A HOSPITAL WITHIN A HOSPITAL

“A hospital within a hospital.” Cleveland Clinic pediatric caregivers have used that nickname to describe Cleveland Clinic’s clinical services for infants, children and adolescents since the venerable medical center devoted its first large hospital ward exclusively to pediatrics back in 1951.

Later establishment of a formal children’s hospital seemed largely a formality, since Cleveland Clinic had been caring for sick children ever since it began operations in 1921. After all, one of its four founding physicians, John Phillips, MD, was a pediatrician, and Cleveland Clinic clinicians figured in a number of pediatric milestones, such as:

› Founding (in 1929) of the oldest camp in America for children with diabetes
› Introduction of novel neonatology practices in the 1950s, including amniocentesis, intrauterine transfusions and newborns “living in” with mothers
› A historic ventricular septal defect repair in a 17-month-old in 1956
› Establishment (in 1963) of one of the earliest successful pediatric kidney transplant programs

In the decades since the pediatric ward first opened, this hospital within a hospital has flourished, as evidenced by the team of 25 pediatric hospitalists who today provide around-the-clock care at five hospitals in the Cleveland Clinic health system, constituting one of the largest pediatric hospitalist programs in the country.

And it certainly represents more than just a hospital, given Cleveland Clinic Children’s integrated network of pediatric services delivered at more than 40 community locations to the largest patient population of any children’s hospital in Northeast Ohio.

A Name More True Than Ever

Despite all this evolution, the “hospital within a hospital” descriptor remains truer than ever in many senses — and it speaks to some of Cleveland Clinic Children’s greatest strengths today.

Our 350+ pediatricians and pediatric subspecialists do not practice pediatrics in a vacuum. They benefit from daily interactions with their adult-care Cleveland Clinic colleagues — interactions that occur down the office corridor, within surgical suites and in the laboratories of Cleveland Clinic’s Lerner Research Institute. By sharing space, clinical advice and research ideas with some of the finest adult-care clinicians in the world, our pediatricians bring added perspectives and expertise to bear for their young patients.

Being a hospital within a hospital simply brings more resources to the table to manage the most complex patients.

In other cases, being a hospital within a hospital simply brings more resources to the table to manage the most complex patients. That was the case, for instance, when we relied on a team of five renowned Cleveland Clinic transplant surgeons to successfully complete a four-organ multivisceral transplant in a 4-year-old in 2013,
From advanced fetal diagnostics through our carefully coordinated transitional care programs, Cleveland Clinic Children’s is structured to see patients through from birth to healthy adulthood.

enabling the boy to achieve a quality and length of life never before seen with the rare Martinez-Frias syndrome.

And being a hospital within a hospital means that Cleveland Clinic Children’s is equipped to offer unsurpassed continuity of care to patients with congenital conditions and other complex diseases that persist beyond childhood. From our advanced fetal diagnostic services through our carefully coordinated transitional care programs in cardiology, nephrology/urology, endocrinology and many other areas, we are structured to see patients through from birth to the healthiest adulthood possible.

Our patients’ ability to see pediatric and adult-care providers in a shared location for select conditions, such as congenital heart disease, means that deep-rooted physician-patient relationships need not end when patients reach college age.

Pediatrics Remains Paramount

While we are privileged to take advantage of the full resources of Cleveland Clinic, our pediatric providers never forget that their patients are far more complex than just “little adults.” Indeed, our caregivers’ prodigious clinical and research initiatives to advance the highly nuanced care of their young patients fill the remainder of this publication. Those activities are reflective of why Cleveland Clinic Children’s is consistently ranked as a “Best Children’s Hospital” in America by U.S. News & World Report.

Cleveland Clinic Children’s patients benefit from the best of both worlds — the singular empathy and subspecialized expertise of a premier children’s hospital coupled with the leading-edge technology and extraordinary clinical capabilities of one of the world’s most acclaimed medical centers.

We are proud to be a hospital within a hospital that has a tradition as rich as Cleveland Clinic’s, and we are committed to upholding and enhancing that tradition. The pages that follow present glimpses of ways we set out to do so in the year just passed.
Cleveland Clinic Children’s provides comprehensive medical, surgical and rehabilitative care for infants, children and adolescents at:

› Inpatient and outpatient facilities on Cleveland Clinic’s main campus and at several community hospitals
› Cleveland Clinic Children’s Hospital for Rehabilitation and its outpatient facilities
› Family health centers and outpatient facilities across Northeast Ohio

350+ staff pediatricians and pediatric specialists

107 physicians recognized as “Best Doctors” by Best Doctors Inc.®

40+ community locations across Northeast Ohio

883 pediatric nurses

429 pediatric beds, including:

87 level III NICU beds

25 PICU beds

52 beds at Children’s Hospital for Rehabilitation

16 blood and marrow transplant/cancer beds

9 pediatric epilepsy monitoring unit beds

574 employees

324 volunteers

39 pediatric residents

20 pediatric fellows

107 third- or fourth-year medical students
GIOVANNI PIEDIMONTE, MD
Physician-in-Chief, Cleveland Clinic Children's
Chairman, Pediatric Institute
President, Cleveland Clinic Children's Hospital for Rehabilitation
Dear Colleagues,

As the preceding pages make clear, Cleveland Clinic Children's derives distinct benefits from being an integral part of the larger Cleveland Clinic enterprise. I welcome you to this Year in Review by introducing some standout stories from 2013 that flesh out those benefits in striking and moving detail.

