Welcome to Riley Children’s Health

As one of the nation’s leading pediatric health systems, Riley Children’s Health is committed to delivering evidence-based, patient-centered care to children and families. We are pleased to share this overview of Riley’s 25 medical specialties,* highlighting our expertise in pediatric healthcare from primary care to the most serious and complex medical conditions.

Our care teams are honored to be part of a children’s hospital that is consistently ranked among the best in the nation by U.S. News & World Report. This year, Riley Hospital for Children at Indiana University Health—Indiana’s only nationally ranked children’s hospital—is one of only 24 hospitals to be ranked in all 10 pediatric specialties cited by U.S. News. Our urology and cardiology and heart surgery programs are ranked second and fifth, respectively, with three other programs earning placement in the top 15.

With quality and safety among our highest priorities, Riley is a partner in the Children’s Hospitals’ Solutions for Patient Safety Network, a group of hospitals that shares best practices for delivering preeminent care. As a leader in harms reduction and quality improvement, Riley has exceeded, as of November 2020, 483 days without a serious safety event. We’ve also received best-in-class recognition for our Level I Pediatric Trauma Center, congenital heart surgery program and extracorporeal membrane oxygenation program, among others.

While this is a 2019 report, we would be remiss if we didn’t address the COVID-19 crisis that has gripped our state, nation and world. Months before the pandemic and in step with other IU Health system hospitals, Riley prepared for what we knew to be unprecedented circumstances. Making significant modifications to safely deliver care under challenging conditions, our response to COVID-19 has been swift, far-reaching and impactful.

- Riley is the only Indiana children’s hospital—and one of the few regionally—to voluntarily contribute data to the Virtual PICU System, a dashboard launched to track pediatric COVID-19 cases across North America and used to inform best practices for treatment.
- For seriously ill children with heart and kidney conditions, we transitioned within 36 hours to virtual care to ensure crucial monitoring and oversight continued without interruption.
- Our specialists have initiated COVID-19 research studies and developed clinical guidelines to treat children with multisystem inflammatory syndrome (MIS-C).
- Through virtual town halls, Riley physicians are sharing the latest information and guidance with pediatric providers across the state.

These are just a few examples of our leadership in battling COVID-19. Through this pandemic and beyond, Riley is driven by our enduring commitment to deliver the unmatched clinical care and ambitious research that make healthier lives possible for children in Indiana and around the world.

* The surgical specialties of Riley Children’s Health are highlighted in a separate annual report. Visit rileychildrens.org/surgeryannualreport or request print copies from rileychildrens@iuhealth.org. This annual report is also available online at rileychildrens.org/medicalannualreport.

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Story of Riley siblings:
Samantha Brown, age 7
Miles Brown, age 3
Brother and sister beat cancer together.

Jeff and Melissa Brown are watching and laughing as their 7-year-old daughter flips her little body into cartwheels and headstands around their Westfield home. The laughter feels good after nine months of unrelenting worry. It’s a long way from where they were last summer, when the couple were knocked flat by the news that their first-born, Samantha, had kidney cancer.

Just about the time they approached the finish line of her treatment at Riley at IU Health came another devastating blow almost too cruel to believe. Their 2-year-old son, Miles, was diagnosed with Burkitt’s leukemia, an aggressive cancer.

“Don’t know that we have processed it,” Melissa said during an interview earlier this year. “You don’t really have a choice but just to keep moving forward.”

It started in August 2019 when Samantha was diagnosed with Wilms’ tumor, a rare form of kidney cancer. She underwent surgery to remove the tumor, then began a five-month course of chemotherapy as an outpatient at Riley. In December, when Samantha was just a month away from completing chemo and her scans were looking good, the family took a trip to Chicago, where they had previously lived. While there, Miles, who was born in Chicago, had an appointment with a pediatric urologist who had been watching a condition he was born with called hydronephrosis, a swelling of the kidney due to a build-up of urine.

Jeff will never forget what he saw during Miles’ testing.

“I was watching the ultrasound and I could see stuff lighting up in there, and I’m asking, ‘What is that?’”

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

Riley Hospital for Children at IU Health – Indianapolis
Riley Hospital for Children at IU Health North Hospital – Carmel

AFFILIATED WITH

INDIANA UNIVERSITY SCHOOL OF MEDICINE

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.

Leader in research and innovation

• Indiana’s only pediatric research hospital
• Sixth-ranked children’s hospital for National Institutes of Health 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

About Riley Children’s Health

Riley Children’s Health, Indiana’s largest and most skilled pediatric 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 Hospital for Children at IU Health North Hospital – Carmel

COMPREHENSIVE CHILDREN’S HOSPITAL AND HEALTH SYSTEM OF

Indiana University Health

Leaders in education, training and research

Riley Children’s Health Statewide Reach

After learning that Miles had multiple tumors on his kidneys and his liver, Jeff immediately sent an email to Riley oncologist Michael J. Ferguson, MD, who was overseeing Samantha’s care. The email was marked urgent, but this time it was about Samantha’s little brother.

Dr. Ferguson got on the phone with the couple and the Chicago urologist to discuss Miles’ care and create a game plan for treatment. The family got in their car and drove back to Indianapolis the next day.

Once at Riley, a CT scan confirmed the diagnosis of Burkitt’s. Miles was admitted to Riley and was hospitalized for 54 days.

Riley oncology team members helped carry them through the worst of it. Miles, who was born in Chicago, had an appointment with a pediatric urologist who had been watching a condition he was born with called hydronephrosis, a swelling of the kidney due to a build-up of urine.

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Riley Children’s Health Statewide Reach
Sharing expertise with colleagues statewide
COVID-19 town halls
- Virtual events for community-based medical providers
- Latest guidance and treatment of MIS-C
- Back-to-school series with practical health tips for a safe restart during the pandemic
- COVID-19 research by Riley specialists

Project ECHO (Extension for Community Healthcare Outcomes)
Riley physicians participate in Project ECHO, an initiative connecting local primary care providers with specialists to improve treatment for complex and chronic health concerns. In 2019, our physicians shared knowledge and best practices for sepsis prevention.

Promoting prevention and improving access to care
Flu vaccinations and COVID-19
In a year when flu vaccinations are even more important to public health, Riley provided hundreds of free flu shots to children and families during two flu vaccination events at The Children’s Museum of Indianapolis.

Virtual visits
To help ensure uninterrupted care during the pandemic, Riley specialists increased and in some cases initiated the use of virtual visits and telehealth to meet the health needs of pediatric patients in Indiana. Several Riley surgical specialties use virtual care for initial assessments and follow-up visits, and the Riley Emergency department is evaluating how telehealth can be used to provide emergent care.

Supporting civic involvement and healthcare advocacy
Riley emergency medicine physicians volunteered to participate in VoIER, a nationwide nonpartisan initiative aimed at helping people register to vote. Founded by an emergency medicine resident at Harvard, VoIER mobilizes healthcare organizations to provide information and resources to patients who express an interest in voting or using their voice to change healthcare policy. Physicians at Riley and IU Health Methodist Hospital—wearing “Ready to Vote?” lanyards—helped 85 patients register to vote in the weeks before Indiana’s voter registration deadline.

Meeting patients where they are: Riley Children’s Health at IU Health North
- Riley inpatient care at IU Health North Hospital with pediatric intensive care unit and 24/7 coverage
- Surgery and procedures in gastroenterology, urology, pulmonology, otolaryngology, orthopedics and sports medicine, and general surgery
- On-site pediatric emergency medicine physicians
- Outpatient care in more than two dozen pediatric specialties

As Indiana’s largest and most comprehensive healthcare system for children, Riley Children’s Health is committed to using our expertise and resources to serve our community. We offer advanced, nationally ranked care in more than 15 communities across Indiana. Riley is also a leader in promoting preventive care and in sharing our specialized expertise with medical providers and stakeholders to improve the health and well-being of children and families.

Helping to build strong, healthy communities

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New maternity tower to feature unique, fully integrated care model

The Maternity Tower at Riley Hospital for Children at IU Health is scheduled to open in 2021. The facility centralizes all of Riley’s obstetric and neonatal care across the Riley Hospital for Children and IU Health Methodist Hospital campuses. The maternity tower 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. Riley, alongside our partners at IU Health, offers comprehensive, multidisciplinary services and exceptional medical support to patients experiencing low- to high-risk pregnancies.

In March 2020, Riley Maternal Fetal Medicine relocated to the Riley Outpatient Center, expanding its footprint with additional private exam rooms and ultrasound suites. The Riley Fetal Center is housed in the same area and includes a “nesting room” for patients to relax between appointments and testing.

Riley Fetal Center
The Riley Fetal Center provides preeminent management of a broad range of complex and high-risk conditions, while supporting families with coordinated care specific to the needs of the patient.

- Advanced fetal imaging, including echocardiography, extensive ultrasonography and the state’s only fetal MRI
- Personalized, multidisciplinary and family-centered care consultations with families and support team members
- Multidisciplinary fetal care conferences, bringing together more than 40 Riley specialists, to discuss best practices and management plans for complex fetal diagnoses

Maternity Tower at Riley Hospital for Children

Expertise and services
- Most comprehensive obstetrics and maternal fetal medicine program in the state
- High-risk pregnancy consultation and services for women with medical and obstetrical issues
- On-site Level III and Level IV NICUs
  - Riley’s combined Level III and Level IV NICU is the largest NICU in Indiana and among the largest in the country
- Specialty maternal fetal medicine programs:
  - Mood Disorders Program (collaboration with IU Health Psychiatry)
  - Maternal Recovery Program (women recovering from substance abuse disorders)
  - Centering Pregnancy Program (group prenatal care)
  - Programs for pregnant women with medical conditions such as diabetes and cardiac disease
- General pregnancy care, including experienced obstetricians and midwifery program

Learn more about our approach to maternity and newborn health

Collaboration between obstetrics and neonatology exists in most health centers, but the Riley care model is integrated both operationally and physically in our children’s hospital. This allows our specialists to deliver services in a seamless manner from initial consultation and maternal and fetal assessment to delivery planning—and finally, to management of labor and delivery. For babies needing immediate, high-level care, our pediatric subspecialists are available on site, with no need for transport, resulting in consistently better patient outcomes.

Comprehensive services for high-risk and low-risk pregnancies

Being equipped to manage the highest risk cases means Riley is more than prepared to take care of mothers experiencing normal pregnancies. Complications during labor and delivery are unpredictable and occur even in pregnancies that are considered low risk. Our expertise in managing complex pregnancies makes Riley the safest place even for low-risk patients because of our ability to skillfully respond at the highest level to unexpected complications that can happen.

In addition, the new midwifery program at Riley offers an alternative for women who want a more natural labor and delivery experience and also desire the security of a hospital setting. Our certified nurse midwives provide patient-centered care for women through pregnancy, birth, postpartum and beyond.

24/7 adult care for mothers

While our maternity services are in a children’s hospital, our program is closely aligned with IU Health adult services to provide high-quality, safe care for all mothers delivering at Riley. Our obstetrics intensive care unit will be covered 24/7 by an adult intensive care physician, and both adult and pediatric experts from throughout the IU Health Adult Academic Health Center will be on call day and night for consultations at Riley, if needed.

Maternity tower
These images are renderings only. The final product may differ slightly.
Adolescent Medicine

Riley Adolescent Medicine is dedicated to the care and treatment of young people up to age 21. Our fellowship-trained physicians, experienced in caring for the special needs of teenagers and young adults, treat a wide range of adolescent health concerns, including eating disorders, reproductive health and gender health. The adolescent medicine team routinely works with other Riley specialties, including cardiology, hematology/oncology, child development, psychiatry, endocrinology, and obstetrics and gynecology.

Expertise and specialized programs to treat a variety of adolescent health concerns

Adolescent Medicine Consultation Program
This program offers evaluation and treatment of any problem in an adolescent that persists or requires more specialized treatment than is usually available through primary care providers. The range of services is broad and includes treatment for physical, emotional and behavioral concerns. Patients are seen in person at the Riley Pediatric Care Center or through a virtual visit. Common referrals include (but are not limited to):
- Management of chronic illness
- Evaluation for chronic symptoms without a diagnosis
- Mental health and behavioral issues, including anxiety, depression and disordered attention
- Nutritional concerns, including eating disorders

Adolescent gynecology and reproductive healthcare
Riley adolescent medicine specialists evaluate and treat a variety of gynecological conditions, including delayed puberty, dysfunctional uterine bleeding, polycystic ovary syndrome, chronic pelvic pain and dysmenorrhea. Riley offers specialized gynecology and reproductive healthcare, such as long-acting reversible contraceptive options. Our specialists have extensive experience consulting patients and families about fertility preservation for adolescents with complex illnesses, such as heart transplants and congenital heart conditions, sickle cell disease, cystic fibrosis, and childhood cancer.

