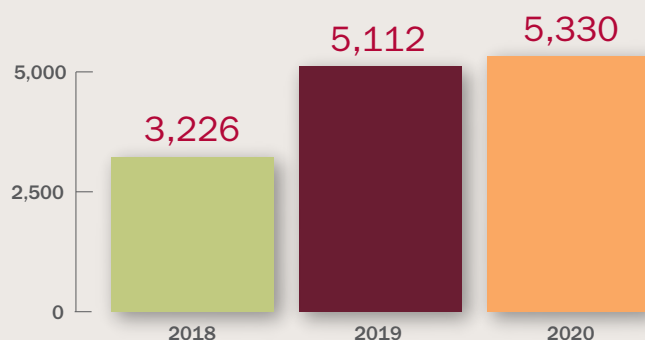
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Leading-edge technologies

Advanced genetic testing laboratories

- The Indiana University Genetic Testing Laboratories are a worldwide leader in innovative laboratory research and development.
- We offer an extensive menu of highly complex and unique medical tests available in cytogenetics, biochemical genetics, pharmacogenetics and molecular genetics.
- All laboratories are accredited by the College of American Pathologists (CAP) and certified by Clinical Laboratory Improvement Amendments (CLIA).

New Referrals Volume: 2018 – 2020



We have a high level of expertise in molecular and cytogenetic diagnostics. Our genetics team is skilled in ordering the right test, interpreting results and coordinating management plans based on the findings.

183

research
publications
in 2020



Specialized expertise aids Indiana children with genetic and metabolic conditions

For more than 30 years, the Riley genetics team has partnered with the Indiana State Department of Health to provide biochemical/molecular confirmation, counseling and medical/dietary management of newborns who screen positive for inborn errors of metabolism.



Research highlights and clinical trials

- Our team participates in approximately 10 ongoing clinical trials annually.
- Trials are currently underway for phenylketonuria, Prader-Willi Syndrome and cystathionine beta-synthase deficient homocystinuria.

IU School of Medicine Medical and Molecular Genetics is ranked 10th in National Institutes of Health funding for genetics research—both adult and pediatric. Total research funding in 2020: \$14.2 million



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NEONATOLOGY

The expert team of neonatologists at Riley Hospital for Children at IU Health delivers specialized, evidence-based care to neonates in need of lifesaving services. In many cases, our care begins prenatally and continues through the transition to home with comprehensive, multidisciplinary follow-up in the Riley Early Years Program.



Program distinctions



Ranked among the top pediatric neonatology programs in the nation by *U.S. News & World Report*



Home to one of the first neonatal neurocritical care units in the country; established in 2013



Innovative cardiac NICU with neonatology integration and daily rounds with CV intensivists and cardiology that contribute to stellar outcomes



ECMO program designated as Platinum Level Center of Excellence by Extracorporeal Life Support Organization



DIVISION CHIEF

> **Laura S. Haneline, MD**

Edwin L. Gresham Professor of Pediatrics,
IU School of Medicine

Connect with Dr. Haneline on Doximity.

50

board certified
physicians



See full team
member list

Specialized programs

Riley Fetal Center

The center provides multidisciplinary care for women with pregnancies complicated by fetal anomalies.

Riley Heart Center NICU

Riley's best practice model of shared management between neonatology, cardiac intensivists and cardiology is executed by less than 10% of centers.*

Bronchopulmonary Dysplasia (BPD) Program

Our program incorporates the expertise of multiple specialists to improve the outcomes of patients with severe BPD in the NICU and as outpatients.

For BPD program outcomes, see [Pulmonology and Sleep Medicine](#).

NeuroNICU

Riley provides leading-edge capabilities for targeted surveillance and diagnosis, evidence-based treatment options, and developmental monitoring and support to more than 200 newborns with serious neurologic problems each year.

Neonatal Acute Kidney Injury (AKI) Program

Riley neonatologists and nephrologists launched a joint initiative in 2020 to monitor and follow neonates with acute kidney injury; only formalized neonatal AKI follow-up program in the region.

Riley at IU Health is home to a Level IV NICU providing the highest level of care. With 119 NICU beds, our hospital houses Indiana's largest NICU.



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* Children's Hospitals Neonatal Consortium survey

Leading-edge technologies and procedures

- Therapeutic hypothermia
- Continuous EEG monitoring
- Neonatal dialysis
- Miris human milk analyzer: Novel device measures nutritional content in breast milk, facilitating individualized nutritional support for infants at risk for growth failure.
- Riley NICU Twistle Program: Only NICU virtual communication platform in the nation that uses automated workflows that optimize parent engagement and safer transition to home.

Committed to quality care and patient safety

Vermont Oxford Network

- Top centile for fewest number of patients who are under the 10th percentile for weight at discharge

Children's Hospital Neonatal Consortium (CHNC)

- Top quartile for several outcomes, including growth velocity at discharge and CLABSI (among 37 Level IV NICUs nationally that are part of CHNC)

2020 outcomes metrics

CLABSI rate
1.03 per
1,000 line days

Postop
euthermia
97.6%

Unplanned
extubation rate
0.53



Research highlights

Study topics:

Salt to grow – Noninvasive study hypothesizes that implementing a sodium supplementation algorithm will improve in-hospital somatic growth.