› On page 6 we share the historic case of Khaled, a boy from the Middle East who has become the longest known survivor of Martinez-Frias syndrome, a rare disorder of the GI system. After 13 months of intricate inpatient care from our pediatric gastroenterologists while waiting for organs to become available, 4½-year-old Khaled underwent a four-organ multivisceral transplant by five expert surgeons from Cleveland Clinic’s Transplant Center. Today Khaled is thriving as the first known Martinez-Frias patient with hope for the future.

› On page 10 we profile the many measures Cleveland Clinic Children’s cardiologists have recently taken to limit their patients’ radiation exposure from diagnostic tests and invasive procedures. These measures reflect our sensitivity to the repeated procedures congenital heart disease patients undergo throughout their lives, a sensitivity that stems from the lifelong management we offer to increasing numbers of these patients.

› On page 14 we spotlight the vision of our newest hematologist-oncologist, Johannes Wolff, MD, who has brought his targeted therapy approach to Cleveland Clinic Children’s, making ours one of only three U.S. pediatric centers offering this strategy. His efforts are benefiting from collaboration with colleagues in Cleveland Clinic’s Taussig Cancer Institute, as targeted therapy first took hold in adult oncology.

› On page 18 we examine two areas of specialized pediatric epilepsy care where Cleveland Clinic Children’s large epilepsy patient volumes have made it possible to better define outcomes and advance novel practices. These volumes and opportunities to innovate are byproducts of Cleveland Clinic’s status as an elite epilepsy referral center for patients of all ages.

› On page 22 we preview exciting research to identify noninvasive biomarkers of pediatric inflammatory bowel disease (IBD) progression. Our pediatric gastroenterologists are collaborating with colleagues in Cleveland Clinic’s Digestive Disease Institute and scientists in Lerner Research Institute to study for the first time whether findings in adult IBD apply to pediatric IBD — and to look for signature findings in the pediatric setting.

The remaining pages profile our many specialized departments and centers with a focus on notable clinical and research activities in 2013. We start with two areas — surgery and rehabilitation — where we believe the comprehensiveness of our services is virtually unsurpassed.

Just as Cleveland Clinic Children’s benefits from being a part of an internationally celebrated medical center, we all benefit from being part of the overall pediatrics community. I welcome your input on what you see here, and I invite ideas on how we might work together to advance our singularly special medical discipline.

Respectfully,

GIOVANNI PIEDIMONTE, MD
piedimg@ccf.org
Khaled Malamid wasn’t supposed to have even made it to Cleveland Clinic Children’s. He was born half a world away with Martinez-Frias syndrome, a very rare disorder with autosomal recessive inheritance and a host of life-threatening manifestations. In Khaled’s case, these included neonatal diabetes, duodenal atresia, gallbladder agenesis, hypothyroidism, thalassemia, and iron overload with cholestatic liver disease.

There were no reports of any child with the condition reaching his or her second birthday. Yet today Khaled is an energetic and chatty 5-year-old whose experience is rewriting the book on Martinez-Frias syndrome after he underwent a landmark four-organ multivisceral transplant at Cleveland Clinic Children’s in September 2013.

Defying Early Expectations

Since birth, Khaled required total parenteral nutrition (TPN) and multiple daily doses of insulin. “He had a line placed and had infections all the time,” his mother recalls. “He weighed only 3 kg on his first birthday.” His doctors were preparing the family for his death soon after that birthday.

But somehow little Khaled hung on. After he turned 2, his doctors in his home country in the Middle East suggested that his parents explore options for a transplant abroad.

They eventually connected with Kareem Abu-Elmagd, MD, PhD, Director of Cleveland Clinic’s Transplant Center and the leading member of a pioneering team of transplant surgeons who developed multivisceral transplantation in the early 1990s. He proposed a complex transplant procedure to provide Khaled with a new intestine, duodenum, liver and pancreas.

“The fact that Khaled had survived longer than any other patient with Martinez-Frias syndrome suggested he might fare well,” says Dr. Abu-Elmagd. “It prompted us to try to give him a second chance through transplantation.”
Before Khaled, there were no reports of any child with Martinez-Frias syndrome reaching his or her second birthday.

**Enduring the Wait with Comprehensive Care**

So Khaled and his parents came to Cleveland Clinic in August 2012, when he was almost 3½ years old, to wait for suitable organs to become available.

Thus began months of inpatient therapy in the care of Kadakkal Radhakrishnan, MD, Cleveland Clinic Children’s Director of Nutrition and Intestinal Rehabilitation as well as Medical Director of Intestinal and Multivisceral Transplantation. His team provided Khaled with complex IV nutrition, maintained his fluid balance, worked with pediatric endocrinology colleagues to manage his diabetes and ensured his lines were clean to prevent infection.

**Transplant and Transformation: No More Diabetes or TPN**

In September 2013, a little more than a year into Khaled's stay at Cleveland Clinic Children’s, donor organs became available and Dr. Abu-Elmagd led a team of five operating surgeons through a 15-hour transplant procedure on then 4-year-old Khaled. The transplant was a success, with all four donor organs grafting well.

Khaled was discharged less than two months later on an unrestricted oral diet and with his diabetes cured. At seven months after transplant, Khaled was faring well with no need for insulin and enjoying his unrestricted diet to the fullest extent (his favorite foods include mussels, octopus and lobster).

Dr. Abu-Elmagd plans to monitor Khaled throughout his life, studying what happens to someone with Martinez-Frias syndrome as he ages and grows — something that had never been possible before.