Riley Gender Health Program for children and adolescents
This interdisciplinary program offers comprehensive support to children, teens and young adults who are experiencing gender dysphoria and seek supportive and affirmative care. We address the medical, psychological, nutritional, family, social, legal and school-related issues associated with diverse gender identities. Our team offers a variety of care and services, including:
- Gender-affirming hormone therapy
- Puberty-blocking medication
- Treatment for menstrual suppression
- Psychological counseling and support
- Surgery consultation and coordination

Charis Center for Eating Disorders
The Charis Center offers the full array of medical, psychological and family services for patients with eating disorders. The multidisciplinary program includes physicians, nurses, psychologists, dietitians, art therapists, schoolteachers and psychiatrists who focus on the care of children, adolescents and adults with eating disorders. The Charis Center treats patients of all ages and provides three levels of care to match the needs of the patient and family.
- Partial hospital program – Eleven-hour therapy, five days per week
- Intensive outpatient program – Three-hour therapy, three days per week; provides group therapy targeted for patients who need more focused treatment
- Outpatient care – More than 10,000 outpatient visits each year

Active in research
Riley adolescent medicine specialists conduct research in a variety of areas, including human papillomavirus (HPV), HPV vaccines, sexually transmitted infections, healthcare access for youth, eating disorders, teen pregnancy prevention, gender health and the long-term effects of illness and recovery on youth. Our researchers are committed to translating research findings into improved patient care and healthcare policy.
Allergy and Immunology

The board certified allergy and immunology specialists at Riley at IU Health are extensively trained in the management and treatment of pediatric allergy, asthma and immunology issues. Our skilled team, which includes two pediatric nurse practitioners, offers the latest diagnostic tools and treatments delivered in a safe and comfortable manner to children dealing with the challenges of allergic conditions. We collaborate with other medical disciplines at Riley to provide integrated, multidisciplinary care to children and families.

Comprehensive care for allergy and immunology conditions

As clinicians, researchers and educators, our specialists are uniquely qualified to diagnose and treat the full spectrum of pediatric allergic conditions:

- Allergic rhinitis (hay fever)
- Angioedema (swelling)
- Asthma
- Drug allergies
- Eczema (atopic dermatitis)
- Eosinophilic esophagitis
- Food allergies/anaphylaxis
- Food protein-induced enterocolitis syndrome
- Urticaria (hives)
- Immune deficiencies
- Insect sting reactions
- Oral allergy syndrome
- Recurrent infections
- Sinusitis

Fields of clinical excellence and specialized programs

Food allergies. Riley at IU Health is recognized by Food Allergy Research & Education as a center of excellence. We perform more than 200 food challenges annually, and our team has years of experience in food introduction at all ages. The Children’s Clinical Research Center at Riley provides designated, child-friendly rooms for families participating in research protocols and food challenges.

Drug allergy management. Our allergy physicians perform several outpatient drug challenges each year. Antibiotic challenges are the most common. In addition, we have collaborated with colleagues in infectious diseases and pharmacy to develop an algorithm based on history, testing and oral drug challenges that accurately labels or de-labels a child’s drug allergies. We have also advised pediatricians across Indiana on how to implement these programs in their practices.

Gastrointestinal Digestive Disease Program. Riley has the only multidisciplinary program in Indiana dedicated to the treatment of children with eosinophilic digestive disorders. Riley allergists, gastroenterologists and dietitians consult with patients and families at every visit to provide comprehensive care for eosinophilic esophagitis, eosinophilic gastroenteritis and other complex immune-mediated digestive issues.

Immunology

Our team provides inpatient and outpatient consultation for children with primary and secondary immune deficiencies. We guide the use of immunoglobulin replacement and other immune modulators in working with children who have challenging cases. Our immunology program addresses the array of immune system disorders, including DiGeorge syndrome, antibody deficiencies, chronic granulomatous disease and other complex conditions. In the past 20 years, we have performed stem cell transplants in more than 25 children with severe combined immunodeficiency (SCID) and other immune deficiencies. Riley immunologists routinely participate in national conferences to review complex cases with colleagues in hematology/oncology, rheumatology and infectious diseases.

Our allergy and immunology specialists collaborate with rheumatologists and other specialists in the Riley Center for Immune Dysregulation. This multidisciplinary program provides optimal care and research opportunities for patients with complex disorders of the immune system. The center is the first of its kind in Indiana and provides families with opportunities to participate in national trials. For more about the center, refer to page 57.

With experience and training in the unique ways allergic reactions affect children, Riley allergy physicians offer the skills and expertise to manage the most complex allergic conditions in children.

The allergy program is a vital part of the Riley High-Risk Asthma Program, which brings together allergists, pulmonologists and clinical asthma educators to address all aspects of asthma management.

Immunomodulator management and immunotherapy

Our specialists—all trained in the management of allergic rhinitis and asthma—have improved the quality of life for hundreds of children with severe asthma by using immunomodulators (biologic medications that reduce inflammation). We also treat children with immunotherapy—allergy injections that change the body’s immune response to pollens, molds, dust mites and animals. Children can then reduce or even stop their medications for itchy eyes, runny nose, sneezing and similar chronic symptoms. We currently see patients in Indianapolis, Carmel and Bloomington, with plans to add more statewide locations.

Serving Indiana’s children

Riley immunologists are responsible for reviewing all positive results for Indiana’s newborn screening program for severe combined immunodeficiency (SCID). Outcomes from SCID treatment show that early identification and intervention with hematopoietic stem cell transplant provide the best chance for survival.

Our specialists are leaders in the state in treating SCID. Management for patients with SCID includes prompt diagnosis, family genetic counseling, inpatient management and long-term care after hospitalization.

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The Riley Heart Center is one of the most highly respected programs for diagnosis and treatment of congenital and acquired heart conditions in children. With the latest technologies and world-class facilities, expert cardiologists at Riley provide the full continuum of care from fetuses and premature infants to adults with congenital heart disease.

**Care from a highly skilled team**
Heart care is managed by an experienced and 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.

**Care for the most fragile**
Fetal Cardiology Program
Our Fetal Cardiology Program, part of the comprehensive Riley Fetal Center, offers in-depth diagnostic imaging and counseling during pregnancy to enable thorough evaluation and development of a treatment plan. With nearly 1,700 evaluations performed in 2019, patient volume has more than doubled since 2000. Fetal echocardiograms are performed statewide in South Bend, Fort Wayne, Bloomington, Evansville and at five locations in Indianapolis.

/Home Monitoring Program
Originally designed for babies with single ventricle physiology, this program now includes any baby with complex physiology. 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 with questions can contact an on-call provider 24/7. Our program allows patients and families to go home sooner and has contributed to a median length of stay following the Norwood procedure that is lower than the national average (47.5 days versus 49.8 days). *

**Notable Home Monitoring Program outcomes**
- 0% inter-stage mortality from 2016 to 2019; 3.8% since 2009
- 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
- 83%: They feel more connected to the Riley care team because of the program

**Home Monitoring Program**
- Provided support with a Berlin Heart to three patients awaiting heart transplant
- Implanted 57 transcatheter pulmonary valves.

Cardiomyopathy Program
Our program is approved by the Children’s Cardiomyopathy Foundation, which recognizes medical centers with expertise in pediatric cardiomyopathy. A center of care provides high-quality cardiac care and special education disease management, including genetic evaluation, to children with cardiomyopathy. Riley cardiologists evaluated 110 new patients in 2019. Since 2016, we’ve assessed more than 500 children for this heart condition.

**Heart failure, transplant and mechanical support**
In 2019, Riley Heart Center:  
- Provided support with a Berlin Heart to three patients awaiting transplant
- Performed nine heart transplants: six pediatric patients and three adult congenital patients
- 100% survival to date in patients receiving heart transplants in 2019

Adult Congenital Heart Disease Program
Jointly led by adult congenital cardiologists from Riley and the Krannert Institute of Cardiology at IU Health Methodist Hospital, our program has experienced tremendous growth in recent years, with outpatient visits increasing from 275 just seven years ago to almost 2,000 evaluations in 2019.

**Cardiology**

**Riley Heart Center Volume**

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<tr>
<th>Cardiology outpatient visits</th>
<th>17,938</th>
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<td>Echocardiogram interpretations in 2019</td>
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<tr>
<th>2016</th>
<th>2019</th>
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<td>7,833</td>
<td>46% increase since 2016</td>
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Child Development and Developmental Pediatrics

Riley at IU Health experts in child development and developmental pediatrics have the experience and resources to care for infants and children with neurodevelopmental disabilities, including those who may have co-occurring emotional or behavioral concerns. Annually, our programs serve more than 5,000 children living in Indiana and surrounding states. We collaborate to provide specialized services to improve access and overall quality of care for our patients.

Helping families understand their child’s condition, our specially trained professionals develop personalized treatment plans to ensure each child receives the care he/she/they need. We provide comprehensive care, working in teams comprised of board certified physicians, pediatric nurse practitioners, psychologists, speech pathologists, social workers, dietitians, a genetic counselor, nurses and others.

Riley Child Development and Riley Developmental Pediatrics are located in the Pediatric Care Center, a newly renovated building on the Riley at IU Health downtown Indianapolis campus. The space houses interdisciplinary teams that often collaborate to support children with developmental needs, offering more services and improved access.

Innovative partnership provides unique service

Riley Child Development specialists are partnering with colleagues in Riley Neonatology to establish an infant mental health program for the Riley neonatal intensive care unit. Christine M. Rachis, PsyD, HSPP, and Elesia N. Hines, PsyD, HSPP, provide support to families and educate team members to promote infant social and emotional well-being in both the inpatient and outpatient care settings.

Skilled, multidisciplinary care team

- 5 board certified specialists in neurodevelopmental disabilities
- 2 board certified developmental-behavioral pediatricians
- 3 board certified child neurologists
- 1 board certified sleep medicine specialist
- 8 general pediatricians
- 1 medicine/pediatrics specialist
- 10 licensed psychologists
- 6 certified pediatric nurse practitioners
- 2 speech language pathologists
- 1 genetic counselor
- 5 social workers
- 2 dietitians

Inpatient care team serves children with complex medical needs

Riley Developmental Pediatrics leads the complex care inpatient service at Riley Hospital for Children, in addition to providing outpatient services for children with neurodevelopmental conditions. Our inpatient team serves children who have complex medical concerns or existing chronic conditions and require a hospital stay. We deliver comprehensive and coordinated care, addressing both medical and social needs. The complex care inpatient approach allows healthcare providers to collaborate as they individualize and streamline each child’s care plan.

Connecting patients with community resources

We are committed to providing individualized care for each child and family, with the goal of helping children develop to their full potential. Focused on the importance of community in the lives of children, our team members are knowledgeable about resources and committed to helping families make connections in their local communities.

Committed to training future clinicians

We understand the importance of educating individuals interested in working with this complex patient population. Our teams provide training to help increase the number of leaders in neurodevelopmental disabilities nationwide.

Leadership Education in Neurodevelopmental Disabilities (LEND)

The Riley Child Development LEND Program 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. These leaders are solidly grounded in their own disciplines and able to work collaboratively with colleagues in interdisciplinary settings.

Graduate medical education

IU School of Medicine’s neurodevelopmental disabilities residency and developmental-behavioral pediatrics fellowship programs, based at Riley at IU Health, provide a variety of clinical experiences to help shape the knowledge of physicians working in the field of neurodevelopmental disabilities.
Child Protection Program

With expertise unmatched in Indiana, the Riley at IU Health Child Protection Program offers multidisciplinary clinical services and education to improve the evaluation and care of maltreated children. Our program’s five board certified physicians provide 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. Our team offers the following services:

- Evaluation of suspected victims of child abuse and/or neglect
- Professional consultation for healthcare providers, child protection services, law enforcement and other professionals
- Crisis counseling for families
- Expert testimony in legal settings when required
- Professional education

Specialized child protection programs offered at Riley

Pediatric Center of Hope. Serving approximately 500 children each year, the center provides comprehensive medical evaluation for children alleged to have been sexually abused.

Foster Care Bridge Clinic. This multidisciplinary clinic acts as a bridge to provide comprehensive healthcare and acquisition of 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. Riley delivers these crisis counseling services to about 1,500 children and family members annually.

Child Abuse Consultation Service. This program facilitates comprehensive medical evaluations for children alleged to have been physically abused or neglected. Annually, our team sees approximately 400 children referred to our program by medical providers or child protective services.

Pediatric Evaluation and Diagnostic Services (PEDS) Program. Each year through PEDS, Riley consults with the Indiana Department of Child Services on about 6,000 cases of suspected child maltreatment.

The Riley Child Protection Program revolves around these core strengths:

- Comprehensive medical evaluations in cases of suspected child abuse
- Crisis counseling for families
- Community education and coordination of services

In 2019, Riley Child Protection facilitated 48 community education programs.

Leadership in graduate medical education

The three-year Riley at IU Health child abuse pediatrics fellowship is one of only 25 child protection fellowship programs accredited by the Accreditation Council for Graduate Medical Education (ACGME). Physicians participating in this subspecialty program receive multidisciplinary training and experience to become experts in child abuse pediatrics.

The Liaison Child Abuse Forum, founded at Riley at IU Health, brings together professionals from child protection services, law enforcement and public schools to solve problems in the identification and management of child abuse cases in Marion County. The forum meets monthly during the school year.

Medical Impression in Suspected Maltreatment Consultations: 2019 – 2020*

- Accidental: 47%
- Medical: 3%
- Neglect: 6%
- No injury: 5%
- Other physical abuse: 19%
- Unknown: 6%
- Abusive head trauma: 1%

* July 2019 – June 2020

Physical Abuse Consultations by Year

- 2009-10: 864
- 2010-11: 993
- 2011-12: 2,044
- 2012-13: 3,095
- 2013-14: 3,485
- 2014-15: 5,441
- 2015-16: 5,172
- 2016-17: 5,552
- 2017-18: 5,425
- 2018-19: 5,442
- 2019-20: 4,973

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

Child abuse physician experts available 24/7 to healthcare providers and family case managers faced with making immediate care decisions

Home to one of the few ACGME-accredited child protection fellowship programs in the nation
Critical Care
Cardiac Critical Care

Providing expert care for critically ill newborns, infants, children and adolescents with congenital and acquired heart disease, the Riley pediatric cardiovascular intensive care unit (CVICU) treats more than 540 inpatients and over 250 cardiopulmonary bypass patients each year. In addition to 16 beds for CVICU patients, our unit also includes a six-bed specialized neonatal ICU.