Morphine Dosing for Neonatal Opioid Withdrawal Syndrome – Randomized pilot trial comparing scheduled morphine with a weaning protocol to intermittent morphine dosing as needed.

Epigenetics – Study identifies markers associated with preterm birth, hypospadias, congenital heart defects and autism.

VENTFIRST – Study to determine whether ventilatory assistance prior to umbilical cord clamping influences the occurrence of intraventricular hemorrhage in extremely preterm infants.

Global health research – Research infrastructure in rural Kenya aims to reduce maternal and infant mortality.

113

research
publications
in 2020



Notable research publications

JAMA Network: November 2020

Predictive Modeling for Perinatal Mortality in Resource-Limited Settings

New England Journal of Medicine: December 2020

Higher or Lower Hemoglobin Transfusion Thresholds for Preterm Infants

JAMA Pediatrics: May 2020

Early-Onset Neonatal Sepsis 2015 – 2017, the Rise of Escherichia Coli and the Need for Novel Prevention Strategies



The Riley Fetal Center was accepted into the North American Fetal Therapy Network (NAFTNet); one of only four centers added in 2020. NAFTNet's 36 members have expertise in fetal interventions, including open neural tube defects, congenital diaphragmatic hernia and twin-to-twin transfusion syndrome.

Meet Riley patients: Lena and Delaney



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NEPHROLOGY

Riley Nephrology is Indiana's only provider of comprehensive evaluation and treatment for children with kidney disease or kidney failure. Our pediatric nephrologists are leaders in using novel technologies and research breakthroughs to launch new clinical programs that lead to better treatments for children impacted by kidney disease.



Program distinctions



Nationally ranked among the top 25 pediatric nephrology programs by *U.S. News & World Report*



One of only 12 pediatric programs in the nation to offer aquapheresis, allowing for continuous renal replacement in smaller patients, including neonates



Comprehensive Neonatal Kidney Health Program, including both inpatient consultations and outpatient care



Ambulatory blood pressure monitoring for patients with asymptomatic elevated blood pressure; complete more than 400 24-hour readings annually



DIVISION CHIEF

> **David S. Hains, MD**

Byron P. & Francis D. Hollett Professor of Pediatrics, IU School of Medicine

Connect with Dr. Hains on Doximity.

8

board certified physicians



See full team member list

Specialized programs

Congenital Anomalies of the Kidney and Urinary Tract (CAKUT) Program

This multidisciplinary program involves Riley specialists from nephrology, urology and medical and molecular genetics.

Stone Program

We educate patients on the importance of making meaningful diet and fluid intake changes to help prevent and control symptoms. We also work closely with colleagues in pediatric urology on strategies to help reduce or eliminate kidney stones.

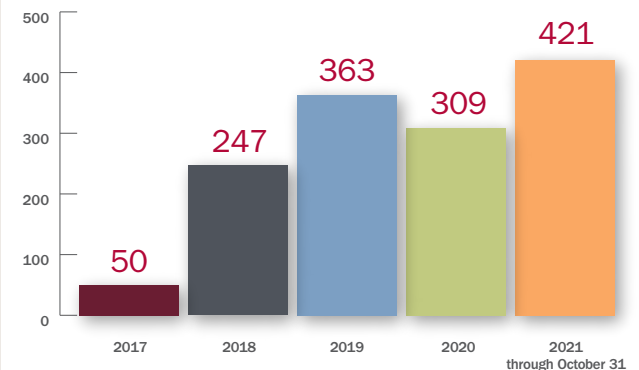
Acute Kidney Injury (AKI) Program

Developed in collaboration with Riley neonatologists, the AKI consultation program has established standardized care guidelines to improve recognition and management of neonates with AKI.

Metabolic Bone Disease Program

For patients with chronic nephrolithiasis and low bone mineral density, this program focuses on identifying patient risk factors, accurately diagnosing osteoporosis with pediatric densitometry and setting medication protocols.

Ambulatory Blood Pressure Monitoring Program: 2017 – 2021
Number of patients who had a monitored reading



Decrease in 2020 was related to the COVID-19 pandemic; limited number of monitors were placed from March through June.



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317.274.2563



Research highlights

- 28 active IRB-approved clinical studies
- Active in the **Chronic Kidney Disease in Children (CKiD)** study since 2005 with high enrollment and retention
- Active in the **CureGN** study since 2015 with 100% retention and high enrollment



Riley at IU Health is the only pediatric dialysis unit serving children in Indiana. We provide inpatient (including NICU and PICU) and acute hemodialysis and peritoneal dialysis services.



Notable research publications

JAMA: June 2020

Asymptomatic Seroconversion of Immunoglobulins to SARS-CoV-2 in a Pediatric Dialysis Unit

Frontiers in Pediatrics: February 2020

Human Papillomavirus Vaccination in Male and Female Adolescents Before and After Kidney Transplantation: A Pediatric Nephrology Research Consortium Study

American Journal of Perinatology: January 2020

Acute Kidney Injury is Associated with Poor Lung Outcomes in Infants Born ≥ 32 Weeks of Gestational Age

American Journal of Physiology, Renal Physiology: June 2020

Developmental Loss, But Not Pharmacological Suppression, of Renal Carbonic Anhydrase 2 Results in Pyelonephritis Susceptibility

Frontiers in Pediatrics: October 2020

Assessment of Seroconversion to SARS-CoV-2 in a Cohort of Pediatric Kidney Transplant Recipients