**Beyond Surgical and Immunologic Expertise**

While Khaled’s mother is deeply grateful for the clinical expertise Dr. Abu-Elmagd, Dr. Radhakrishnan and their colleagues brought to bear for Khaled, she singles out the “specialness” of the caregiving they offered, particularly Dr. Abu-Elmagd. “Not only did he take care of our son,” she says, “but he really served as a psychiatrist to us as parents,” offering reassurance throughout many trying months.

For his part, Dr. Abu-Elmagd is gratified as an academic surgeon “to be able to show humanity this outcome” in a disease with such a traditionally dismal prognosis, but he is even more satisfied by helping to give Khaled a second chance. “I am confident he won’t have recurrent disease with the new organs,” he says. “I want to see the boy continue to be healthy, leading a normal life and enjoying his family.”
Launch of Cleveland Clinic’s pediatric transplant programs

1963 Kidney
362 transplants to date

1977 Blood & Marrow
197 transplants to date

1985 Heart
135 transplants to date

1985 Liver
98 transplants to date

1991 Lung
25 transplants to date

1994 Heart-Lung
7 transplants to date

1998 Pancreas
1 transplant to date

2013 Multivisceral/Intestinal
1 transplant to date

826 total pediatric transplants
629 total solid organ transplants
(through 2013, for patients under age 21)

4 organs, 5 surgeons, 15 hours

Khaled’s 15-hour, five-surgeon multivisceral transplant in September 2013 illustrates the breadth of Cleveland Clinic’s transplantation offerings for pediatric patients. The operation drew on the expertise of surgeons from the programs for intestinal, liver and pancreas transplant as well as specialists with Cleveland Clinic Children’s Nutrition and Intestinal Rehabilitation Program.

Cleveland Clinic Children’s is one of a small number of centers in the world where a child can receive virtually any type of transplant — solid organ, multivisceral, dual-organ, cellular or composite tissue — under one roof.

As of early 2014, three more pediatric patients were listed for multivisceral transplant at Cleveland Clinic Children’s.

For other notable 2013 transplantation developments, see page 42.
Less is more. That was a signature 2013 storyline in Cleveland Clinic Children’s Center for Pediatric and Congenital Heart Disease, at least when it comes to the radiation young heart disease patients are exposed to through diagnostic tests and invasive procedures.

“We know the risks of radiation exposure are dose-dependent and cumulative over time, which makes reduction of radiation exposure in pediatric patients imperative,” says pediatric electrophysiologist Peter Aziz, MD. That’s particularly the case for patients with congenital heart disease, who will undergo multiple procedures throughout their lives.

The past year saw the continuation or culmination of a flurry of efforts by Cleveland Clinic Children’s cardiologists to substantially curb their patients’ radiation exposure by shortening procedure times, adopting leading-edge equipment and deploying new techniques that promote low- or no-radiation testing.

**Cutting-Edge Cath Lab with Ultra-Low Radiation Exposure**

The capstone of those efforts was the early 2014 opening of a second pediatric catheterization laboratory, equipped with the latest detector technology, the Artis Q.zen angiography system (Siemens Healthcare). The system, which employs a crystalline (vs. amorphous) silicon detector, reduces electronic noise, thereby allowing imaging at much lower radiation levels than previously possible.

“This technology appears to reduce radiation exposure by as much as 50 percent without sacrificing image quality,” says Lourdes Prieto, MD, Director of the Pediatric Catheterization Laboratory.

The system is also equipped with an advanced X-ray tube that uses flat emitter technology to provide small focal sizes and strong, short X-ray pulses for improved contrast and spatial resolution of small moving vessels.

**A Hybrid Cath Lab Too**

The new cath lab joins Cleveland Clinic Children’s hybrid catheterization lab, which allows a cardiologist and a thoracic surgeon to work together on patients with complex congenital defects, reducing procedure time (and thus radiation exposure) as well as anesthesia and recovery time — and sometimes avoiding the need for cardiopulmonary bypass.
Cleveland Clinic Children’s interventional cardiologists have worked closely with medical physicists to develop a series of algorithms based on patient weight and planned procedure to minimize radiation exposure in both cath labs. As a result, they achieved a 40 percent reduction in radiation exposure during transcatheter pulmonary valve implantation over the past year for patients of similar weight and procedure duration, Dr. Prieto notes.

**New Frontiers in Real-Time Imaging**

The cardiologists have also been testing pediatric applications of a 3-D to 2-D registration technology that allows anatomic structures from a prior cardiac MRI or CT to be superimposed over fluoroscopy. This technology facilitates access to a desired structure — e.g., a collateral vessel, pulmonary artery branch or pulmonary vein — by providing a road map visible on fluoroscopy. The expected results are shorter procedure times with decreased radiation exposure and reduced use of contrast agents.

Rotational angiography capability in the cath lab improves the diagnostic quality of a procedure and allows the cardiologist to more accurately select the best angiographic angle for a given intervention. “From a 3-D data set, it is possible to register the location of a vessel on fluoroscopy, which decreases the time and radiation needed to access a desired structure,” explains Dr. Prieto.

**3-D Electroanatomic Mapping to Cut Radiation During Catheter Ablation**

At the same time, a novel use of a 3-D electroanatomic navigation system has enabled Cleveland Clinic Children’s...
electrophysiologists to curb radiation exposure during catheter ablation. Major cardiac structures are mapped and used as reference points for tracking the location of the ablation with magnets. Though the navigation system itself is not new, the application of this technology to reduce radiation exposure in the electrophysiology lab is an exciting adaptation.