Riley specialists and professionals from various disciplines—cardiothoracic surgery, cardiology, cardiac critical care, neonatology, nursing, respiratory therapy, nutrition and pharmacy—are available for daily rounds to facilitate patient-focused care coordination and to expedite care.

Focused on quality and safety, Riley Cardiac Critical Care is a leader with a purposefully developed culture of safety resulting in a 14% decrease below benchmark data for adverse events of all causes reported by the Pediatric Cardiac Critical Care Consortium (PC4).

Dedicated to quality and clinical excellence

The Riley Heart Center is a high-reliability unit with experienced specialists and team members working tirelessly to ensure patient safety and the highest quality care.

Additional 2019 outcome measures

![Graph: Risk-adjusted CVICU Surgical Mortality and Risk-adjusted CVICU Medical Mortality]

<table>
<thead>
<tr>
<th>Alternative complications</th>
<th>Cases</th>
<th>Out of</th>
<th>Riley</th>
<th>All PC4* facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI per 1,000 line days (central line-associated bloodstream infection)</td>
<td>0</td>
<td>2,718</td>
<td>0 per 1,000</td>
<td>1.13 per 1,000</td>
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<tr>
<td>CAUTI per 1,000 catheter days (catheter-associated urinary tract infection)</td>
<td>0</td>
<td>1,077</td>
<td>0 per 1,000</td>
<td>1.22 per 1,000</td>
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<tr>
<td>Unplanned extubation per 100 days</td>
<td>7</td>
<td>1,640</td>
<td>0.43 per 100</td>
<td>0.35 per 100</td>
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<tr>
<td>SSI per 100 surgical procedures (surgical site infections)</td>
<td>0</td>
<td>678</td>
<td>0 per 100</td>
<td>0.23 per 100</td>
</tr>
</tbody>
</table>

* Pediatric Cardiac Critical Care Consortium (PC4)

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.

Riley is the only facility in Indiana that offers fellowship training in pediatric cardiac critical care. Our fellowship trainees actively participate in the collaborative care of all cardiology and cardiovascular surgical patients admitted to the pediatric CVICU. We also share our knowledge internationally through lectures and humanitarian work to further promote children’s heart health.

For more about intensive care at Riley, refer to pages 20 – 21 and 40 – 41.

Advancing care at Riley and internationally

Riley Heart Center specialists are committed to improving care for critically ill children with congenital and acquired heart disease at Riley, in the U.S. and around the world.

In addition to contributing to several multicenter research studies, our physicians founded and serve as the coordinating center for the Collaborative Research in Pediatric Cardiac Intensive Care (CoRe-PICIC) network. The network includes 20 U.S. sites participating in several ongoing clinical research projects.

Our specialists also are involved in the Pediatric Cardiac Critical Care Consortium (PC4), which uses registry data from 60 congenital heart programs to evaluate best practices and drive improvements in care. Riley cardiologists and cardiovascular surgeons also serve in international medical missions, providing heart care to critically ill children in Uganda, Jordan and Lebanon.

Only pediatric hospital in Indiana to offer emergency ECMO

The Riley at IU Health Extracorporeal Membrane Oxygenation (ECMO) Program provides cardiopulmonary bypass support in the CVICU setting for neonates and children who suffer from cardiac failure that is refractory to conventional therapies. Riley has earned the Extracorporeal Life Support Organization’s highest designation—the Platinum Level Center of Excellence—and is one of just six pediatric institutions worldwide with this designation. For more on ECMO at Riley, refer to pages 20 and 40.

As one of the first pediatric heart programs in the U.S. to give a child a Berlin Heart ventricular assist device, Riley also offers mechanical ventricular support (including total artificial heart and HeartMate II™ and HeartMate 3™) to children with heart failure refractory to medications.

Committed to educating future critical care specialists

Riley Heart Center is the only facility in Indiana that offers fellowship training in pediatric cardiac critical care. Our fellowship trainees actively participate in the collaborative care of all cardiology and cardiovascular surgical patients admitted to the pediatric CVICU. We also share our knowledge internationally through lectures and humanitarian work to further promote children’s heart health.

For more about intensive care at Riley, refer to pages 20 – 21 and 40 – 41.

Program distinctions

- Ranked among the top five pediatric heart transplant programs by U.S. News & World Report
- Only program in Indiana to offer pediatric heart transplantation and mechanical circulatory support capability
- Exceptional patient quality and safety record that includes three years without a hospital-acquired infection, including CLABSI
- Only pediatric hospital in the state with an emergency ECMO program, using ECMO in cases of pediatric cardiac arrest
- One of only seven programs worldwide to earn the highest rating (three star) from the Society of Thoracic Surgeons (STS)
Critical Care
Pediatric Critical Care

Treating more than 2,500 patients each year, the Riley pediatric intensive care unit (PICU) is one of the highest acuity centers in the U.S. according to The Children’s Hospital Association. Our 42-bed PICU is capable of caring for children with a variety of complex illnesses and provides advanced supportive modalities, including extracorporeal membrane oxygenation (ECMO), inhaled nitric oxide, continuous renal replacement therapy and high-frequency oscillatory ventilation.

Experts in safe procedural sedation
The Riley at IU Health procedural sedation team is led by a pediatric critical care physician and sedation nurse who manage the administration of medicines that reduce awareness, pain and discomfort during medical care and procedures, such as:
- Liver biopsy, kidney biopsy
- Lumbar puncture, bone marrow aspiration
- Hearing tests, dental care
- Imaging studies, including MRI, CT, ultrasound and interventional radiology procedures
- PICC placement

Based on high-quality care and exceptional patient outcomes, Riley’s ECMO program is designated as a Platinum Level Center of Excellence by the Extracorporeal Life Support Organization.

ECMO provides lifesaving support
The Riley ECMO Program delivers cardiopulmonary bypass support for neonates and children who suffer from respiratory or cardiac failure that is refractory to conventional therapies. Comprised of intensivists, pediatric and cardiac surgeons, and ECMO nursing specialists, our multidisciplinary ECMO team supports more than 40 patients annually, making it a high-volume pediatric ECMO center. For more on ECMO at Riley, refer to pages 19 and 40.

Caring for children with COVID-19
During the viral pandemic, the Riley PICU established procedures and protocols to safely and effectively care for children with respiratory failure resulting from COVID-19. Collaborating with our infectious diseases, cardiology and rheumatology colleagues, the pediatric critical care team developed clinical guidelines for the diagnosis and treatment of children critically ill with multisystem inflammatory syndrome (MIS-C). We continue to partner with PICUs across the U.S. to better understand the best treatment modalities for children suffering from COVID-19.

Dedicated to clinical excellence and patient safety
As a member of the Children’s Hospitals’ Solutions for Patient Safety Network, the Riley PICU actively participates in this national network to enhance the delivery of safe care to our patients. By reviewing outcomes, our team implemented multidisciplinary process improvements and accomplished the following quality improvement measures in 2019:
- Reduced central line-associated bloodstream infections from 2.4 to 0.7 infections per 1,000 line days
- Maintained a low rate of catheter-associated urinary tract infection with 0.7 infections per 1,000 catheter days
- Achieved an unplanned extubation rate of 0.46 events per 100 days of mechanical ventilation—well below the national benchmark of 0.95

Experienced, high-quality critical care transport
Our highly skilled transport team, led by pediatric critical care physicians, brings Riley’s standard of care to 4,000 pediatric transport patients each year. Trained to care for critically ill children in extremely complex situations, our multidisciplinary team provides:
- Air and ground transport with mobile ICU capabilities
- Multiple forms of respiratory support, including high-flow nasal cannula, intubation and mechanical ventilation, and inhaled nitric oxide
- IV/IO placement, needle decompression and chest tube placement
- Invasive and noninvasive monitoring and point-of-care laboratory testing
- Isolette transport for patients under 5 kilograms

IU Health LifeLine serves the entire state of Indiana, as well as western Ohio and eastern Illinois. With five base locations throughout Indiana, IU Health LifeLine provides 24/7/365 critical care transport services for our sickest pediatric patients.

Advancing care for critically ill children—in Indiana and nationwide
Riley pediatric intensivists formed the Pediatric Community Outreach Mobile Education (PCOME) project to provide on-site simulation training and education to community hospital healthcare providers for the initial stabilization and management of pediatric patients. PCOME is internationally recognized for its innovative approach in teaching pediatric care to statewide community hospitals. Riley’s pediatric critical care team continues to have a national presence in multicenter research collaborations through such organizations as the Pediatric Acute Lung Injury and Sepsis Investigators network, the Extracorporeal Life Support Organization and the Pediatric Cardiac Critical Care Consortium.

For more about intensive care at Riley, refer to pages 18 – 19 and 40 – 41.
Dermatology

Early recognition of problematic skin conditions and accurate diagnoses lead to improved outcomes for patients. Board certified pediatric dermatologists at Riley at IU 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.

Treating children from birth to age 18, our dermatologists partner with other Riley specialists to provide comprehensive care, ensuring that each patient’s individual needs are met.

Expert care for a variety of conditions
Dedicated to addressing skin health with advanced treatments, Riley dermatologists diagnose and treat a wide range of skin conditions:

- Acne
- Alopecia areata
- Atopic dermatitis
- Drug reactions (skin)
- Genetic skin disorders
- Hyperhidrosis
- Infantile hemangiomas
- Melanoma and mole screening
- Nail disorders
- Pigmented birthmarks
- Psoriasis
- Skin infections
- Vascular malformations
- Vitiligo

Riley dermatologists offer leading-edge treatments:

- Beta blockers for hemangioma
- Allergy patch testing
- Laser and excisional surgery
- Phototherapy

Dedicated to addressing skin health with advanced treatments, Riley dermatologists diagnose and treat a wide range of skin conditions:

Program distinctions

- Comprehensive treatment includes excisional and laser surgery in both outpatient and operating room settings
- Board certified pediatric dermatologists lead interdisciplinary programs for patients with vascular birthmarks
- Pediatric dermatology fellowship program

Committed to pediatric dermatology research

Our dermatologists participate in research and clinical studies related to many skin, hair and nail conditions in children. Studies pertaining to vascular birthmarks are conducted in collaboration with the Pediatric Dermatology Research Alliance and the Hemangioma Investigator Group, an international consortium dedicated to advancing infantile hemangioma research. Studies led by Riley dermatologists have received support from the National Institutes of Health.

DIVISION CHIEF
Anita N. Haggstrom, MD
Program leader since 2006
Associate Professor of Dermatology, IU School of Medicine
For full team member list, see page 60.
Diabetes and Endocrinology

Treating thousands of patients each year, Riley diabetes and endocrinology specialists provide expert care for infants, children and adolescents with diabetes and other endocrine disorders. Part of a nationally ranked program, Riley’s board certified endocrinologists have received additional subspecialty training in pediatric endocrinology and pediatric diabetes. In addition, certified diabetes educators partner with physicians to provide a wide range of educational resources.

With comprehensive services for children with dysfunction of the endocrine glands, Riley at IU Health treats numerous disorders, including:
- Type 1 and Type 2 diabetes
- Growth disorders
- Delayed and precocious puberty
- Disorders of sex development
- Hypopituitarism
- Congenital and acquired disorders of thyroid function
- Metabolic bone disease
- Turner syndrome
- Disorders of calcium metabolism
- Adrenal disorders (including congenital adrenal hyperplasia and adrenal insufficiency)
- Dyslipidemia
- Gender dysphoria

Riley endocrinologists provide outpatient care in Indianapolis, Carmel, South Bend, Fort Wayne, Bloomington and Evansville. In addition, our experienced team offers extensive, multidisciplinary educational services for newly diagnosed patients and parents requiring specialized instruction. Family education, empowerment and psychosocial support are emphasized, and all patients have 24/7 access to a nurse practitioner or physician.

Specialized programs for children with diabetes and other endocrine disorders
- Type 1 Diabetes Program
- Type 2 Diabetes Comprehensive Care Program
- Pediatrics to Adult Program for Transitioning Adolescents
- Hip Hop Obesity Program
- Youth Diabetes Prevention Program
- Endocrine Diseases Newborn Screening Program
- Gender Health Program
- Comprehensive Care Center for Congenital Adrenal Hyperplasia
- Prader-Willi Syndrome Program
- Turner Syndrome Program
- Growth Disorders Program
- Metabolic Bone Disease Program
- Disorders of Sex Development Program

Program distinctions
- Ranked among the top pediatric diabetes and endocrinology programs by U.S. News & World Report
- Multidisciplinary programs in metabolic bone disease, congenital adrenal hyperplasia, transgender health, disorders of sex development, Prader-Willi syndrome, Duchenne muscular dystrophy and childhood cancer survival
- Youth Diabetes Prevention Program, providing individualized intervention for children and adolescents with prediabetes
- Opportunities for participation in clinical trials of new medications to treat diabetes and endocrine conditions

Riley Endocrine Outpatient Visits: 2017 – 2019

<table>
<thead>
<tr>
<th>Year</th>
<th>New endocrinology</th>
<th>New diabetes</th>
<th>Return endocrinology</th>
<th>Return diabetes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>2,173</td>
<td>4,039</td>
<td>4,568</td>
<td>300</td>
<td>11,080</td>
</tr>
<tr>
<td>2018</td>
<td>2,211</td>
<td>4,078</td>
<td>5,464</td>
<td>347</td>
<td>12,100</td>
</tr>
<tr>
<td>2019</td>
<td>2,569</td>
<td>4,538</td>
<td>5,265</td>
<td>324</td>
<td>12,696</td>
</tr>
</tbody>
</table>

Riley Endocrine Patient Distribution by Diagnosis: 2019

- Congenital adrenal hyperplasia
- Disorders of sex development
- Gender dysphoria
- Metabolic bone disease
- Hypopituitarism
- Turner syndrome
- Growth
- Puberty
- Thyroid

Total number of unique endocrine patients: 7,107

Riley Diabetes Patient Volume: 2019

- Total diabetes patients: 2,036
- Type 1: 1,881
- Type 2: 155
- Continuous glucose monitors: 528
- Pumps: 1,189

Riley Endocrine Current Research Studies

- Type 2 diabetes studies: 2
- Type 1 diabetes prevention studies: 3
- Type 1 diabetes intervention studies: 11

Endocrine studies: 5

For full team member list, see page 60.
Emergency Medicine

Riley Emergency Medicine pairs pediatric clinical expertise with kindness and compassion to care for some of the youngest and most critically ill children in the state. Our skilled team of more than 30 emergency medicine physicians specializes in the care of infants and children up to 18 years old. In addition, our nurses and other medical team members, including child life specialists, are trained and experienced in working with children and families during health-related emergencies.