32

research
publications
in 2020



Pediatric Chronic Dialysis Program: 2018 – 2020

	2018	2019	2020
Average HD patients per month	8	10	13
Average HD treatment days per month	103	143	174
Average HD patient days per month	233	322	399
Average HD inpatient days per month	18	18	12
CLABSI per year	1	1	1
Average fistulas and grafts per month	2	2	4
Fistula- and graft-related infections	0	0	0
Transplants	12	12	12



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317.274.2563

NEUROLOGY

Expert neurologists at Riley Children's Health use the latest tools and therapies to diagnose and treat the most complex neurologic disorders in children. Caring for patients from throughout the Midwest, our team, which includes 16 pediatric neurologists, five advanced practice providers and a genetic counselor, has developed numerous specialized multidisciplinary services. These include programs for muscular dystrophy and refractory epilepsy.



Program distinctions



Ranked among the top 25 pediatric neurology programs by *U.S. News & World Report*



Accredited by the National Association of Epilepsy Centers as a Level 4 epilepsy center



Muscular Dystrophy Association Care Center, recognizing clinical care and research



DIRECTOR

> Christopher T. Jackman, MD
Assistant Professor of Clinical Neurology,
IU School of Medicine
Connect with Dr. Jackman on Doximity.

16
board certified
physicians

>
See full team
member list

Specialized programs

Neurocutaneous Program

Pediatric neurologists provide treatment for neurocutaneous syndromes such as neurofibromatosis and tuberous sclerosis.

Pediatric Headache Center

Riley's multidisciplinary pediatric headache center offers a comprehensive approach for patients with rare or refractory headache disorders.

Neurogenetics Program

This program specializes in the diagnosis of neurological disorders through clinical evaluation and expanded genetic testing, particularly next generation and whole exome sequencing.

NeuroNICU

In partnership with Riley neonatologists, we provide targeted surveillance and diagnosis, evidence-based treatment, and developmental monitoring and support to newborns with serious neurologic problems.



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317.948.7450

Advanced treatment for pediatric epilepsy

With five epileptologists, Riley Neurology offers the full range of surgical evaluations and treatments for epilepsy. In cooperation with Riley pediatric neurosurgeons, our neurologists work diligently to improve identification and surgical treatment of epilepsy patients with medically refractory epilepsy.

Leading-edge technologies and procedures

- Stereo EEG
- Laser ablation
- RNS placement
- Gene therapy for spinal muscular atrophy

20

research
publications
in 2020



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317.948.7450

PALLIATIVE CARE

The Riley Children's Health palliative care team provides comprehensive palliative care services for children with life-limiting or life-threatening medical conditions. Committed to helping patients experience the best possible quality of life, we support families in medical decision-making, goals of care discussions, advance directives, and complicated pain and symptom management. Our team also oversees end-of-life care for patients in pediatric hospice.

Program distinctions



Serves as the medical director for home-based pediatric hospice services in Indiana; collaborates with 13 hospices statewide



Offers clinical tracks for clinical palliative care fellows



Recognized worldwide for end-of-life education curriculum



DIVISION CHIEF

> **Adam B. Hill, MD**

Assistant Professor of Clinical Pediatrics
IU School of Medicine

Connect with Dr. Hill on Doximity.

3

board certified
physicians



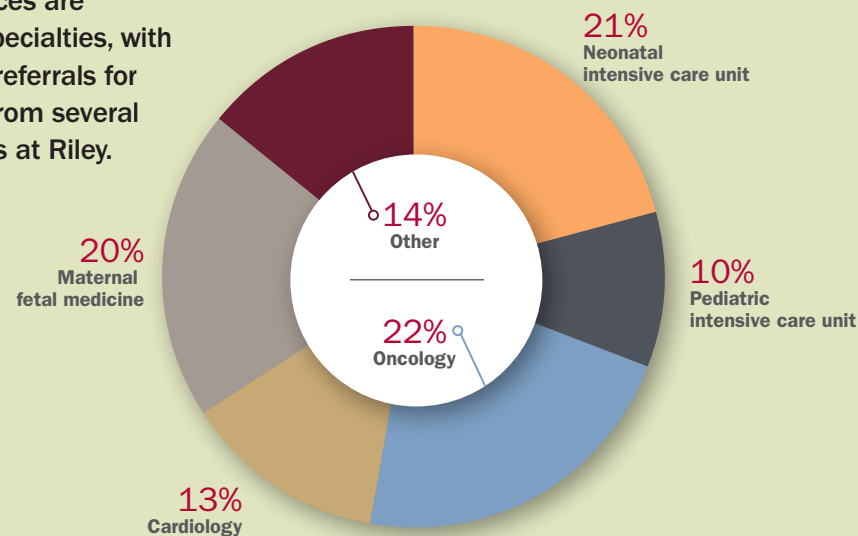
See full team
member list

Riley Palliative Care offers inpatient and outpatient clinical visits and delivers home-based care in partnership with hospice services.

2,286 patient visits in 2020

291 new consultations in 2020

Palliative care services are integrated across specialties, with our team receiving referrals for new consultations from several clinical departments at Riley.