The system allows most right heart ablations to be performed without fluoroscopy. When an arrhythmia is generated on the left side of the heart, fluoroscopy is required to guide the transseptal puncture, but the remainder of the procedure can be performed without fluoroscopy.

The system’s utility was assessed in a recent analysis of pediatric patients who underwent limited fluoroscopic 3-D electroanatomic mapping for catheter ablation for supraventricular tachyarrhythmias at Cleveland Clinic Children’s. These patients’ mean procedure time did not differ significantly from that of age-matched controls who underwent the same procedure under fluoroscopic guidance, and procedural success was equivalent between the two groups. However, mean fluoroscopy time was markedly lower in the 3-D mapping group (5.1 minutes) compared with the control group (35.4 minutes). Sixty percent of patients in the 3-D mapping group required no fluoroscopy at all.

“The more quickly we adopt these techniques and technologies, the more quickly we can reduce and eliminate radiation exposure in our young patients,” says Dr. Aziz.

For other notable 2013 cardiology developments, see page 31.
Aggressive chemotherapy protocols have yielded high cure rates for many forms of pediatric cancer. Yet options remain limited for patients who fail these treatments or have cancers highly resistant to known therapies.

It is these challenging patients that intrigue Johannes Wolff, MD. The pediatric oncologist has dedicated his career to trying to cure children deemed incurable — and to improving their quality of life in the process.

When Dr. Wolff arrived at Cleveland Clinic Children’s in late 2013 as the new Chair of the Department of Pediatric Hematology, Oncology and Blood & Marrow Transplantation, he brought this deep-rooted commitment along with a zeal for an emerging, highly individualized approach to therapy.

An Epiphany Around Targeted Therapy

A decade ago, frustrated by slow progress gained through clinical trials, Dr. Wolff had an epiphany: It struck him that imprecise diagnoses may be the reason for many of the treatment failures plaguing pediatric oncology.

“We were choosing treatments based on traditional diagnoses made by pathology, and they did not necessarily reflect the biology of the tumor,” he explains. “I became convinced we’d be more successful by treating individual tumors with biologic agents known to be effective against individual biomarkers.”

The approach, known as targeted therapy, initially took hold in adult oncology but is now being offered at a few pediatric centers, including Cleveland Clinic Children’s, to children who have failed multiple chemotherapy agents or do not qualify for any treatment protocol.

Under his targeted therapy strategy, Dr. Wolff determines the molecular composition of a tumor and then selects the medication(s) most likely to be effective against it. “This approach has the highest chance of extending event-free survival,” he says.

Success is measured against expectations. “If the expected length of life is 10 months and the child lives 14 months, treatment was a success,” he notes.

Building a Database for Better Treatment Choices

Dr. Wolff is now building a database of outcomes to help oncologists choose the best agent for a particular patient without conducting a literature search. He envisions creating a targeted therapy program that is robust on multiple fronts.

Confident of the value of targeted therapy to improve outcomes, Dr. Wolff ultimately hopes to convince the FDA to use data derived from his database to approve new drugs. The alternative, he says, fails children.
“When standard chemotherapy no longer works, and you think there are no more options, come here. We have options.”

“We’ll never be able to do clinical trials with targeted drugs for children when patient groups are broken down by tumor markers, because we’ll never have enough patients,” he says.

Shaping Trial Protocols — and a More Hopeful Future

While an outcomes database may prove invaluable in guiding individual therapy, clinical trials remain the standard for evaluating treatment potential in large populations.

The Children’s Oncology Group recently asked Dr. Wolff to write a clinical trial protocol for a novel drug for diffuse intrinsic pontine glioma (DIPG), a fast-growing brain tumor affecting the nervous system. Though standard chemotherapy often produces a remission lasting several months, the tumor always returns and few patients survive.

In his former position at MD Anderson Cancer Center, Dr. Wolff discovered that recurrent radiation had a dramatic effect on quality of life in children with DIPG. “It did not extend survival time, but it enabled these children to walk and talk again for their remaining days,” he says. “Their parents were extremely grateful.”

At Cleveland Clinic Children’s, Dr. Wolff intends to continue this research with a trial involving simultaneous radiochemotherapy building on radiosensitization.

“We don’t need to give up so soon,” he says. “When standard chemotherapy no longer works, and you think there are no more options, come here. We have options.”

For other notable 2013 hematology-oncology developments, see page 35.
Burgeoning Blood & Marrow Transplant Activities

Dr. Wolff’s arrival as the new chairman was not the only big 2013 development in the Department of Pediatric Hematology, Oncology and Blood & Marrow Transplantation. Activity was also abundant in the Pediatric Blood & Marrow Transplant Program, which was formalized as a dedicated pediatric program in 2011. Here are some 2013 highlights:

**FACT accreditation** — Accredited by the Foundation for the Accreditation of Cellular Therapy (FACT) for all services and facilities assessed, including:

- Pediatric allogeneic and autologous hematopoietic progenitor cell transplantation
- Marrow and peripheral blood cellular therapy product collection
- Cellular therapy product processing with minimal manipulation

**Launch of haploidentical transplant efforts**

- Initiated participation in clinical trials of pediatric haploidentical hematopoietic stem cell transplantation (HSCT) to broaden potential donor base
- Developed Cleveland Clinic Children’s own protocol using a myeloablative conditioning regimen to reduce relapse risk and improve survival in children undergoing haploidentical HSCT

**Enhanced collaboration with adult Blood & Marrow Transplant Program**

- Spurred by the 2013 arrival of Navneet Majhail, MD, MS, recruited from the National Marrow Donor Program and University of Minnesota, as Blood & Marrow Transplant Program Director for Cleveland Clinic’s Taussig Cancer Institute

**Program growth and maturation** — Continued the program’s steady growth since its formalization in 2011:

- 19 HSCT procedures from 2011 through 2013, with 92 percent overall survival
- Two pediatric HSCT specialists with support from four other pediatric hematologist-oncologists; added four specialized nurse practitioners for 24/7 HSCT-dedicated care
- Innovative application of HSCT to nonmalignant conditions such as thalassemia, Fanconi anemia, thrombocytopenias, etc.
- 0 percent CLABSI rate in 2013
Advances in managing refractory pediatric epilepsy depend on the steady, persistent application of innovative techniques — something for which a large patient population is a prerequisite.