Emergency medicine team members have access to the latest medical and information technology, including 24-hour access to pediatric radiology, all pediatric subspecialties and other resources found in a nationally ranked academic medical center. Our team works closely with other physician specialists and health professionals throughout the hospital to ensure coordinated, effective care for every child and adolescent who comes to the Emergency department.

With expertise extending beyond emergency medicine, our team includes physicians with subspecialties in quality and safety, out-of-hospital care, disaster medicine, informatics and pediatric ultrasound.

The leading pediatric trauma center in Indiana

Riley at IU Health is 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 (ACS) as a Level I Pediatric Trauma Center. Established by the ACS in 1987, this verification program promotes the development of trauma centers in which verified centers provide not only the hospital resources necessary for trauma care, but also the entire spectrum of care to address the needs of injured patients. This encompasses the prehospital phase through rehabilitation, as well as injury prevention. Riley has been a verified Level I Pediatric Trauma Center since 1992.

The Indiana Network for Patient Care

As a member of this care coordination network, Riley at IU Health has access to medical records for most Indiana hospitals. If a child has visited a participating hospital, Riley can retrieve critical information about the child’s medical history, drug allergies and specific needs.

Riley Emergency Department: By the numbers

*Admission rate: 16.1%*

Emergency Severity Index (ESI) Level 1 or 2:

*Median door-to-doctor time: 23 minutes*

*Average door-to-doctor time: 38 minutes*

*Median length of stay: 173 minutes*

*Average daily census: 140*

**Patient Visits: 2018 – 2019**

<table>
<thead>
<tr>
<th>Year</th>
<th>Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>47,632</td>
</tr>
<tr>
<td>2019</td>
<td>51,077</td>
</tr>
</tbody>
</table>

Emergency Medicine

**Verification**

Riley at IU Health is a Level I Pediatric Trauma Center, verified by the American College of Surgeons (ACS) since 1992. This verification ensures that the emergency department provides not only hospital resources necessary for trauma care, but also the entire spectrum of care to address the needs of injured patients. This encompasses the prehospital phase through rehabilitation, as well as injury prevention.

**Program distinctions**

Riley Emergency Department:

- **Admission rate:** 16.1%
- **Emergency Severity Index (ESI) Level 1 or 2:**
- **Median door-to-doctor time:** 23 minutes
- **Average door-to-doctor time:** 38 minutes
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*Patient Visits: 2018 – 2019*

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<td>2019</td>
<td>51,077</td>
</tr>
</tbody>
</table>
Gastroenterology, Hepatology and Nutrition

Riley at IU Health provides nationally recognized care to children with conditions of the digestive tract, liver and pancreas, as well as nutritional issues. Through comprehensive evaluation, individualized treatment and extensive education, our board certified pediatric gastroenterologists and skilled team members work with each child to improve health and ensure quality of life. Our team of 17 specialists leads nationally in research and clinical care, performing more than 2,700 endoscopies and managing 16,000 outpatient visits each year.

Specialized programs address complex conditions

Through a variety of multidisciplinary programs, Riley gastroenterology (GI) specialists 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, nutritional disorders and psychological conditions related to GI diseases.

Successful pediatric liver transplant program

Riley at IU Health transplant surgeons perform between 10 and 16 pediatric liver transplants each year with outstanding outcomes.

- 34 transplants since January 2018
- 273 transplants since program started in 1988
- 97% one-year survival rate

Combining leading-edge care with the latest technology

We use the most advanced technologies for the diagnosis and treatment of digestive and liver disease, including:

- **FibroScan** specialized ultrasound technology to measure liver fibrosis and fat
- **High-resolution motility testing** to record GI tract motility
- **IB-STIM device** to treat abdominal pain and nausea
- **High-resolution esophageal manometry testing** to measure pressures in the esophagus

Other technologies used in diagnosis and treatment:

- Gastric pacemaker
- Bravo wireless pH probe studies
- Upper endoscopy and colonoscopy
- Capsule endoscopy

Riley gastroenterologists and hepatologists treat a variety of conditions, including:

- Alagille syndrome
- Alpha-1 antitrypsin deficiency
- Anal fissure
- Autoimmune hepatitis
- Biliary atresia*
- Celiac disease*
- Cirrhosis and portal hypertension
- Clostridium difficile
- Constipation
- Crohn’s disease*
- Cystic fibrosis liver disease*
- Delayed gastric emptying
- Encopresis
- Eosinophilic disorders*
- Failure to thrive
- Feeding problems
- Fulminant hepatic failure
- Functional abdominal pain
- Gallbladder disease
- Gastroesophageal reflux
- Gastrointestinal polyps
- GI foreign bodies
- Hepatitis (A, B and C)
- Hirschsprung’s disease
- Inflammatory bowel disease (IBD)*
- Irritable bowel syndrome
- Lactose intolerance
- Motility disorders*
- Neonatal hepatitis
- Nonalcoholic steatohepatitis
- Obesity and metabolic syndrome*
- Pancreatitis*
- Peptic ulcers, gastritis and helicobacter pylori
- Sclerosing cholangitis
- Short bowel syndrome *
- Ulcerative colitis*
- Wilson’s disease

* Specialized clinic or program is available.

Improving patient care quality and safety

- Study of vaccination rate in immunosuppressed children with IBD led to improved understanding of family decision-making and obstacles to immunizing these vulnerable children; interventions resulting from study are now in place.
- Riley hematology and liver transplant teams implemented a novel evaluation to identify clotting disorders pre-operatively to reduce clotting complications after transplant.
- Pilot study of depression screening and management in GI program revealed the importance of early intervention and led to the expansion of our screening program.

Strong GI and liver research program advances clinical care

- 82 peer-reviewed publications since January 2018
- 70 approved research studies

- Cholestatic liver disease
- Constipation
- Eosinophilic esophagitis
- Fatty liver
- Gastroesophageal reflux disease
- Hepatitis B and C
- Inflammatory bowel disease
- Irritable bowel syndrome
- Motility disorders
- Nutrition and feeding
- Pancreatitis
- Short bowel syndrome
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 a general and community pediatrics division of Indiana University School of Medicine.

IU School of Medicine General and Community Pediatrics

Primary care

University faculty physicians provide preventive care and disease management to children with a variety of neurodevelopmental and chronic conditions. More than 75% of the patients visiting this on-site practice at Riley at IU Health are children with special healthcare needs. Evidence-based medical management and a team-based approach promote high-quality care. The multidisciplinary care team includes skilled pediatricians, a nurse practitioner, pharmacist, nursing and medical assisting professionals, and a social worker. Integrated mental health services are also available.

Diagnostic office

Pediatricians in this office work closely with Riley specialty programs to care for children with more complex health issues and improve access to specialty care. Services include:

Autism Early Evaluation Program
Expert physicians evaluate children, ages 18 – 42 months, who are at risk for autism spectrum disorder. Following a patient's initial visit, the team coordinates care and helps families initiate essential therapies and navigate healthcare financing.

Early Years Program
This multidisciplinary program supports babies with complex medical needs in transitioning from the neonatal intensive care unit (NICU) to outpatient care. Infants' neurodevelopmental progress is then followed for three to five years. All babies discharged from the Riley NICU are eligible for this program and receive necessary follow-up care. 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 Healthy Lungs Program supports the developmental needs of children with bronchopulmonary dysplasia.

General pediatrics specialty programs

General pediatricians collaborate with pediatric subspecialties to improve access related to pediatric weight management (through our weight management program) and pediatric gastrointestinal disorders.

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

Funded by the state, the CYACC at Riley helps youth age 11 to 22 with chronic health conditions transition from seeing pediatric physicians to adult physicians.

Collaborative Improvement and Innovation Network (CoIIN)

Designed to improve the quality of life for children with medical complexity, CoIIN promotes the well-being of families and increases the cost-effectiveness of care by testing and spreading promising care delivery strategies through innovative care coordination. The project is funded by the federal Health Resources & Services Administration, IU School of Medicine is one of 10 CoIIN teams in the state.

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.

- Get-to-know-you visits
- Well-child visits
- Sick and acute care visits
- Chronic disease management
- Immunizations
- Sports physicals
- Vision and hearing screenings

Sharing expertise with providers across Indiana

Our primary care physicians, with support from the IU School of Medicine Department of Pediatrics, host the annual Riley Pediatric Conference. The conference provides an opportunity for pediatric providers in Indiana and surrounding states to stay current on pediatric healthcare, network with colleagues and Riley specialists, and learn about various community-based health organizations and wellness resources. Our general and community pediatrics division also organizes the quarterly Pediatric Pearls Conference, focusing on evidence-based clinical care and the latest topics in pediatrics.

More than 200 primary care providers throughout Indiana

IU School of Medicine General and Community Pediatrics and Riley Pediatric Care Center Volume: 2017 – 2019

<table>
<thead>
<tr>
<th>New patients</th>
<th>Total patient visits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2017</td>
</tr>
<tr>
<td>478</td>
<td>9,480</td>
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<tr>
<td>620</td>
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</tr>
<tr>
<td>967</td>
<td></td>
</tr>
</tbody>
</table>

Program distinctions

- Team-based primary care (including care coordination, social work, lactation support and pharmacy) 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 special healthcare needs and their families
- Program to support teens and young adults with complex medical conditions in transitioning to adulthood
Hematology/Oncology

Riley Hematology/Oncology delivers patient- and family-centered care for children and adolescents with cancer and blood disorders. In addition to treating patients from Indiana, Riley hematologists and oncologists also care for children in Michigan, Illinois, Ohio and Kentucky. Our physicians see more than 300 new oncology patients and over 700 new hematology patients each year. We manage more than 13,000 outpatient visits annually, including a comprehensive telehealth program offering virtual visits to patients throughout the state.

Holistic care and clinical leadership

Providing comprehensive cancer treatment, Riley hematologists and oncologists collaborate with specialists in other medical fields to help ensure the best possible outcomes for children and young adults with cancer. These include acute lymphoblastic leukemia, acute myeloid leukemia, sickle cell disease, immunodeficiency, bone marrow failure and other non-malignant conditions.

Leukemia and Lymphoma Program

Riley is home to the largest leukemia and lymphoma program of its kind in Indiana. We offer the latest and most innovative treatments, including CAR-T cell therapy, for newly diagnosed and relapsed childhood leukemia and lymphomas. Using precision medicine and new immunotherapies, our highly trained physicians have diagnosed and treated more than 1,000 children in the past decade, with very high cure rates.

Stem Cell Transplant and Cellular Therapy Program

Employing both autologous and allogeneic transplants, as well as CAR-T cell therapy, Riley oncologists use cellular therapy to fight a variety of pediatric cancers and other severe diseases. These include acute lymphoblastic leukemia, acute myeloid leukemia, sickle cell disease, immunodeficiency, bone marrow failure and other non-malignant conditions.

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Solid Tumor Program

Our oncologists have extensive experience in diagnosing and treating all types of solid tumor malignancies. Riley patients have access to the latest clinical trials, including the leading-edge antibody therapy for neuroblastoma known as Hu3F8. Riley at IU Health is the only hospital in Indiana offering this novel edge antibody therapy for neuroblastoma known as Hu3F8. Riley is one of the only comprehensive programs of its kind in the Midwest.

Expertise in the treatment of hematologic conditions

Hemostasis and Thrombosis Program – Riley provides multidisciplinary care to children and adolescents with bleeding and clotting disorders, including heavy menstrual bleeding and vascular anomalies. We also collaborate with the Herzog Laboratory at IU School of Medicine, a leader in research for alternative forms of treatment for children with hemophilia.

Hemoglobinopathy Program – Riley has the largest pediatric sickle cell program in the state and the only stem cell transplant center for non-malignant transplants. Our program serves children with sickle cell disease and other hemoglobinopathies such as thalassemia.

Bone Marrow Failure Program – Treating children with bone marrow failure syndromes and cytopenias, 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.

Precision genomics targets aggressive cancer with customized therapies

Our Precision Genomics Program helps identify new treatment options that may be effective when other treatments no longer work.