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Research publications

The American Journal of Hospice & Palliative Care: November 2020
Pediatric Resident Perception and Participation in End-of-Life Care

Journal of Perinatology: December 2020

Neonatal Palliative Care: Perception Differences Between Providers



Supporting diversity, equity and inclusion

Reviewing oncologic outcomes of patients with palliative care involvement, Riley Palliative Care leads an ongoing research project to examine race and demographic data as they relate to use of hospice services and end-of-life preferences.



PHYSICAL MEDICINE AND REHABILITATION

Led by expert physiatrists, Riley Physical Medicine and Rehabilitation offers medical management to optimize health, function and overall well-being. We provide structured therapy programs designed to maximize children's function and mobility so they can more fully participate in activities.

Program distinctions



Only pediatric inpatient rehabilitation unit in Indiana



Home to the state's only fellowship training program in pediatric rehabilitation medicine



Multidisciplinary approach promotes functional recovery of children and adolescents



Riley's Pediatric Rehabilitation Medicine Fellowship was accredited by the Accreditation Council for Graduate Medical Education in 2020.



DIVISION CHIEF

> **Francisco J. Angulo Parker, MD**

Assistant Professor of Clinical Pediatrics,
IU School of Medicine

Connect with Dr. Angulo Parker on Doximity.

4

board certified
physicians



See full team
member list

Specialized programs

Spina Bifida Program and Cerebral Palsy Program

- Using a multidisciplinary approach, these programs offer a variety of ancillary services, including dietary support, orthotics, and a wheelchair and car seat specialist; staffed by several specialties to achieve care coordination.

Brachial Plexus Program

- Interdisciplinary team provides comprehensive treatment for brachial plexus injuries.

Traumatic Brain Injury and Concussion Program

- This comprehensive program delivers multispecialty care coordination to meet the unique needs of patients with traumatic brain injuries and concussions.

Movement Disorder Program

- Using surgical and nonsurgical approaches, this program provides complete treatment for complex hypertonia.



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317.944.2353

Our pediatric inpatient rehabilitation unit served 113 patients in 2020.

Top five impairment groups or diagnoses:

1. Nontraumatic brain injury
2. Major multiple trauma
3. Traumatic brain injury
4. Nontraumatic spinal cord injury
5. Traumatic spinal cord injury

Outpatient Data: 2020

Patient visits
2,964

Virtual visits
394

New patient visits
310

Procedures
696



Professional organization affiliations

ADAPTIVE SPORTS AND RECREATION COMMITTEE

American Academy of Cerebral Palsy and Developmental Medicine

Jessica L. Camilleri, DO

ADVOCACY COMMITTEE

American Academy of Cerebral Palsy and Developmental Medicine

Laura E. Black, MD

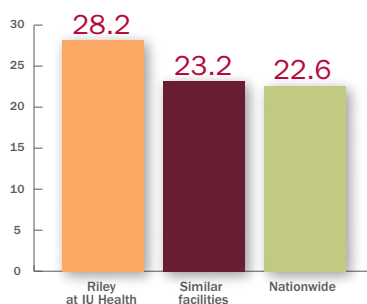
In 2020:

- Average age of patients treated: **11.2 years** (with a range from 3 months to 20 years old)
- Discharged to community: **96.5%**

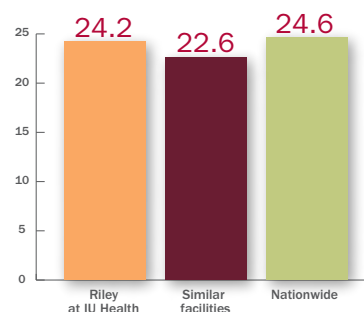


Outcomes Data: 2020

WeeFIM rating total gain

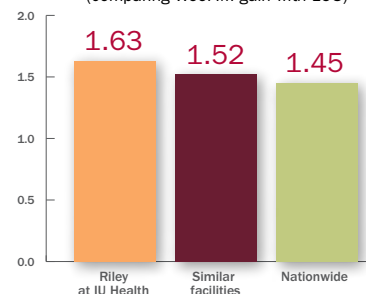


Length of stay (LOS)

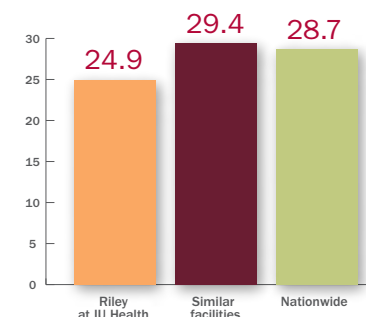


LOS efficiency

(comparing WeeFIM gain with LOS)



Average onset in days



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317.944.2353

PSYCHIATRY AND PSYCHOLOGY

The expert team of child and adolescent psychiatrists and clinical child psychologists at Riley Children's Health partners with children and families to develop a treatment plan to address each child's mental health needs. Working in outpatient, hospital-based and emergency department settings, our clinicians focus on advanced, evidence-based evaluations and treatments to provide expert care for psychiatric diagnoses and behavior problems. Services include:

- Diagnostic evaluation
- Individual psychotherapy
- Family therapy and behavior modification
- Psychological testing
- Pharmacotherapy

Program distinctions



Home to one of only two specialists in Indiana certified to train clinicians to use the Autism Diagnostic Observation Schedule-2, the gold standard for diagnosing autism



Led the development and testing of assessments that are widely used internationally, including the Learning, Executive and Attention Functioning (LEAF) Scale and the Outburst Monitoring Scale (OMS)



One of the few sites in the U.S. to offer a Triple Board Program that trains physicians in pediatrics, general psychiatry and child and adolescent psychiatry



Home to the state's only fellowship program that trains child and adolescent psychiatrists



DIVISION CHIEF

> **Leslie A. Hulvershorn, MD, MSc**

Associate Professor of Psychiatry,
IU School of Medicine

Connect with Dr. Hulvershorn on Doximity.