In 2013, Cleveland Clinic Children’s epilepsy experts published important reports from their sizable patient base in two evolving aspects of pediatric epilepsy management — hemispherectomy for refractory cases and stereoelectroencephalography (SEEG)-guided resection for difficult-to-localize focal epilepsy.

More Meaningful Outcomes After Hemispherectomy

Cleveland Clinic Children’s has one of the world’s largest experience bases in hemispherectomy for medically refractory epilepsy in children. A team of its pediatric epileptologists drew from this base to publish in early 2013 the largest single-center experience on long-term seizure outcomes after pediatric hemispherectomy (Neurology. 2013;80:253-260).

Among the 170 consecutive children with evaluable data who underwent hemispherectomy from 1997 to 2009, 66 percent were seizure-free at mean follow-up of 5.3 years, and 80 percent were either seizure-free or had major improvement at last follow-up.

An accompanying editorial (Neurology. 2013;80:232-233) noted that the paper “contributes meaningfully to the hemispherectomy story” and that its large cohort enables assessment of the prognostic value of several key variables, including early postoperative seizures. But the editorial went on to note the literature’s lack of comprehensive assessment of functional outcomes following hemispherectomy, a question of huge import to patients and their families.

The team from Cleveland Clinic Children’s was already on that task, as later in the year the same researchers published a detailed report (Epilepsia. 2013;54:1771-1779) on long-term functional outcomes and their predictors among 115 of the 170 children in the hemispherectomy series whose families completed a structured questionnaire. They found the following at mean follow-up of 6.05 years:

› 83 percent of patients walked independently
› 73 percent had minimal or no behavioral problems
› 69.5 percent had satisfactory spoken language skills
› 42 percent had satisfactory reading skills

“Seizure freedom after hemispherectomy emerged as the single most important predictor of favorable outcome in all functional domains studied,” says Ajay Gupta, MD, Section Head of Pediatric Epilepsy and corresponding author of both papers.
The findings suggest that early interventions after hemispherectomy to curb seizure recurrence and to provide intensive language rehabilitation may improve long-term functional outcomes, although further study is needed for confirmation.

“Meanwhile, we’re hopeful our study will guide counseling of families before hemispherectomy through use of simple and easily comprehensible functional landmarks,” adds co-author Ahsan N.V. Moosa, MD.

Early Endorsement for SEEG-Guided Resection in Select Patients

At the same time, other Cleveland Clinic epilepsy specialists, led by pediatric epilepsy surgeon Jorgé Gonzalez-Martinez, MD, PhD, published their early experience with SEEG for extraoperative mapping of difficult-to-localize refractory focal epilepsy (Epilepsia. 2013;54:323-330). The cohort included a large share of pediatric and adolescent patients.

The team is among early U.S. adopters of the SEEG method for extraoperative monitoring in this setting as an alternative to subdural grids and strips. The latter are limited by an inability to localize deep epileptic foci, the need for relatively large craniotomies and a general restriction to exploration of a single hemisphere, which are important drawbacks in the pediatric population.

“SEEG enables precise recordings from deep cortical structures and multiple noncontiguous lobes while allowing bilateral explorations and avoiding large craniotomies,” explains Dr. Gonzalez-Martinez.

His team analyzed results in 30 consecutive pediatric patients (age < 21 years) with a diagnosis of medically refractory focal epilepsy who underwent SEEG implantation at Cleveland Clinic Children’s between August 2009 and March 2012. The hypothetical epileptogenic zone was localized in 26 of 30 patients, of whom 18 underwent resection. The average number of electrodes implanted per patient was 13.4, and each patient underwent two or three procedures, which included SEEG implantations, SEEG electrode removals and SEEG-guided resections.

None of the 30 patients experienced serious or permanent morbidity. Among the 18 patients who underwent resection, outcomes were as follows at last follow-up (mean of 21.9 months):

› 10 (55.6 percent) were seizure-free (Engel class I)
› 5 (27.8 percent) had seizure improvement (Engel class II or III)
› 3 (16.6 percent) had no seizure improvement

The researchers concluded that the SEEG method, when individualized through careful analysis, is a safe and efficient option for pediatric patients who present with clinical features of intractable focal epilepsy in the setting of nonlocalizable scalp EEG recordings and/or nonlesional MRIs.

“Performing SEEG in this highly selected group allowed us to partially overcome the relative limits of standard methods of invasive monitoring,” says Dr. Gonzalez-Martinez. “It offers an additional opportunity for seizure freedom without safety compromises in clinically challenging cases.”

“Seizure freedom after hemispherectomy emerged as the single most important predictor of favorable outcome in all functional domains studied.” — AJAY GUPTA, MD
Performing SEEG in this highly selected group allowed us to partially overcome the relative limits of standard methods of invasive monitoring.” — JORGE GONZALEZ-MARTINEZ, MD, PhD
Increased abdominal visceral adipose tissue (VAT) correlates with more aggressive and complicated inflammatory bowel disease (IBD) in adults, but no one had examined whether this finding applies to children as well. Until now.