- Our innovative approach uses genetic testing to identify DNA, RNA and proteins in cancer cells that can be precisely targeted with different treatments.
- After testing is interpreted, the team researches therapeutic options and facilitates tumor board in collaboration with the treating physician.
- More than 290 pediatric patients have been evaluated through the program, and nearly a quarter of those patients are receiving recommended therapy.

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2019 Hematopoietic Stem Cell Transplants

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autologous stem cell transplants</td>
<td>35</td>
</tr>
<tr>
<td>Allogeneic matched donor transplants</td>
<td>7</td>
</tr>
<tr>
<td>Haploidentical transplants</td>
<td>14</td>
</tr>
<tr>
<td>Other cellular therapy infusions</td>
<td>3</td>
</tr>
<tr>
<td>Allogeneic transplant 100-day survival rate</td>
<td>95%</td>
</tr>
</tbody>
</table>

2019 Patient Volume

LEUKEMIA/LYMPHOMA

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukemia patients treated</td>
<td>392</td>
</tr>
<tr>
<td>Lymphoma patients treated</td>
<td>120</td>
</tr>
<tr>
<td>Leukemia/Lymphoma patients enrolled in clinical trial</td>
<td>59</td>
</tr>
<tr>
<td>Relapsed patients treated with targeted immunotherapy</td>
<td>5</td>
</tr>
<tr>
<td>SOLID TUMOR</td>
<td></td>
</tr>
<tr>
<td>Neuroblastoma patients treated</td>
<td>18</td>
</tr>
<tr>
<td>Bone tumor patients treated</td>
<td>65</td>
</tr>
<tr>
<td>Soft tissue sarcoma patients treated</td>
<td>55</td>
</tr>
<tr>
<td>Wilms’ tumor patients treated</td>
<td>67</td>
</tr>
<tr>
<td>Liver tumor patients treated</td>
<td>18</td>
</tr>
<tr>
<td>Germ cell tumor patients treated</td>
<td>15</td>
</tr>
<tr>
<td>Retinoblastoma patients treated</td>
<td>20</td>
</tr>
<tr>
<td>Total solid tumor patients enrolled in clinical trial</td>
<td>58</td>
</tr>
</tbody>
</table>

2019 Patient Volume

NEURO-ONCOLOGY PROGRAM

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric patients treated</td>
<td>222</td>
</tr>
<tr>
<td>Brain tumor patients enrolled in clinical trial</td>
<td>15</td>
</tr>
</tbody>
</table>

We are affiliated with the Indiana University Health Melvin and Bren Simon Cancer Center and the Indiana University Simon Cancer Center, which earned the National Cancer Institute’s (NCI) highest recognition—Comprehensive Cancer Center—in 2019.
Hospital Medicine

Serving more than 6,000 patients in 2019, Riley Hospital Medicine is committed to excellence in the care of hospitalized children. Our team of more than 30 physicians continually strives to improve care through quality improvement, collaboration with inpatient specialists and primary care providers, community outreach, and the education and training of future healthcare providers.

Dedicated to delivering exceptional inpatient care, Riley hospitalists have led family-centered rounds for nearly a decade. This type of rounding—conducted with physicians, learners and nursing team members at the bedside with the patient and family at the center of the discussion—allows for optimal communication and understanding of treatment plans, expected outcomes and length of stay.

High-quality inpatient care

Through implementation of best practices and taking part in leading-edge research, Riley Hospital Medicine sets the standard for inpatient pediatric care and targets continuous quality improvement.

Neonatal sepsis calculator. Specializing in the care of our youngest patients, Riley newborn hospitalists have implemented a neonatal sepsis calculator to limit unnecessary antibiotic use in newborns and reduce the time these babies are separated from their mothers.

Infant mortality. Riley hospitalists work tirelessly to impact infant mortality in Indiana. Aware of the racial disparities associated with this tragedy, we collaborate with the Indiana chapter of the American Academy of Pediatrics infant mortality committee, the Indiana State Department of Health (ISDH) and the Indiana University School of Medicine Division of Children’s Health Services Research to identify and address the gaps contributing to these disparities. Riley hospitalists also serve the ISDH by partnering with the Indiana Hospital Association to create a statewide hospital certification program for newborn care.

Advancing inpatient care. Riley pediatric hospitalists conduct ongoing research on a variety of clinical issues, including the care of children with brief resolved unexplained event (BRUE) and optimizing treatment for children and teens with self-harm behaviors. In addition, our hospital medicine team is spearheading a hospitalwide sepsis protocol to aid in early identification and treatment of patients with bacterial sepsis.

Committed to training future physicians

Providing instruction to more than 320 learners each year, Riley hospitalists host pediatric residents, family practice residents, transitional-year residents and medical students at multiple locations. These students and residents, guided by Riley hospitalists, learn to care for hospitalized patients and communicate with families, specialists and support teams with a goal of improving clinical care quality.

Riley hospitalists care for infants and children across central Indiana.

Riley Hospital for Children at IU Health
IU Health Academic Health Center, Indianapolis, Indiana
Care of hospitalized pediatric patients with attention to general pediatric health issues, as well as co-management of pediatric neurologic, genetic, adolescent and rheumatologic issues

IU Health Methodist Hospital
IU Health Academic Health Center, Indianapolis, Indiana
Care of normal newborns

IU Health North Hospital
Carmel, Indiana
Care of hospitalized children in pediatric unit; overnight care of pediatric intensive care unit patients; emergency department consultations; care of normal newborns

IU Health West Hospital
Avon, Indiana
Care of hospitalized children in the pediatric unit; emergency department consultations; attendance during deliveries and resuscitation of infants; care of normal newborns, as well as infants (32 weeks estimated gestational age or older) in the hospital’s Level II neonatal intensive care unit

Fostering clinical partnerships and collaboration

Viewing our role as the “hospital medical home,” Riley hospitalists prioritize collaboration, communication and coordination of care with specialists and primary care providers.

With expertise in the care of the hospitalized patient, Riley Hospital Medicine serves as the primary admitting service for many subspecialties at Riley, including neurology, rheumatology, adolescent medicine, psychiatry and genetics. We provide general pediatric inpatient consultations for patients admitted to other services and partner with surgical subspecialists to co-manage otolaryngology and urology patients.

When patients are ready for discharge, Riley hospitalists ensure primary care providers are kept informed of the hospitalization, procedures, treatments and follow-up. Our team was instrumental in creating a same-day discharge summary process that allows primary care physicians to receive electronic communication of their patients’ hospital stay in real time, ensuring a smooth transition of care for every child.
Infectious Diseases

A leader in global pediatric infectious disease clinical care, research and education, the Ryan White Center for Pediatric Infectious Diseases and Global 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.

Comprehensive inpatient and outpatient care
Riley at IU Health is home to one of the few dedicated inpatient pediatric infectious disease programs in the nation. Children can be transferred to Riley at any time and receive direct primary care from the specialists most familiar with infections and their complications.

Our board certified pediatric infectious disease specialists also provide comprehensive outpatient care for children with infectious diseases. In most cases, patients can be seen within one week at Riley at IU Health in downtown Indianapolis or at the Riley Children’s Health outpatient office in Carmel, Indiana. Our team also strives to accommodate urgent visits that require even more rapid evaluation.

Pediatric infectious disease consultations
Riley infectious disease specialists are available 24 hours a day, seven days a week, to answer questions about infectious disease concerns or to accept transfer of patients with complex infectious disease issues. Our team of expert physicians responds to thousands of inquiries from community physicians each year.

Travel medicine program
Riley infectious disease specialists provide health services to children and families before and after international travel, including preventive medicine, vaccinations and travel education. We also offer support for parents of internationally adopted children. These services are provided to young travelers of all ages and the adults accompanying them on their trip.

In addition, Riley at IU Health laboratories are capable of diagnosing travel-related conditions, such as malaria and parasitic and diarrheal infections. Our travel medicine team stays current on the latest alerts and advisories from the Centers for Disease Control and Prevention and the World Health Organization.

Primary care for patients with HIV
Riley infectious disease specialists evaluate and treat the majority of Indiana children with human immunodeficiency virus (HIV). Our program is led by experts in all aspects of HIV and its complications, and includes professionals in nursing, pharmacy and social work to provide the best care for children with HIV.

The Ryan White Center for Pediatric Infectious Diseases and Global Health is a major referral program and provides care during more than 4,000 inpatient and outpatient visits each year.

Infection prevention and antimicrobial stewardship
Riley at IU Health is committed to keeping the rates of hospital-acquired infections low. Additionally, our antimicrobial stewardship program helps prevent unnecessary antibiotic use that could lead to drug resistance or drug-related complications, and encourages the use of the correct antibiotic when one is needed.

A major part of our infection prevention program is the promotion of vaccines, which are the most effective means of preventing infection.

Advancing research in infectious diseases
Our physician researchers are committed to preventing infection, disease and complications in malaria, HIV and sickle cell disease—among the leading causes of death and disability in children worldwide. We also conduct research studies in diseases more common in Indiana, including bone infections, Kawasaki disease and COVID-19.

Malaria
- Parasite and host factors that lead to severe malaria in children
- Complications of severe malaria, including neurodevelopmental impairment and acute kidney injury
- Effects of changing transmission on malaria immunity

HIV
- Adherence to HIV medications
- Stigma in HIV
- Disclosure of HIV status to children
- Evaluation and treatment of HIV in adolescents
- Neurodevelopmental impairment in infants exposed to HIV

Sickle cell disease
- Prevention of infection in sickle cell disease

Bone infection
- Improved detection of bacterial causes of bone infection

Kawasaki disease
- KIDCARE: Preventing recurrence of Kawasaki disease

COVID-19
- TACTIC: Investigating asymptomatic SARS-CoV-2 transmission in children and families
- DISCOVER: Evaluating the immune response to COVID-19

For full team member list, see page 61.
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.

The care we deliver is:

- Comprehensive
  - Diagnosis and management of genetic conditions in individuals of all ages, from fetuses to the elderly
  - Expertise in all subspecialty areas of medical and molecular genetics, including cancer, neurology, cardiology, ophthalmology and others
  - Inpatient and outpatient services available
  - Statewide management for patients with inborn errors of metabolism

- Leading-edge
  - Recently formed a program at Riley for undiagnosed rare diseases
  - Manage a program for the delivery of Palynziq®, a new therapy for phenylketonuria (PKU)
  - Orphan disease therapies such as enzyme replacement and new drug treatments for rare diseases

- Accessible
  - Genetics physician available 24/7
  - Improved access and shorter wait times for new patients; triage system to ensure patients with certain genetic indications are seen the next day
  - Telehealth and virtual visits available for genetic counseling or geneticist evaluation
  - Educational videos incorporated into the cystic fibrosis program to enhance patient knowledge and improve satisfaction
  - Genetic and biochemical testing through our on-site laboratories; stat testing and rapid diagnostics for the most seriously ill infants and children with genetic disease

- Team-based
  - Geneticists, genetic counselors, nursing team members, dietitians and a social worker specially trained to provide expert care to patients with complex genetic disorders
  - Partner with many Riley specialties, including pediatric cancer, cardiology, otolaryngology and ophthalmology, to deliver multidisciplinary care

Designated providers for 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. Riley geneticists have outstanding metrics in days from diagnosis to implementation of medical care, including dietary treatment with medical formula.

For newborns identified with cystic fibrosis, the team partners with the state to offer genetic counseling services. With the initiation in 2019 of Indiana’s newborn screening for severe combined immunodeficiency (SCID) disease and spinal muscular atrophy, our team also facilitates genetic testing, provides genetic counseling and coordinates multidisciplinary care for these conditions in partnership with Riley immunologists and neurologists.

Subspecialty focus areas

- Cancer genetics. Board certified clinical geneticists and genetic counselors offer clinical cancer genetic services to children and adults who are diagnosed with, or have a family history of, cancer, polyposis, pancreatitis or other syndromes associated with increased cancer risk. To meet growing demand, our cancer genetics program has increased the number of monthly clinics.
- Cardiovascular genetics. We evaluate and treat patients with cardiomyopathy, heritable arrhythmias, aortopathy and connective tissue disorders, pulmonary hypertension, and lipid disorders.
- Metabolism. Our team provides comprehensive evaluation and team-based management of patients with inborn errors of metabolism, including lysosomal storage disorders and mitochondrial disorders. Our patient population of more than 450 ranges from neonates identified through newborn screening to adults.
- Rare disorders and genomics medicine. Riley Medical and Molecular Genetics team members evaluate children with rare conditions using the latest genetic testing methodology.
- Genetic testing. Offering highly complex and unique medical tests in cytogenetics and cytogenomics, biochemical genetics, and molecular genetics, our labs process more than 14,000 genetic tests annually with turnaround time outperforming the national average in all areas.

Research funding and clinical trials

- The IU School of Medicine Department of Medical and Molecular Genetics is ranked 10th in the nation in National Institutes of Health funding for genetics research. Total genetics research funding at Riley exceeded $14 million in 2019.
- Our team is involved in more than 20 multicenter research studies or clinical trials for disorders such as PKU, achondroplasia, homocystinuria, urea cycle disorders, cardiomyopathy, arrhythmia and congenital heart defects.
Neonatology

Riley at IU Health—home to a 60-bed, Level IV neonatal intensive care unit (NICU)—offers the most advanced neonatology services in Indiana. Treating nearly 700 newborns each year and staffed by board-certified neonatologists, our expert team delivers the highest level of care to neonates in need of specialized, lifesaving services. In many cases, our care begins prenatally and continues throughout the NICU stay. We collaborate with the full spectrum of medical, surgical and interventional subspecialists at Riley and coordinate appropriate neurodevelopmental follow-up upon discharge from the hospital.