30

doctoral-level
providers



See full team
member list

Specialized programs

Outpatient psychiatric care

Provides comprehensive, evidence-based psychotherapy and pharmacotherapy across all diagnostic domains, including mood and anxiety disorders, autism, tics and compulsive disorders, trauma-related disorders, self-injurious behaviors, and disruptive behavior disorders

Hospital-based psychiatric care

Includes Indiana's only Emergency Department Behavioral Health Access Center staffed by in-person child psychiatrists; a multidisciplinary Psychiatric Consultation-Liaison Service that provides mental health assessments and unique treatment services for medically hospitalized patients; and a dialectical behavior therapy-informed child and adolescent psychiatric inpatient unit

Substance use disorder treatment

One of a few adolescent substance use disorder treatment programs in the Midwest that uses medication-assisted treatment



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317.329.7313

Leading-edge technologies and procedures

- **Electroconvulsive therapy and transcranial magnetic stimulation** – Riley specialists are among the only practitioners in the state able to use ECT and TMS to treat severe psychiatric disorders in youth.
- **ReSET** – FDA-approved prescription, app-based digital therapeutic that delivers cognitive behavioral therapy and contingency management content for individuals with substance use disorders.
- **Computer adaptive testing** – This testing, based on multidimensional item response theory for mental health and substance use disorders, allows for measurement-based care in our programs.



Research highlights

Study topics:

- Language development in hearing-impaired children
- **Telehealth Recovery & Resilience Program – Opioid Extension in Adolescent and Young Adult Trauma Survivors**
- Risky decision-making in youth
- Virtual reality and perspective taking

38

research
publications
in 2020



Riley at IU Health developed and operates Indiana's only child psychiatry access programs—**Behavioral Health Access Program for Youth (Be Happy)** and Adolescent Addiction Access—which support pediatric physicians and advanced practice providers in caring for youth with mental health and substance use disorders.

Be Happy is a part of the National Network of Child Psychiatry Access Programs.

Professional organization affiliations

VICE CHAIR, EPILEPSY MAINTENANCE OF CERTIFICATION COMMITTEE

American Board of Psychiatry and Neurology

David W. Dunn, MD

RESEARCH COMMITTEE MEMBER

American Academy of Child and Adolescent Psychiatry

Leslie A. Hulvershorn, MD, MSc

COMMISSION ON ACCREDITATION

American Psychological Association

Ann M. Lagges, PhD

CHILD AND ADOLESCENT MENTAL HEALTH WORKGROUP MEMBER

National Network of Depression Centers

Leslie A. Hulvershorn, MD, MSc

Advancing care in Indiana and beyond

ENCOMPASS is a treatment model that uses CBT, motivational interviewing, pharmacotherapy and contingency management to treat co-occurring psychiatric and SUDs in adolescents. Riley is the only entity in the U.S. certified to train others on this evidence-based model.



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PULMONOLOGY AND SLEEP MEDICINE

The pulmonology and sleep medicine specialists at Riley Children's Health provide advanced, child-focused and family-centered clinical care to children with respiratory, allergy and sleep disorders. Our team serves as a specialized medical home that works together with hospital and community-based providers to treat children with chronic respiratory illnesses.



DIVISION CHIEF

> **James F. Chmiel, MD, MPH, ATSF**

Professor of Pediatrics,
IU School of Medicine

Connect with Dr. Chmiel on Doximity.

22

board certified
physicians



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member list

Program distinctions



Ranked among the top 15 pediatric pulmonology programs in the nation by *U.S. News & World Report*



One of the nation's largest cystic fibrosis programs; only program in Indiana accredited by the Cystic Fibrosis Foundation



Home to an interdisciplinary inpatient BPD program that lowers mortality and reduces the number of infants needing tracheostomy

Specialized programs

- Infant Breathing Program
- Cystic Fibrosis Program
- Aerodigestive Program
- High-Risk Asthma Program
- Primary Ciliary Dyskinesia (PCD) Program
- Pulmonary Hypertension Program
- Sickle Cell Disease Program
- Sleep Disorders Program
- Home Ventilation Program

Leading-edge technologies and procedures

Multiple breath washout measures air flow in and out of the lungs and is more sensitive in detecting abnormalities in cystic fibrosis patients.

iPad home monitoring program for pulmonary hypertension patients receiving subcutaneous or intravenous prostacyclin therapy.

Riley at IU Health is one of the few facilities in the U.S. capable of administering infant pulmonary function testing. We are **one of only two centers worldwide** that can measure diffusion capacity in infants.