A team of Cleveland Clinic Children’s gastroenterologists, in collaboration with colleagues in Cleveland Clinic’s Digestive Disease Institute and Lerner Research Institute, has completed the first retrospective study of this question and is now enrolling patients in a novel prospective study to confirm and expand their retrospective findings.

“These investigations aim to better define the risks of excess abdominal fat in IBD and may improve clinicians’ ability to predict which children with IBD will benefit from early intensive therapy without the need for repeat imaging studies,” says Rishi Gupta, MD, of Cleveland Clinic Children’s Department of Pediatric Gastroenterology, who is principal investigator for the ongoing prospective trial.

Abdominal Fat Associated with IBD Risk and Disease Activity

The retrospective study, which has been submitted for publication, was a single-center retrospective cohort investigation that compared 114 pediatric patients with newly diagnosed IBD (101 with Crohn’s disease [CD] and 13 with ulcerative colitis) with 78 age-matched controls without IBD. All subjects had abdominal CT scans, which were obtained at the time of IBD diagnosis in the patient group and for other reasons in the control group. VAT volumes were measured from the CT scans for all subjects.

The researchers found the following (after adjusting for body mass index [BMI] and age):

› VAT volumes were 33 percent higher in the IBD group than in controls ($P = .002$)

› Among the 101 patients with CD, higher VAT volumes were significantly associated with fistulizing or fibrostenotic disease, CD hospitalizations, moderate or severe disease activity scores, and shorter intervals from diagnosis to surgery

Adding Cytokines to the Mix in a Follow-On Prospective Trial

These results — indicating a correlation of IBD with increased abdominal fat, as well as an association between abdominal fat and disease activity and outcomes — have prompted a prospective study to confirm the findings and assess an additional question: whether cytokines in blood derived from VAT cells correlate with VAT volumes and with disease activity.
Adipose tissue has recently been recognized as producing a wide range of secretory factors, known collectively as adipokines, that play an important part in the immune response,” explains Dr. Gupta. “We suspect some of these adipokines may become activated and thus contribute to the inflammatory process of IBD.”

To test that hypothesis, he and colleagues are enrolling patients ages 5 to 20 who are scheduled to undergo colonoscopy at Cleveland Clinic Children’s for the purpose of establishing or ruling out an IBD diagnosis. They plan to enroll 30 patients with biopsy-confirmed IBD and 60 age-matched controls in whom IBD has been excluded.

All subjects undergo a baseline blood draw to assess for 11 serum adipokines (including TNF-alpha, IL-6, adiponectin and other less-well-studied cytokines) as well as baseline anthropometric measurement. Patients with IBD will also have VAT volumes measured from any MRI or CT studies ordered as part of their routine IBD management. The patients with IBD are being followed for 12 months for monitoring of disease activity, and control patients are monitored over the same period to confirm they are not subsequently diagnosed with IBD.

The researchers seek to do the following:

› Compare serum adipokine concentrations between the IBD patients and controls
› Correlate serum adipokine concentrations with BMI and waist circumference in both IBD patients and controls
› Correlate serum adipokine concentrations with VAT volume in IBD patients and with disease-related outcomes over 12 months, such as time to first IBD-related surgery, number of IBD hospitalizations, number of IBD flares requiring steroid therapy, and escalation of steroids and need for biologic therapy

**Potential Clinical Payoffs**

“If we find a correlation between some of these cytokines in the blood and MRI or CT findings, in the future we might be able to simply do repeat blood tests...
to assess disease activity rather than doing repeat imaging studies, which are not feasible because of radiation exposure, cost and other factors,” says Dr. Gupta.

He adds that correlating cytokine levels with disease activity might enable prediction of which children with IBD are at high risk of complications and thus prompt earlier treatment intensification to avoid complications. “This could yield a helpful noninvasive marker of disease progression,” he says.

An added benefit is better understanding of the interplay between IBD and obesity. “We are seeing that children with IBD tend to have increased visceral fat even if they are not obese,” Dr. Gupta says. “If these children become obese in addition to their extra visceral fat, that can be a dangerous double whammy” that requires extra vigilance to manage or to ward off in the first place.

Next Steps

Dr. Gupta expects to complete study enrollment by the end of 2014 and hopes to publish results by next year. While Cleveland Clinic Children’s knows of no other center currently pursuing this line of research in pediatric IBD, Dr. Gupta would be eager to expand these efforts to a multicenter trial if warranted by his study’s ultimate findings. “We welcome the opportunity to enhance the power of our study and benefit more children with IBD.”

For other notable 2013 gastroenterology developments, see page 34.

High Volumes and a High Profile in Pediatric IBD

Dr. Gupta cites the size and deep experience of Cleveland Clinic Children’s pediatric IBD program as key drivers of the groundbreaking studies he and his colleagues are doing. “About half our IBD patients have been referred for second or third opinions, many from out of state,” he notes. “We see a huge number of IBD patients, which makes studies like this feasible.”