Our team is multidisciplinary with dedicated advanced practice providers who communicate with referring obstetricians, neonatologists, pediatricians and primary care physicians about infants being treated in our NICU.

NeuroNICU Program
Focused on safeguarding infant brain health, Riley’s world-class neonatal neurocritical care program brings together neonatologists, neonatal neurologists, pediatric neurosurgeons and neurodiagnostic specialists. This team provides the highest level of care to infants born with:

- Neonatal encephalopathy
- Brain and spine malformations
- Seizures
- Meningitis

Riley Heart Center NICU
Riley Neonatology offers a dedicated program to support babies with cardiovascular abnormalities. The team provides care through a collaboration with Riley cardiology, cardiovascular surgery, cardiovascular intensive care and genetics. Annually, approximately 150 newborns with congenital heart disease are treated in the Riley Heart Center NICU.

Extracorporeal Membrane Oxygenation (ECMO) Program
Treating more than 1,000 infants and children since 1987, the Riley at IU Health ECMO program is designated as a Platinum Level Center of Excellence by the Extracorporeal Life Support Organization (ELSO). The designation recognizes centers demonstrating an exceptional commitment to evidence-based processes and quality measures, team member training, continuing education, patient satisfaction and clinical care. In addition to nurses specially trained in ECMO, team members include neonatologists, pediatric surgeons, pediatric intensivists and pediatric cardiovascular surgeons. For more on ECMO, refer to pages 19 and 20.

Bronchopulmonary dysplasia team
For infants with severe lung disease acquired from premature birth, specialists from pediatric pulmonology, neonatology, respiratory therapy and advanced practice providers collaborate to provide individualized, consistent care to improve patient outcomes.

Riley Neuronatology offers numerous leading-edge therapies, including whole-body therapeutic hypothermia, continuous video EEG, ECMO, peritoneal dialysis, inhaled nitric oxide, high-frequency ventilation, and advanced genetic and metabolic testing.

Committed to quality care and patient safety
- Low central line-associated bloodstream infections (0.38 per 1,000 line days)
- Low unplanned extubation rate (0.48 per 100 ventilator days)
- Zero breast milk administration errors over the past three years due to on-site human milk lab
- Evidence-based guidelines to standardize care and improve outcomes

Riley Neonatology:
- Participates in the Vermont Oxford Network to benchmark outcomes to NICUs nationwide and as a platform for quality improvement with NICUs throughout Indiana
- Is a member of the Children’s Hospitals Neonatal Consortium (of Level IV NICUs) to improve outcomes for infants with the most complex surgical and medical diagnoses

Dedicated to family-centered care
- NICU Nest program – As members of the neonatal team, parents develop education and support resources for families to use during and after their time in the NICU.
- Psychological support – Neonatology team includes psychologists to serve NICU families’ mental health needs.
- NICView™ – A camera system allows parents to observe their newborns using any internet-connected device.

Riley Early Years Program
A care collaboration between neonatology, psychology, developmental pediatrics and general pediatrics, the Riley Early Years Program provides follow-up care for NICU patients after discharge. The program serves as a single screening and referral point for patients as they grow through infancy and early childhood.

Riley neonatologists provide care throughout central Indiana

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Level III NICU</th>
<th>Level IV NICU</th>
<th>Average annual admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IU Health North Hospital</td>
<td>23 private beds</td>
<td>36 private beds</td>
<td>573</td>
</tr>
<tr>
<td>Riley Hospital for Children at IU Health</td>
<td>27 private beds</td>
<td>70 private beds</td>
<td>750</td>
</tr>
<tr>
<td>Community Hospital North</td>
<td>3 private beds</td>
<td>13 private beds</td>
<td>237</td>
</tr>
<tr>
<td>Franciscan Health Indianapolis</td>
<td>3 private beds</td>
<td>27 private beds</td>
<td>362</td>
</tr>
</tbody>
</table>

Our survival rates for neonates requiring ECMO for respiratory or cardiac failure are consistently above the ELSO average.

Neonatal critical care transport
The Riley neonatal transport team manages care for more than 900 neonatal helicopter and ground transports annually. We have access to specialized therapies, including high-frequency ventilation, inhaled nitric oxide and whole-body hyperthermia. IU Health LifeLine team members communicate directly with Riley neonatologists during transport. For more on pediatric transport, refer to page 21.
Nephrology

Riley Nephrology is Indiana’s only provider of comprehensive evaluation and treatment for children with kidney disease or kidney failure. Our eight 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.

Specialized, team-based programs
target unique patient needs
Delivering personalized care that focuses on patient and family needs, our nephrology programs provide leading-edge patient care and treatment with a multidisciplinary, team-based approach.

Stone Program
The Riley at IU Health Stone Program focuses on long-term kidney stone prevention and relief. The program educates patients on the importance of making meaningful diet and fluid intake changes to help prevent and control symptoms. Developing customized care plans for each patient, Riley nephrologists work closely with colleagues in pediatric urology on strategies to help reduce or eliminate the occurrence of kidney stones.

Metabolic Bone Disease Program
Riley nephrologists, in collaboration with pediatric endocrinologists, diagnose and treat children who are at risk for frequent fractures due to metabolic bone disease and low bone density.

Outpatient Dialysis Program
On average there are 40 children on dialysis in the Riley Outpatient Dialysis Unit at any given time. The modality of dialysis is blended between hemodialysis and peritoneal dialysis. Our treatment goal is for all children to receive a renal transplant.

Kidney Transplant Program
The Riley at IU Health Pediatric Kidney Transplant Program is nationally ranked in the top quartile, based on the number of patients receiving transplants and its leadership in positive patient outcomes. Our transplant center is part of the Improving Renal Outcomes Collaborative (IROC), a nationwide pediatric kidney transplant outcomes network that seeks to improve long-term health outcomes and quality of life for children with kidney transplants.

Transition Program
Pediatric and adult nephrologists collaboratively manage patients with the goal of preparing adolescent patients for independence and establishing continuity with nephrologists at IU Health.

Innovative care models and expanded services
Blood pressure monitoring, Riley Nephrology directs a statewide Ambulatory Blood Pressure Monitor Program for initial and ongoing assessment of children with abnormal blood pressure readings. We increased the number of studies from 50 in 2017 to more than 600 in the past year.

Telemedicine.
We offered telemedicine services for dialysis patients and ambulatory blood pressure monitoring visits in 2019. We have significantly expanded these capabilities and now see all patients via telemedicine when appropriate. Through the first five months of the COVID-19 pandemic, Riley Nephrology conducted more than 350 virtual visits.

Satellite program expansion. Sushil Gupta, MD, is leading our statewide expansion efforts by opening an in-person practice in Fort Wayne and continuing our presence in Evansville.

Expansion of prenatal services. Our nephrologists, in collaboration with Riley Maternal Fetal Medicine physicians, offer prenatal consults five days a week.

3,142 patient visits
In 2019, Riley nephrologists conducted more patient visits than ever before.*

* Excluding dialysis and transplant

Enhancing quality of life for children with kidney disease

Kidney Camp. Children with kidney disease enjoy a week at Kidney Camp each year. Riley supports the camp by providing an on-site nephrologist, dialysis nurses and nurse practitioners who provide dialysis care and medical management.

Riley Nephrology Music Program. The first initiative of its kind in the U.S., the Riley Nephrology Music Program provides a diversion to help children cope with multiple hours of inpatient dialysis. Each week during their treatment, patients participate in 30-minute private piano lessons.

Leaders in research
Riley at IU Health is among the leading recipients of National Institutes of Health funding for pediatric nephrology. In addition to two R01-funded nephrologists, we have 20 ongoing Institutional Review Board-approved clinical studies. Every physician member of our team is a principal investigator on an active research study.

COVID-19 antibody study
Riley Nephrology leads a COVID-19 antibody surveillance program in our dialysis unit. This project has already resulted in a high-profile publication, “Asymptomatic Seroconversion of Immunoglobulins to SARS-CoV-2 in a Pediatric Dialysis Unit,” in the Journal of the American Medical Association.
Neurology

The largest child neurology group in Indiana, nationally ranked Riley Neurology includes 17 board certified pediatric neurologists. Our specialists use the latest diagnostic tools and therapies to diagnose and treat the most complex neurologic disorders in children. Caring for patients and families from throughout the Midwest, our team, which includes five advanced practice providers and a genetic counselor, has developed numerous specialized multidisciplinary services. These include programs for muscular dystrophy and refractory epilepsy.

**Comprehensive, seamless care**

Riley Neurology provides both inpatient and outpatient care. Our outpatient services are centered at Riley at IU Health in downtown Indianapolis with a satellite office in Carmel and outreach programs in Avon, Lafayette and Bloomington. Riley neurologists offer inpatient coverage and manage epilepsy monitoring units at Riley at IU Health and Riley Hospital for Children at IU Health North Hospital in Carmel.

**Expertise in treating complex neurologic conditions**

**Pediatric epilepsy.** Riley Neurology offers the full range of surgical evaluations and treatments for epilepsy. Our team includes a surgeon specializing in pediatric epilepsy and five pediatric epileptologists. In cooperation with Riley pediatric neurosurgeons, our neurologists work diligently to improve identification and surgical treatment of epilepsy patients with medically refractory epilepsy.

**Employing leading-edge diagnostics, Riley Neurology:**

- Performed the first two pediatric responsive neurostimulation (RNS) implantations in the state
- Continues to expand the use of intracranial electroencephalogram (EEG) monitoring and stereo EEG

**By the numbers: 2019**

**Epilepsy Surgery Program**

57 therapeutic procedures, including:
- 9 temporal lobectomy
- 2 hemispherectomy
- 6 laser ablation
- 2 responsive neurostimulation
11 invasive monitoring procedures

**Electrophysiological monitoring**

2,191 routine EEG
2,823 prolonged video EEG

**Patient volume**

3,715 new outpatient consults
11,881 return patient visits

**Concentration.** In addition to consulting on pediatric concussion cases, Riley neurologists treat concussions through our traumatic brain injury program. The program, a collaboration with neurosurgery, pediatric rehabilitation, neuropsychology and physical therapy, aims to accelerate recovery and maximize functional outcomes for pediatric patients sustaining mild to severe traumatic brain injury. A schoolteacher provides educational support to patients and families.

**Pediatric headache center.** Led by a pediatric neurologist and a nurse practitioner skilled in headache medicine, Riley’s multidisciplinary pediatric headache center offers a comprehensive approach for patients with extreme refractory headache disorders. Treatments include the latest therapeutic techniques, with rational use of medications, pain psychology, biofeedback, cranial nerve blocks, botulinum toxin therapy and trigger point injections.

**Neurogenetics.** The Riley Neurogenetics Program is directed by a pediatric neurogeneticist, neurodevelopmental pediatrician and genetic counselor. We specialize in the diagnosis of neurological disorders through clinical evaluation and expanded genetic testing, particularly next generation and whole exome sequencing.

**Neonatal neurology.** Through the first and only program of its kind in Indiana, Riley’s neonatal neurologists collaborate with NICU specialists to examine outcomes and develop best practices for term and preterm neonates with neurologic injury, disease or seizures. For more, refer to the NeuroNICU Program on page 40.

**Movement disorders.** Riley at IU Health offers the only pediatric movement disorders program in the state, which includes collaboration with a neurologist and neurosurgeon experienced in deep brain stimulation.

**Neuromuscular/MDA.** Riley at IU Health offers a bimonthly multidisciplinary program with specialists from neurology, neurogenetics, physiatry, cardiology, pulmonology, genetic counseling, social work and physical therapy. Our neuromuscular specialists are active in clinical trials of several agents for Duchenne muscular dystrophy, and we lead the state in the treatment of spinal muscular atrophy (SMA). Our team admires the binusiners, an intrathecal therapy that can help maintain or improve strength in SMA, as well as the new revolutionary gene therapy for this disease.

**Pediatric stroke.** Riley treats patients with prenatal, perinatal and childhood stroke and cerebral sinusovenous thrombosis. Our team, including a dedicated stroke neurologist and pediatric interventional radiologist, works in collaboration with hematology and neurosurgery to ensure children with stroke receive timely and appropriate evaluation and the most advanced interventions.
Palliative Care

The Riley at IU Health Palliative Care team provides comprehensive palliative care services for children with a variety of 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.

Interdisciplinary team delivers comprehensive palliative care
- 2.5 full-time physicians
- 2 advanced practice nurses
- 1 palliative care social worker
- 1 administrative assistant

Partners in home-based pediatric hospice care
Serving children and families across Indiana, our palliative care team members help coordinate home-based pediatric hospice services. Patients and families have 24/7 on-call access for guidance and support. These hospices include:
- Center for Hospice Care
- Visiting Nurse Service (VNS) Hospice
- Deaconess Hospice
- Family Life Care
- Good Samaritan Hospice
- Guardian Angel
- Hospice of the Wabash Valley
- IU Health Hospice (Bloomington, Lafayette and Indianapolis)
- Our Hospice
- Seasons Hospice
- Unity

Patient visit volume
Riley Palliative Care team members conduct inpatient and outpatient clinical visits and offer home-based care in partnership with hospice services.

- 2,497 patient visits in 2019
- 315 new consultations in 2019

Committed to training in the U.S. and around the world
Riley at IU Health contributes to palliative care education and training at all levels—from undergraduates and medical students to residents, fellows, and nursing and physician colleagues. Our team has built a national and international reputation for our work with opportunities to teach in several different states, as well as international programs such as Bugando Medical Center in Tanzania, the International Society of Nurses in Cancer Care in Auckland, New Zealand, and hosting the first-ever pediatric End-of-Life Nursing Education Consortium (ELNEC) training course at Beijing Medical Center in China.