Procedure Volume: 2020

Pulmonary
function tests
6,427

Sleep
studies
2,660

Cystic Fibrosis Patient Volume: 2020

Pediatric patients **340**
Adult patients **252**

Program accreditations

Cystic Fibrosis
Foundation

American Academy
of Sleep Medicine

Primary Ciliary
Dyskinesia Foundation



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317.948.7208



Research highlights

By the numbers: 2020

30 randomized clinical trials

63 observational studies

50 clinical/research database projects

Opened **14** new protocols

Closed/completed **29** protocols or projects

121 total IRB-approved projects

Select study topics and notable publications

PrecISE: Precision Interventions for Severe and/or Exacerbation-prone
Asthma Network National Clinical Trial

Journal of Cystic Fibrosis: May 2020

Predictors of Pulmonary Exacerbation Treatment in Cystic Fibrosis

Behavioral Sleep Medicine: September 2020

Implementation of Infant Behavioral Sleep Intervention in a Diverse Sample of Mothers

Pediatric Pulmonology: October 2020

Antenatal Corticosteroids Decrease Forced Vital Capacity in Infants Born Fullterm

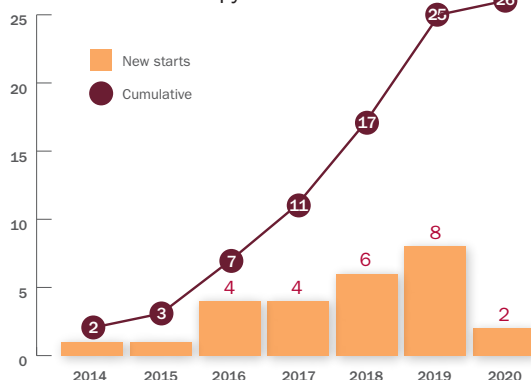
63

research
publications
in 2020



IV/SubQ Treprostinil Therapy: 2014 – 2020

To treat severe pulmonary arterial hypertension, Treprostinil is most effective when given continuously through either a permanent IV or subcutaneous catheter. Riley's team has multiple years of experience in initiating and maintaining vulnerable patients on this complex, labor-intensive therapy.

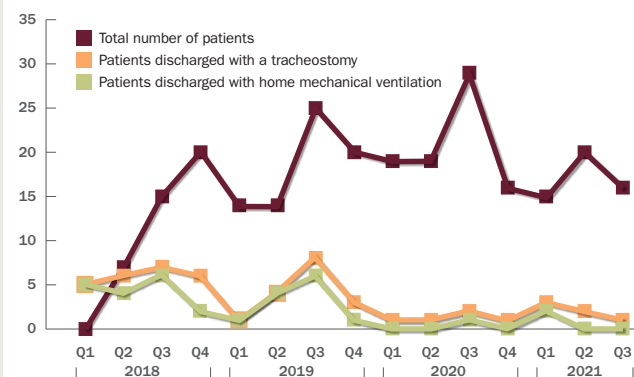


High-Risk Asthma Program Outcomes: 2015 – 2020

This program has resulted in a 30% decrease in asthma readmissions and a 25% decrease in length of stay.

Year	IN readmission (%)	Length of stay (IN+Obs combined)
2015	2.09	2.38
2016	2.17	2.32
2017	1.17	2.2
2018	0	1.91
2019	0.6	2.03
2020	2.13	1.78

Interdisciplinary BPD Team in NICU: Patients Seen and Results



Select professional organization affiliations

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James F. Chmiel, MD, MPH, ATSF

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Society for Behavioral Sleep Medicine

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American Thoracic Society

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American Academy of Sleep Medicine

Anuja Bandyopadhyay, MD

MEMBER, PROGRAM COMMITTEE

American Thoracic Society

A. Ioana Cristea, MD



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RHEUMATOLOGY

Riley Rheumatology is one of the nation's largest programs specializing in autoimmune diseases such as juvenile arthritis and lupus, and less common autoinflammatory diseases. Our team offers the latest and most promising treatments, some of which are only available through research trials. Rheumatologists at Riley are involved in clinical trials of novel medications and drug combinations that are defining how to treat these chronic inflammatory diseases in children.

Program distinctions



One of the largest academic pediatric rheumatology programs in the nation; only group of board certified pediatric rheumatologists in Indiana



Robust research program that studies genetic causes and disease mechanisms of rare autoimmune, autoinflammatory and primary immune deficiency overlap syndromes



Building clinical focus areas in joint diseases and treatment, sclerosing skin diseases and autoinflammatory/immune dysregulation disorders



DIVISION CHIEF

> **Eric P. Hanson, MD**

Associate Professor of Pediatrics,
IU School of Medicine

Connect with Dr. Hanson on Doximity.

9

board certified
physicians



See full team
member list

Specialized programs

Temporomandibular Joint (TMJ) Program

In partnership with IU School of Dentistry, Riley rheumatologists support the evidence-based evaluation, diagnosis and anti-inflammatory drug treatment of patients with arthritis that leads to TMJ dysfunction.

Related research

Research is a key component of the TMJ Program. Studies are designed to improve TMJ disease management and outcomes, based on specialized understanding of a patient's pathology.



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317.274.2172

Leading-edge technologies

- Intra-articular arthrocentesis and infusion training program
- Advanced genomics and precision medicine analyses of rare autoinflammatory disease cases

Notable research publications

The Journal of Clinical Investigation: April 2020
Distinct Interferon Signatures and Cytokine Patterns Define Additional Systemic Autoinflammatory Diseases

The Journal of Experimental Medicine: May 2020
Somatic SMAD3-activating Mutations Cause Melorheostosis by Up-regulating the TGF- β /SMAD Pathway

—
6
 research
 publications
 in 2020
 —

**First preventive trial for complications of juvenile arthritis**

Riley Rheumatology is a participant in the multicenter trial, “A Randomized, Open Label, Multi-Center, Phase 3 Efficacy Study of Sub-Q Abatacept in Preventing Extension of Oligoarticular JIA.”