Below are a few ways in which Cleveland Clinic Children’s stands out from the crowd in pediatric IBD:

› One of the nation’s largest centers for pediatric IBD

› One of the nation’s first pediatric centers to offer infusions of biologic agents (e.g., infliximab), given on an outpatient basis to more than 150 patients annually at four locations

› Significant contributor to the National Pediatric IBD Registry

› Monthly combined pediatric and adult clinics for IBD and pouchitis in which patients of all ages benefit from the collective expertise of gastroenterologists and surgeons from Cleveland Clinic Children’s and Cleveland Clinic’s celebrated Digestive Disease Institute

› Ready access to the expertise and resources of the Digestive Disease Institute’s world-renowned adult IBD program, which performs more operations for Crohn’s disease than any other center and features an IBD DNA bank to study IBD’s genetic basis
Cleveland Clinic Children’s offers a breadth and depth of surgical expertise and resources for pediatric patients that few children’s hospitals can match.

Our extensive team of dedicated pediatric surgeons works collaboratively with Cleveland Clinic’s ranks of adult-care surgeons to provide comprehensive surgical care to patients ranging from premature newborns to adolescents and young adults as well as individuals with congenital or persistent pediatric diseases requiring lifelong interventions.

The result is a culture of collaboration, continuity and comfort for patients with complex clinical needs, especially when transition to adult care is a priority.

A core team of pediatric general surgeons (see next page) is complemented by a large cadre of pediatric surgeons specializing in the following areas (numbers of pediatric surgeons are in parentheses):

- Cardiothoracic surgery (2)
- Eye surgery (6)
- Neurosurgery and epilepsy surgery (5)
- Orthopaedic and spine surgery (6)
- Otolaryngologic surgery (3)
- Plastic and reconstructive surgery (3)
- Urologic surgery (3)

Their work is supplemented by procedures performed by our three pediatric interventional cardiologists, endoscopies by our 11 pediatric GIs and bronchoscopies by our five pediatric pulmonologists.

Benefits of a Broad Institutional Team

These pediatric surgeons partner with their Cleveland Clinic adult-care colleagues when needed, such as for select organ transplants and other highly specialized procedures. They take full advantage of the high-definition imaging technology and leading-edge surgical instrumentation and other equipment of Cleveland Clinic’s renowned surgery programs across multiple specialties.

Much of that advanced equipment is found in Cleveland Clinic Children’s newly renovated pediatric operating rooms, including four minimally invasive surgery suites, designed and equipped for the tiniest newborns to the huskiest adolescents. It also figures prominently in the hybrid operating room/cardiac catheterization lab adjacent to our Special Delivery Unit — the only unit of its kind designed to accommodate serious medical conditions in either mother or newborn.

Rising Robotics Use

Minimal invasiveness is a guiding principle across all Cleveland Clinic Children’s surgical services. A prime example is our expanding application of robotic surgical techniques to pediatric procedures, particularly for delicate operations within small surgical workspaces. In 2013, our pediatric surgeons used robotic techniques for procedures such as Nissen fundoplication and for emerging applications where we are helping to refine practice, including:

- Choledochal cyst excision
- Congenital diaphragmatic hernia repair
- Excision of abdominal masses
- Adrenalectomy

Distinction in Congenital Heart Surgery

1.4%  
Our actual 2013 mortality for pediatric congenital heart surgery

3.9%  
Average mortality for pediatric congenital heart surgery, per Society of Thoracic Surgeons
Pediatric Surgical Services by the Numbers (2013)

11,924 total surgeries

11,562 surgical cases

1,425 general surgery cases

144 cardiothoracic surgery cases, including 37 neonatal and 39 infant cases

465 neurosurgery cases

427 cardiac catheterization procedures

1,113 endoscopy procedures

Department of Pediatric General Surgery

Our pediatric general surgeons operate at three locations — Cleveland Clinic’s main campus plus two community hospitals — with a dedicated pediatric team of anesthesiologists, radiologists, advanced practice nurses and other support clinicians at each location. They provide 24/7 pediatric surgical coverage at all three locations, including the pediatric ERs, level III NICUs and pediatric wards at the community hospitals. They perform common operations of childhood as well as a wide range of more complex procedures, including:

› General surgery of the chest and abdomen
› Noncardiac thoracic surgery
› Gastrointestinal and hepatobiliary procedures
› Surgical oncology
› Repairs of endocrine disorders
› Repairs of complex congenital anomalies in newborns

2013 Developments & Highlights

› 1,425 surgeries
› Performed Nuss procedure for 28 pectus excavatum cases, continuing our designation as one of only six national centers of excellence for minimally invasive repair of pectus excavatum
› Used single-port approach in > 65 percent of laparoscopic cholecystectomy procedures, with no instances of bile duct injury, cystic duct leak, infection or other complications
› Used single-port techniques in half of all appendectomies, with average length of stay < 1 day

clevelandclinicchildrens.org/surgery
Children’s Hospital for Rehabilitation

Cleveland Clinic Children’s Hospital for Rehabilitation is one of only 13 accredited, freestanding rehabilitation hospitals in the U.S. that serve pediatric patients exclusively. The breadth of offerings across its integrated inpatient program, outpatient rehabilitation programs and diverse therapy services is unsurpassed.

The Children’s Hospital for Rehabilitation offers an array of multidisciplinary programs for special patient populations (see list at far right) that operate out of one or more of its four major component areas:

› The Department of Physical Medicine and Rehabilitation, whose pediatric physiatrists specialize in areas such as head injury, spasticity, gait abnormalities and others
› The Center for Therapy Services, whose 102 therapists (occupational, physical, speech-language and recreational) serve patients at five distinct sites with assistance from art and music therapists and adaptive equipment specialists
› The Center for Developmental and Rehabilitative Pediatrics, where pediatricians with board certification in developmental-behavioral pediatrics work with specialty-trained nurse practitioners to manage children with conditions from feeding disorders to genetic disorders such as Down and fragile X syndromes
› The Center for Pediatric Behavioral Health, whose pediatric psychologists and neuropsychologists are subspecialty trained and highly specialized in conditions from headache to sleep problems to eating disorders. This center operates the Pediatric Pain Rehabilitation Program, the only such pediatric program in the world accredited by the Commission on Accreditation of Rehabilitation Facilities (CARF). The center also runs a distinctive Summer Treatment Program and a Medication Monitoring Clinic for children with ADHD.