Affiliated with Indiana University School of Medicine, Riley Palliative Care participates in ongoing education training in Vital Talk, an empathic communication training skills curriculum, as well as ELNEC and the Pediatric End-of-Life Education Curriculum for Pediatric Residents.

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

- 21% Neonatal intensive care unit
- 15% Maternal fetal medicine
- 17% Pediatric intensive care unit
- 18% Oncology
- 18% Other
- 11% Cardiology

The Riley Palliative Care team directs home-based hospice care for 40 to 50 patients each year with an average hospice stay of 52.5 days.

Riley Palliative Care develops end-of-life education for hospices in Indiana to continually improve the home-based experience for pediatric patients. We also work closely with and educate IU Health colleagues to enhance the quality of our care, improve communication, and promote effective and timely care delivery.
Physical Medicine and Rehabilitation

A variety of medical conditions can impact a child’s ability to move, perform daily living activities and interact with family, school and community. Riley Physical Medicine and Rehabilitation, led by expert physiatrists, 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 return to regular activities. While in the hospital, early treatment is essential to ensure patients retain any current mobility and to help prevent any future decline in function.

Children and adolescents may be admitted to Riley’s inpatient rehabilitation center if they are:

- Medically stable
- In need of active and ongoing multidisciplinary intervention
- Able to tolerate at least three hours of therapy a day

Working with Riley specialists across multiple disciplines to understand each patient’s challenges, our team develops interdisciplinary, customized treatment plans to address specific functional goals.

Inpatient rehabilitation provides personalized, coordinated care

With a goal to facilitate seamless recovery, our physiatrists and multidisciplinary team members work with patients and families to help children return home, to school and to their community as soon as possible.

Riley Physical Medicine and Rehabilitation team members provide individualized care for each patient that includes:

- Daily visit from a physiatrist
- Documented plan of care within the first four days of admission with weekly team meetings to evaluate progress and modify care plan, as needed
- Family meetings to coordinate care, provide updates and plan for care following discharge
- Emotional and social support from family support services
- Recommendations for and provision of resources to ensure a safe transition from hospital to home
- A teacher who works with the child’s school to facilitate schoolwork during hospitalization and to provide assistance once the child returns to school

On-site resources offer added support for inpatient care

To help facilitate recovery and functional improvement, the Riley at IU Health pediatric rehabilitation gym includes equipment and toys for children of all stages and levels of function and mobility. Because families play an important role on the rehabilitation and recovery care team, our center provides sleeping arrangements in patient rooms if parents choose to stay with their children in the hospital.

Riley Physical Medicine and Rehabilitation specializes in treating the functional needs of children and adolescents affected by a variety of diseases and conditions, including:

- Brain injury
- Trauma
- Severe burns
- Amputation
- Spinal cord injury
- Cancer
- Neuromuscular disorders
- Stroke
- Congenital diseases
- Rhizotomy/baclofen pump placement

Outpatient rehabilitation offers continuity of care

To prevent complications and continue improvement after hospital discharge, outpatient rehabilitation is essential. In addition to therapy, the pediatric physical medicine and rehabilitation team provides adaptive tools, education on lifestyle changes and support to help each child function comfortably at home and thrive as they grow.

Patients have access to several multidisciplinary programs, including:

- Traumatic Brain Injury Program
- Neuro-Oncology Program
- Spina Bifida Program
- Cerebral Palsy Program
- Muscular Dystrophy Program

Inpatient volume

In 2019, the Riley at IU Health Inpatient Pediatric Rehabilitation Center admitted 135 children and young adults ranging from 6 months to 18 years old. The top three admitting diagnoses were:

- Non-traumatic brain dysfunction
- Traumatic brain injury
- Patients recovering from selective dorsal rhizotomy surgery

Shorter length of stay

The WeeFIM II® System, provided by Uniform Data Systems (UDS), allows the Riley team to compare pediatric rehabilitation outcomes to similar facilities across the U.S., including gains in independence and length of stay. In 2019, our inpatient pediatric rehabilitation center had a shorter length of stay (21.5 days) and a greater WeeFIM II® System Rating Total Gain (27.5) when compared to similar facilities nationwide that also use the UDS system.
Psychiatry and Psychology

Riley at IU Health psychiatry and psychology specialists diagnose and treat children of all ages. Our expert team of child and adolescent psychiatrists, clinical child psychologists and psychiatric social workers 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.

Diagnostic evaluation. Riley specialists conduct thorough interviews and use the latest assessment methods to identify problems and establish a diagnosis.

Psychological testing. In-depth psychological testing can be used to provide specific, quantifiable results explaining the nature and severity of psychological challenges.

Individual psychotherapy. Working one-on-one with children, our specialists help them learn coping strategies to build skills and address challenges in feelings, beliefs and behaviors with the goal of moving toward desired changes.

Family therapy and behavior modification. Through consultation with children and family members, Riley psychiatry and psychology experts work to change family interactions and structure to improve children’s behavior and mental well-being.

Pharmacotherapy. Based on thorough evaluation, our physicians may recommend treating certain psychological conditions with medicines that help regulate brain-based psychological and behavioral problems.

Our comprehensive child psychiatry and psychology services include specialized programs designed to meet unique needs:

**Autism Treatment Center**

An expert resource dedicated to treating children with autism spectrum disorder, this center offers leading-edge care for children with autism who struggle with social interactions, communication and other developmental abnormalities.

**ADHD/Disruptive Behavior Disorders Program**

This comprehensive program offers evaluation and treatment for children with persistent, severe patterns of inattention, hyperactivity and impulsivity. Our team also provides diagnostic and treatment services for other issues such as oppositionality, defiance, outbursts, rule breaking and anger control issues.

**Tic/Anxiety/Compulsive Disorders Program**

Riley specialists diagnose and treat children and adolescents with any of the following symptoms:

- Recurrent obsessions or compulsions that are severe enough to significantly impair daily living
- Recurrent tics, vocal noises or outbursts
- Anxiety/fearfulness/apprehension
- Trichotillomania

Riley’s highly trained specialists diagnose and treat a variety of psychiatric and psychological conditions, including:

- Attention-deficit/hyperactivity disorder (ADHD)
- Autism spectrum disorder
- Anxiety disorders
- Bipolar disorder
- Depression
- Language and learning disorders
- Post-traumatic stress disorder
- Obsessive compulsive disorder
- Substance abuse disorders
- Psychosis
- Tourette syndrome

**Mood Disorders Program**

Riley psychiatric specialists manage evaluation and care for children with a variety of mood disturbances, including:

- Social isolation
- Depression
- Loss of interest or pleasure in normal activities
- Irritability
- Suicidal ideation

**Dual Diagnosis Program**

This concentrated outpatient program is designed for children and teens with psychiatric disorders who also struggle with substance abuse. The program helps patients and families deal with the challenges of each circumstance to promote recovery and improved well-being.

For children ages 10 to 18, Riley’s program uses a treatment model called ENCOMPASS that incorporates cognitive behavioral therapy, motivational enhancements, parent management training and medication-assisted treatment.

**Pediatric Psychology Testing Program**

We offer standardized psychological tests for many issues, including:

- Intellectual ability strengths and weaknesses
- Attention and learning problems
- Severe/unexplained emotional, behavioral or personality problems
- Memory problems

**Committed to improving clinical care through research**

Riley psychiatrists and psychologists are faculty members at IU School of Medicine who conduct leading-edge research to better understand how behaviors, emotions, abilities and skills develop in children and adolescents. They also study how disorders surface at different ages and stages of development.

Our investigators lead research to uncover new insights for a variety of disorders:

- ADHD
- Autism spectrum disorder
- Addictions
- Mood disorders
- Disruptive behavior disorders
- Language and learning disorders
- Traumatic stress

Research studies using the latest treatment protocols and technology are in progress to better identify, evaluate and treat these and other psychiatric disorders in children and adolescents. Findings help pave the way for new interventions to improve clinical care.

Refer a patient: 317.329.7313
Pulmonary and Sleep Medicine

Riley Pulmonology and Sleep Medicine is a nationally ranked leader in clinical care, teaching, research and advocacy in pediatric respiratory medicine. Our expert team cares for children throughout the state and nation, and aims to:

- Provide advanced, child-focused and family-centered clinical care to children with respiratory, allergy and sleep disorders
- Serve as a specialized medical home that works together with hospital and community-based providers in the care of children with chronic respiratory illnesses
- Conduct basic, clinical and translational research that directly brings new discoveries and therapies to the forefront of treatment
- Train pediatric physician scientists and clinician educators as future academic leaders

Specialized programs treat complex conditions

Aerodigestive Program. Dedicated professionals from pulmonology, gastroenterology, otolaryngology and speech therapy provide advanced multidisciplinary care for infants and children with airway, feeding and gastrointestinal disorders. Our approach allows for efficient diagnosis and treatment for our patients through coordinated appointments and procedures, with all care organized through a dedicated clinical nurse coordinator.

Bronchopulmonary Dysplasia Program. Pediatric pulmonologists, general pediatricians, a nutritionist, a respiratory therapist, a speech pathologist and a social worker deliver leading-edge care to infants. With all care organized by a dedicated nurse coordinator, patients undergo comprehensive guideline-based evaluations and management. We provide respiratory medication management and oxygen weaning and titration, while assuring that children receive adequate nutrition for optimal somatic growth. In addition, close neurodevelopmental follow-up reassures parents and educates them on appropriate developmental milestones attainment, specific to the child’s chronologic age and degree of prematurity.

High-Risk Asthma Program. The Riley High-Risk Asthma Program is one of the longest-running clinics of its kind in the U.S. Patients are assessed by a multidisciplinary team, including an asthma educator, pulmonologist, allergist, social worker, respiratory therapist and psychologist. The program has resulted in a 70% decrease in hospitalizations and improved quality of life.

Neuromuscular Program. Accredited by the Muscular Dystrophy Association, our neuromuscular clinic is the only one of its kind in the state. It is exclusively dedicated to children with neuromuscular disorders and is staffed by an experienced team of board certified pulmonologists, sleep physicians, neurologists, cardiologists, endocrinologists, palliative care physicians, physical medicine and rehabilitation physicians, physical therapists, dietitians, and social workers. We perform comprehensive pulmonary function testing and sleep studies and provide specialized therapies like non-invasive ventilation when indicated.

Riley pulmonology specialists are at the forefront of clinical care through leadership and participation in:
- Cystic Fibrosis Foundation
- American Thoracic Society
- American Board of Pediatrics
- American Academy of Pediatrics
- Childhood Interstitial Lung Disease Network
- Pulmonary Hypertension Association
- Primary Ciliary Dyskinesia Foundation
- NIH Asthma Clinical Trial Network
- Global Tracheostomy Collaborative

Pulmonary Hypertension (PH) Program. The program focuses on evaluating and treating children with pulmonary vascular disease. We provide guidelines-based assessments via echocardiography, cardiac catheterization evaluations, lung function and exercise testing, radiological imaging, and individualized genetic testing and counseling. Team members have extensive experience with multi-drug treatment regimens, including parenteral medications. Customized treatment regimens use all available therapeutic modalities for the treatment of PH. Some children may be eligible for clinical research trials evaluating new PH medications.

New Initiations of IV/SubQ Treprostinil Therapy: 2013 – 2019

Severe pulmonary arterial hypertension often requires aggressive, multiligand regimens to stabilize the disease. Treprostinil, the most potent of these medications, is most effective when given continuously through either a permanent IV or a small subcutaneous catheter. Our team has multiple years of experience in initiating and maintaining our most vulnerable patients on this complex, labor-intensive therapy.

Pediatric Sleep Medicine Program

With 16 beds in two locations, our program includes four certified sleep medicine physicians, two behavioral sleep psychologists, respiratory therapists and registered polysomnographic technicians. Specific aspects of our program:

Behavioral sleep medicine. We offer assessment and brief focused treatments for behavioral and/or psychological factors that contribute to the development and persistence of sleep disorders in children. Our clinical psychologists treat children with sleep difficulties such as insomnia, persistent nightmares and circadian rhythm sleep disorders.

Positive airway pressure (PAP) sleep medicine. A licensed psychologist and respiratory technician work with children who require PAP therapy but struggle to wear it consistently. Children with developmental, sensory, psychological or behavioral difficulties are seen frequently to help desensitize them to wearing a mask when they sleep.

Program distinctions

- Ranked among the top 15 pediatric pulmonology programs in the nation by U.S. News & World Report
- Perform more than 10,000 pulmonary function tests each year
- Recipients of more than $30 million in research funding
- Engaged in COVID-19 basic science research and submitted an investigative new drug application to the FDA for a COVID-19 clinical trial

Improving clinical outcomes through research

In 2019, Riley pediatric respiratory disease researchers conducted 119 clinical trials and published 53 manuscripts related to:
- Cystic fibrosis
- Primary ciliary dyskinesia
- Asthma
- Sickle cell disease
- Food allergies
- Sleep disorders
- Preterm lung disease
- Pulmonary hypertension

Reference a patient: 317.948.7208
Interventional radiology provides minimally invasive methods for effective diagnosis and treatment

Riley’s specially trained interventional radiologists use minimally invasive procedures to diagnose and treat many pediatric conditions. By minimizing the physical trauma associated with open surgery, our program contributes to decreased infection rates, faster recoveries and shorter hospital stays. Pediatric patients benefit greatly from this approach to treatment, which often results in less pain than standard procedures.