**Research highlights****Childhood Arthritis and Rheumatology Research Alliance (CARRA)**

Riley at IU Health is a leading recruiting site for CARRA, the largest, most comprehensive North American registry of patients with pediatric rheumatic disease.

Study topics:

- Juvenile spondyloarthritis
- Chronic nonbacterial osteomyelitis

Riley Center for Immune Dysregulation Research

The ImmunoGenetics Program at the Riley Center for Immune Dysregulation Research was established in 2019 to study genetic causes and disease mechanisms of rare autoimmune, autoinflammatory and primary immune deficiency overlap syndromes. Patients are enrolled in one or more natural history protocols to be evaluated.

COVID-19 research**Molecular diagnosis of severe viral response syndromes**

Study is designed to understand the genetic susceptibilities and immune response events that lead to severe disease characterized by SARS-CoV-2 and related viruses.

- Evaluate samples to obtain genetic sequencing and perform genetic variant analysis.
- Measure gene expression and cytokine levels to develop an understanding of disease mechanism.
- Pursue detailed mechanism studies to understand how altered NF-kB regulation leads to severe inflammatory outcomes.



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Division Chief

J. Dennis Fortenberry, MD, MS

Eric Meininger, MD, MPH

Mary Ott, MD, MA

Cynthia Robbins, MD, MS

Mary Rouse, MD

Marcia Shew, MD, MPH

Rebekah Williams, MD, MS

Kelly Donahue, PhD, HSPP

Laura L. Erickson, RN, MSN, CPNP

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Girish V. Vitalpur, MD, FAAP, FAAAAI
Director

Jay J. Jin, MD, PhD

Kirsten M. Klopfer, MD, MS

Nurcicek Padem, MD, MS

Cecilia M. Beehler, MSN, CPNP, FNP-C

Olivia M. Swinger, MSN, RN, CPNP

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Larry W. Markham, MD
Division Chief

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Mark D. Ayers, MD

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Thomas E. Capannari, MD

Timothy M. Cordes, MD

Robert K. Darragh, MD

Erin K. Davis, MD

Eric S. Ebenroth, MD

Huda Elshershari, MD

Anne G. Farrell, MD

Mark H. Hoyer, MD

Michael W. Johansen, DO

Tiffanie R. Johnson, MD

Adam C. Kean, MD, MPH

Benjamin J. Landis, MD

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John J. Parent, MD, MSCR

Gabriel Paris, MD

Jyoti K. Patel, MD

Ronald M. Payne, MD

Poonam M. Puranik, MD

Andrew L. Rodenbarger, MD

Michael M. Ross, MD

Marcus S. Schamberger, MD

Ryan M. Serrano, MD

Megan M. Wilde, MD

Lauren Sterrett, PA

Rosie Bland, NP

Nichole M. Gralia, NP

Jennifer A. Grossi, NP

Dana M. Hartman, NP

Child Protection Program

Roberta A. Hibbard, MD
Division Chief

Cortney Demetris, MD

Ann E. Freshour, DO

Ralph A. Hicks, MD

Tara Holloran, MD

Holly Robinson, MD

Shannon L. Thompson, MD

Barb Mulvaney, RN, CPNP-PC, SANE-P

Andrea Powers, RN, CPNP-PC

Anna Gordon, RN, CPNP-PC

Barb Coffel, RN

Jena Lane, RN

Dawn Rank, RN

Chanin Smith, MSW, LCSW

Lisa Emberton, MSW, LCSW

Jennifer Norris, MSW, LCSW

Peggy Box, MS

Russell Black

Andrew Bodenham

Lori Millikan

Critical Care

Cardiac Critical Care

Riad Lutfi, MD
Director

Gabriela I. Centers, MD

Christopher W. Mastropietro, MD, FCCM

Lee D. Murphy, DO

Tina M. Schade Willis, MD

Kevin M. Valentine, MD

Mouhammad Yabrodi, MD

Monica S. Broo, NP

Melinda Christian, NP

Melissa Cleveland, NP

Amy DeHeer, NP

Angela Finley, NP

Jamie Floyd, NP

Melissa Johnson, NP

Ashley Lawrence, NP

Sydney Rice, NP

Jessica Riggins, NP

Kimberly Stull, NP

Erica Vinson, NP

Critical Care

Pediatric Critical Care

Mara E. Nitu, MD, MBA
Division Chief

Kamal M. Abulebda, MD

Samer Abu-Sultaneh, MD

Andrew L. Beardsley, MD

Zachary J. Berrens, MD, MPH

Gabriela I. Centers, MD

Jason A. Espinoza, MD

Matthew L. Friedman, MD

Courtney T. Frye, MD

Michael J. Hobson, MD

Brian D. Leland, MD

Riad Lutfi, MD

Chris G. Markham, MD

Christopher W. Mastropietro, MD, FCCM

Danielle K. Maue, MD

Lee D. Murphy, DO

Laura A. Pacholski, MD

Colin M. Rogerson, MD

Courtney M. Rowan, MD

Tina M. Schade Willis, MD

Nathan D. Swinger, MD

Alvaro J. Tori, MD

Kevin M. Valentine, MD

Mouhammad Yabrodi, MD

Matthew L. Yuknis, MD

Courtney Barnett, NP

Monica S. Broo, NP

Casey L. Culley, NP

Angela R. Finley, NP

Christina M. Geis, NP

(continued on next page)



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Critical Care

Pediatric Critical Care *continued*

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Ann E. McCallister Mills, NP
Anila N. Paul, NP
Natalie E. Szczypiorski, NP

Dentistry

Brian J. Sanders, DDS, MS
Division Chief
Jeffrey A. Dean, DDS, MSD
James E. Jones, DMD, MSD, EdD, PhD
LaQuia A. Vinson, DDS, MPH
Juan F. Yepes, DDS, MD, MPH, MS,
DrPH

Dermatology

Anita N. Haggstrom, MD
Division Chief
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Donna C. Cummings, PA-C

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Co-Division Chief
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Co-Division Chief
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Dorota Szczepaniak, MD, FAAP
Sarah Brown, PsyD, HSPP
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Elesia N. Hines, PsyD, HSPP
Steven M. Koch, PhD, HSPP
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HSPP
Christine M. Raches, PsyD, HSPP
Debra L. Reisinger, PhD, HSPP
Maura Rouse, PsyD, HSPP
Tybytha Ryan, PhD, HSPP
Lynne A. Sturm, PhD, HSPP
Susan M. Bollman, CPNP
Casaundra Gutowski, CPNP
Charlene H. Davis, CPNP
Patricia A. Halloran, CPNP
Mary F. Hickel, CPNP
Donna U. Watkins, CPNP
Rachel Cooper, LPN
Kelly Geary, RN
Denise Hahn, RN
Melissa Hash, RN
Debbie Rickard, LPN
Jillian Thomas, RN

Gretchen Vandergriff, RN
Mary Lou Wulf, RN
Kerry M. White, MS, LCGC
Caitlin Martin, MS, CCC-SLP
Sarah Muir, MS, CCC-SLP
Carrie Fitterling, LCSW
Salma Mohiuddin, LCSW
Margo Ramaker, LCSW
Connie Citrino, RD
Christina Wadelton, RD

Diabetes and Endocrinology

Linda A. DiMeglio, MD, MPH
Division Chief
Erica A. Eugster, MD
John S. Fuqua, MD
Anisha Gohil, DO
Nadine G. Haddad, MD
Tamara S. Hannon, MD
Erik A. Imel, MD
Heba Ismail, MD
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Zeina M. Nabhan, MD
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Juan C. Sanchez, MD
Emily K. Sims, MD
Emily C. Walvoord, MD
Erika L. Zevin, MD
Kelly Donahue, PhD
Heather Jolivet, NP
Jill Meier, NP
Mary Kay Mitscher, NP
Dana Mitten, NP

Staci Nekic, NP
Tina Pottorff, NP
Karen Stancombe, NP
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Division Chief
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Boaz Karmazyn, MD
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Pediatric Interventional Radiology

Francis Marshalleck, MD
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Christopher Sinsabaugh, MD

Pediatric Neurointerventional Radiology

Mesha Martinez, MD
Pediatric Neuroradiology
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Drew A. Streicher, MD
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Isaac Wu, MD

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Elizabeth Weinstein, MD, FACEP,
FAAEM, FAAP

Division Chief

Tyler S. Arnold, MD

Mariju Baluyot, MD

Stephen J. Cico, MD, MEd

Gregory W. Faris, MD

Lindsey N. Haut, MD

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Division Chief

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Annemarie Rompca, MD

Adam Russman, MD

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Brandon A. Sparks, MD

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Charles P.B. Vanderpool, MD

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Shamaila Waseem, MD, MS

Sandra Kennedy, NP

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Tiffani Tobe, CNS

Gail Waltz, NP

General and Community Pediatrics

Dorota A. Szczepaniak, MD, FAAP

Division Chief

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James T. Blackwell, MD

Sarah S. Bosslet, MD

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Mary R. Ciccarella, MD

Susan M. Gaston, MD

Robert Gonzalez, MD

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Maria J. Herrera, MD, MS

Zahra Kamal, MD

Thomas K. Klausmeier, MD

Parisa Mansoori, MD

Meagan B. O'Neill, MD

Erin J. Phipps, MD

April P'Pool, MD

Lori S. Price, MD

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Emily K. Scott, MD

Ryan J. Stegnik, MD

Sarah M. Stelzner, MD

Patricia A. Treadwell, MD

David E. Van Reken, MD

Laura M. Walls, MD

Abby Williams, MD

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primary care providers, visit
rileychildrens.org/findprimarycare.

Hematology/Oncology

Jamie L. Renbarger, MD, MS

Division Chief

Sandeep Batra, MD

Melissa K. Bear, MD, MS

Jennifer A. Belsky, DO, MS

Kari L. Bjornard, MD, MPH

Lindsay A. Blazin, MD

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Marissa A. Just, MD

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Stayce Woodburn, RN, MSN, CPNP

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CPON, CHPPN
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Division Chief

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Tamara Stanley, LCSW, MSW

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Jenny Rollins, RN
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Pulmonology and Sleep Medicine

James F. Chmiel, MD, MPH, ATSF
Division Chief

Pulmonology

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Hasnaa E. Jalou, MD
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