Our interventional radiologists use X-ray, computed tomography or ultrasound to see inside the body and guide tools such as catheters, stents and needles to:

- Diagnose conditions
- Obtain biopsies
- Treat:
  - Tumors
  - Joint pain
  - Bile ducts that are blocked or damaged
  - Blocked or damaged arteries or veins
  - Blockages in the urinary tract
- Stop intestinal bleeding
- Stop internal bleeding caused by organ trauma or pelvis fractures

CO-DIVISION CHIEF
Matthew L. Cooper, MD
Program leader since 2015
Assistant Professor of Clinical Radiology & Imaging Sciences, IU School of Medicine

CO-DIVISION CHIEF
Donald D. Corea, DO
Program leader since 2014
Assistant Professor of Clinical Radiology & Imaging Sciences, IU School of Medicine

For full team member list, see page 62.

Program distinctions
One of the first three programs in the nation to implement 3.0 Tesla fetal MRI
Advanced fetal imaging that includes quantitative MRI measurement of blood volume in the placenta and brain
Home to the only pediatric neurointerventional radiologist in Indiana
One of the only facilities in the region to offer SPECT/CT technology

Radiology
Performing thousands of imaging exams each year, the Riley at IU Health pediatric radiology team 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 our youngest 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
- An on-site interventional radiology suite

Comprehensive radiologic and imaging services
- EOS
- CT
- MRI
- Fluoroscopy
- Ultrasound
- Nuclear medicine
- Anesthesia for diagnostic and interventional procedures
- Procedural sedation

Highly trained pediatric radiologists
Riley radiologists have specialized expertise in a variety of areas:

- Cardiac imaging
- Pediatric musculoskeletal imaging
- Pediatric genitourinary imaging
- Fetal imaging
- Pediatric oncologic imaging
- Interventional radiology
- Neuroradiology
- Neurointerventional radiology
- Nuclear medicine

Riley Radiology offers advanced technology

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.

Radiology Exam Volume: 2018 – 2019

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<tr>
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<th>2019</th>
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<td>Fluoroscopy</td>
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<td>Magnetic resonance imaging (MRI)</td>
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<td>Nuclear medicine</td>
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<td>Ultrasound</td>
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<td><strong>TOTAL EXAMS</strong></td>
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Riley Children’s Health Medical Specialties Annual Report 2019 | 55
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 of eight board certified rheumatologists and five dedicated rheumatology nurses offers the latest and most promising treatments, some of which are only available through research trials. Our specialists are involved in clinical trials of novel medications and drug combinations that are defining how to treat these chronic inflammatory diseases in children.

Comprehensive treatment for pediatric rheumatic illnesses

Riley at IU Health rheumatologists provide consultation with physicians throughout the region and manage or co-manage children with a wide range of pediatric conditions—sometimes even for diseases yet to be named. Our skilled team diagnoses and treats a broad range of inflammatory and autoimmune illnesses, including:

- Antiphospholipid syndrome
- Autoinflammatory diseases
- Childhood nonbacterial osteomyelitis
- Childhood scleroderma and morphea
- Childhood systemic lupus erythematosus
- Juvenile dermatomyositis and polymyositis
- Juvenile idiopathic arthritis
- Juvenile mixed connective tissue disease
- Periodic fever syndromes, such as NOMID and PFAPA
- Raynaud disease
- Reactive arthritis
- Rheumatic fever
- Sarcoidosis
- Sjögren’s syndrome
- Vasculitis (ANCA positive and negative)

In addition, we diagnose biomechanical issues that can produce some symptoms seen in chronic inflammatory or autoimmune disease. For all rheumatology patients, our physicians gather a detailed medical history, perform a thorough physical examination and address the current medical issues while considering all aspects of the child’s health.

When treatment is required, Riley rheumatologists develop pediatric-focused treatment plans that improve a child’s symptoms and healthy function.

Statewide outreach

While most outpatient visits occur in Indianapolis, Riley Rheumatology serves patients in other communities, with plans for continued expansion. In addition, our rheumatologists use virtual visits and telehealth to increase statewide access.
In June 2019, Lena and Delaney Drew were delivered in Evansville by emergency C-section at just 24 weeks and six days. The identical twins were identified as mono-mono twins early in the pregnancy. It’s an anomaly that occurs in just 1% of pregnancies wherein both twins share the same amniotic sac with the same placenta. In early pregnancy and up to 24 weeks, monoamniotic or monochorionic twins have a survival rate of 50%.

“We knew it was really rare and it’s one of the riskiest pregnancies there is, so we were going to appointments every other week,” said Emma Drew. “We knew that there was a high chance that one or both wouldn’t make it even before birth. And then after birth, with them coming so early, it’s tough.”

Before the twins’ birth, Emma and her husband, Eric, also learned the babies had twin to twin transfusion syndrome. Before the twins’ birth, Emma and her husband, Eric, also learned the babies had twin to twin transfusion syndrome.

“Before birth. And then after birth, with them coming so early, it’s tough.”

For two weeks, they dealt with each twin's medical crises separated by the 170-plus miles between them. After Delaney suffered a pulmonary hemorrhage, she joined her sister at Riley at the end of June.

Neonatologist David W. Boyle, MD, co-medical director, Riley Maternity & Newborn Health, and medical director, Riley Fetal Center, worked with staff in Evansville to get Delaney moved to Indianapolis. “This is the place to be; they’re wonderful here,” Emma said. While at Riley, the girls were treated for patent ductus arteriosus, a congenital heart defect common in premature babies in which a vessel connecting the pulmonary artery to the descending aorta fails to close. What once required open-heart surgery can now be repaired using a device in the cardiac catheterization lab, a relatively new procedure being performed at the Riley Heart Center.

After five months in the hospital, Lena “graduated” from the NICU and made her first trip home to Petersburg, Indiana. Her twin sister, Delaney, was able to go home a month later—just in time for Christmas.

“In June 2019, Lena and Delaney Drew were delivered in Evansville by emergency C-section at just 24 weeks and six days. The identical twins were identified as mono-mono twins early in the pregnancy. It’s an anomaly that occurs in just 1% of pregnancies wherein both twins share the same amniotic sac with the same placenta. In early pregnancy and up to 24 weeks, monoamniotic or monochorionic twins have a survival rate of 50%.

“We knew it was really rare and it’s one of the riskiest pregnancies there is, so we were going to appointments every other week,” said Emma Drew. “We knew that there was a high chance that one or both wouldn’t make it even before birth. And then after birth, with them coming so early, it’s tough.”

Before the twins’ birth, Emma and her husband, Eric, also learned the babies had twin to twin transfusion syndrome (TTTS), meaning one twin—in this case Lena—in effect stealing blood and nutrients from her sister, putting Delaney at risk. Left untreated, the survival rate for TTTS twins is 10-15%.

“Our colleagues in Evansville were terrific. It was so important that we got both babies to Indianapolis so the family could be together.”

When the babies were born, Delaney weighed 1 pound, 8 ounces, and Lena weighed 1 pound, 9 ounces. Despite her bigger size, Lena was in worse shape than her sister. Doctors prepared Emma and Eric for the possibility of losing her. Within a week, Lena had been flown to Riley for treatment of a perforated bowel. Emma followed her to Indianapolis, while Eric stayed in Evansville with Delaney.

For two weeks, they dealt with each twin's medical crises separated by the 170-plus miles between them. After Delaney suffered a pulmonary hemorrhage, she joined her sister at Riley at the end of June.

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After five months in the hospital, Lena “graduated” from the NICU and made her first trip home to Petersburg, Indiana. Her twin sister, Delaney, was able to go home a month later—just in time for Christmas.
It was an aggressive infection … her blood pressure was bacteria somehow that had already turned into infection.

"Everything started going downhill quickly," Michelle wrote a temperature of 99.9, but just 30 minutes later, it had Kylei arrived in the Riley Emergency department with daughter to Riley immediately.

had intensified. Her pediatrician told Brown to take her worse and Kylei could walk only on her toes.

After spending a day at the pool and beach, Kylei woke up with pain in her calf. Her mom, Michelle Brown, thought it was a muscle cramp, but by the following day the pain was many more lose limbs.

More than 25% of people who contract the disease die; flesh-eating disease—can be deadly. It starts suddenly and turned terrifying her family last year Florida vacation with

"Her medical staff, the Riley Children's Health experienced PICU team saves young girl's life. Experienced PICU team

"Clearly she had an infection and septic shock," Dr. Abulebda said. "She had a lot of swelling and redness in her leg, so we were quite concerned that she had extensive infection there.

"Her blood pressure was very low, and that's consistent with the diagnosis of septic shock. We had to give her a lot of antibiotics to cover any possible organism that could cause this, and we had to give a lot of fluids to try to bring her blood pressure up.”

--- Kamal M. Abulebda, MD Pediatric critical care intensivist

To prevent ongoing sepsis that can lead to multi-organ failure, the Riley critical care team treated Kylei's infection with antibiotics, while supporting her vital organs with fluids and inotropic medications.

Within a few hours of being admitted to Riley, an orthopedic surgeon drained and removed the deep tissue infection in Kylei's right leg. She had two more surgeries before she was released a week later.

Necrotizing fasciitis is rare, and Dr. Abulebda said he can count on one hand the number of cases Riley sees each year.

"Her medical staff, the orthopedic surgery room staff, everyone was absolutely amazing,” Michelle said. “They worked very aggressively to save her life, and I'm very, very fortunate.”
In July 2020, Griffin Smith was looking forward to starting his senior year at Noblesville High School, seeing his friends again and gearing up for lacrosse season. Those plans were put on hold when the 17-year-old suffered a serious back injury that left him unable to walk.

It was in the Emergency department at an Anderson hospital that Griffin first realized the freak back injury he suffered while playing a game outdoors might be worse than he and his parents originally thought. Gradually, he began to lose feeling in his lower body. He turned to his mom and said, “I can’t move my legs.”

Griffin’s parents, Greg and Heather, get emotional when they talk about the care their son received at Riley Hospital for Children at IU Health, where Griffin was transported by ambulance shortly after the injury.

“Riley has done an amazing, amazing job to get him where he’s at,” Greg Smith said. “Miracles do happen here.”

Griffin had suffered a rare spinal stroke, a disruption in the blood supply to the spinal cord. Under the care of Riley neurologists, he progressed from no feeling to being able to wiggle both of his big toes and move both knees. Physical therapist Kristina Davey and occupational therapist Kelly Salter worked the 6-foot-3-inch athlete hard—just the way he wants it.

“They both love to push me. They know how to make me work hard enough to keep me going for the day,” said Griffin.

Griffin is determined to be among that group. He made tremendous progress during his three-week stay in Riley’s inpatient rehab unit, where he embraced the multiple therapy sessions required daily. Undergoing outpatient therapy, he’s motivated to recover and hopes to be back at school for his last semester.

“I’m focused on getting better and graduating and walking again,” Griffin said. “I’ll figure out the rest once I start walking.”

Story of a Riley kid: Griffin Smith, age 17
Specialists and therapists speed teen’s recovery from rare spinal injury.

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Refer a patient

Riley Children’s Health cares for children in Indiana, across the nation and around the world. Same-day appointments are available for some providers. To schedule an appointment or to speak with a medical specialty administrator, please call:

<table>
<thead>
<tr>
<th>SPECIALTY</th>
<th>PHONE NUMBER</th>
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<tbody>
<tr>
<td>Adolescent Medicine</td>
<td>317.274.8812</td>
</tr>
<tr>
<td>Allergy and Immunology</td>
<td>317.948.7208</td>
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<tr>
<td>Cardiology</td>
<td>317.944.8906</td>
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<tr>
<td>Child Development and Developmental Pediatrics</td>
<td>317.944.4846 (Riley Pediatric Care Center)</td>
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<td>Child Protection Program</td>
<td>317.274.2617</td>
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<tr>
<td>Critical Care</td>
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<tr>
<td>Cardiac Critical Care</td>
<td>317.963.3330 (IU Health 24/7 Transfer Center)</td>
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<tr>
<td>Pediatric Critical Care</td>
<td>317.963.3330 (IU Health 24/7 Transfer Center)</td>
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<tr>
<td>Dermatology</td>
<td>317.944.7744</td>
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<tr>
<td>Diabetes and Endocrinology</td>
<td>317.944.3889</td>
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<tr>
<td>Emergency Medicine</td>
<td>317.963.3330 (IU Health 24/7 Transfer Center)</td>
</tr>
<tr>
<td>Gastroenterology, Hepatology and Nutrition</td>
<td>317.944.3774</td>
</tr>
<tr>
<td>General Pediatrics and Primary Care</td>
<td>1.888.IUHEALTH</td>
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<tr>
<td>Hematology/Oncology</td>
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<td>Hospital Medicine</td>
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<td>Psychiatry and Psychology</td>
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<td>Radiology</td>
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<td>Rheumatology</td>
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Submit a referral online at rileychildrens.org/refer.
Riley Children's Health is Indiana's only full-service statewide pediatric health system. Riley Children's Health offers complete, comprehensive pediatric care ranging from routine primary care checkups to the most complex acute care needs from highly skilled pediatric specialists. The system connects patients with 200 primary care and 400 specialty care physicians in communities across the state of Indiana. Riley physicians treat patients in their home communities, bringing top-notch care close to home. This statewide network is an extension of Riley Hospital for Children at Indiana University Health, one of the nation's leading children's hospitals.

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