2013 Developments & Highlights

› Earned Magnet® redesignation (third consecutive recognition) for nursing excellence from the American Nurses Credentialing Center
› Pediatric Inpatient Rehabilitation Program achieved a median length-of-stay efficiency (WeeFIM) rate of 1.99, vs. 1.34 for similar U.S. facilities, marking the sixth straight year of outperforming the U.S. benchmark on this measure of the speed of functional improvement
› Launched an Upper Extremity Management Clinic for children with one arm that is not functioning well due to brachial plexus injury, cerebral palsy or stroke
› Acquired an advanced mobile gait lab to enable enhanced gait disorders assessment at multiple locations
› Started the Constraint-Induced Movement Therapy Program, three weeks of intensive outpatient occupational therapy for children with upper extremity hemiplegia
› Began offering acupuncture and acupressure therapy to select pediatric patients with chronic pain, brain injuries and other conditions
› Introduced group behavioral therapy for children and teens with recurrent headache
› Markedly increased the number of patients managed in the Spasticity Clinic, which provides botulinum toxin injections and other specialized interventions

clevelandclinicchildrens.org/rehabhospital
Children’s Hospital for Rehabilitation by the Numbers (2013)

52 licensed beds

26 professional staff — physicians, psychologists and researchers — in multiple specialties

102 therapists

58 nurses

51,281 physical, occupational and speech therapy visits

7,417 behavioral health visits

613 rehabilitation visits

752 pain management visits

1 the world’s only CARF-accredited Pediatric Pain Rehabilitation Program

Multidisciplinary Programs for Special Populations

Aquatic Therapy Program
Autism Program
Feeding Disorders Program
CHAMPS (community sports program for children with disabilities)
Constraint-Induced Movement Therapy Program
Day Hospital
Feeding Disorders Program
Fragile X Clinic
Judith M. Power Center for Dialysis
Masterpiece Kids (art program)
Motor Control Program
NICU Follow-Up Clinic
Outpatient Therapy Services
Pediatric Pain Rehabilitation Program
Reach Out and Read Program
Seating and Wheelchair Clinic
Spasticity Program
Technology Resource Center (for augmentative and alternative communication)
Upper Extremity Management Clinic
Cleveland Clinic Children’s
Who We Are and What We Did in
2013

Autism

Cleveland Clinic Children’s Center for Autism provides comprehensive outpatient and school-based clinical services for children and young adults with autism spectrum disorder (ASD). The center’s many components include the state-certified Lerner School for Autism, the innovative SPIES group-training program to foster social thinking, a translational research program focused on characterizing genetic subgroups of ASD and multidisciplinary evaluation services specializing in early ASD detection.

2013 Developments & Highlights

› Outperformed national benchmark in average age at first ASD diagnosis (3.08 years vs. national average of 5.25 years)
› Discovered high urine levels of taurine and aspartic acid and altered blood levels of other amino acids in children with ASD, raising the prospect of future simple diagnostic tests
› Led largest-ever study of females with ASD, which found a specific female ASD phenotype and possible underidentification of ASD in high-functioning females
› Completed largest-ever study of twins with ASD, showing that ASD is highly heritable and may be driven by one or a few powerful genetic effects in each patient
› Implemented tablet-based electronic data collection in Lerner School for Autism, enabling real-time documentation of student progress
› Launched baseline and annual progress assessments for Lerner School for Autism students to provide parents with more accurate prognosis and improve educational planning
› 82 percent of individualized education plan (IEP) goals met by Lerner School for Autism students (2012-2013 school year)
› 67 percent placement of exiting preschool students in educational settings with less-intensive support (cumulative, 2008-2013)

clevelandclinicchildrens.org/autism

Allergy and Immunology

The 10 pediatric allergist/immunologists in the Center for Pediatric Allergy and Immunology manage young patients with all types of allergy as well as those with recurrent infection and problems related to immune deficiency. Specialized treatment offerings include desensitization and IV immunoglobulin, the latter given at pediatric infusion centers at multiple community locations. Allergy skin testing and ingestion challenge testing are offered on an outpatient basis.

2013 Developments & Highlights

› 8,606 outpatient visits
› Began developing protocols for challenges for food protein-induced enterocolitis syndrome
› Actively involved in allergy research and specific testing to provide patients with the latest treatment options

clevelandclinicchildrens.org/allergy
Cardiology

The 17 pediatric cardiologists and cardiothoracic surgeons in the Center for Pediatric and Congenital Heart Disease cover all subspecialty areas, from fetal care to neurocardiology, and perform all types of diagnostic, interventional and surgical procedures. Their commitment to lifelong management of congenital heart disease translates to close collaboration with Cleveland Clinic’s premier adult heart specialists for a seamless transition to adult care. Despite a highly complex case mix with referrals from around the world, complication rates remain below national averages.

2013 Developments & Highlights

› 10,405 outpatient visits across 11 Northeast Ohio locations
› 524 catheterization procedures, 10 in the first month and 66 in the first year of life
› 144 cardiothoracic surgeries
› 5 heart transplants (135 since program inception)
› Added second pediatric catheterization lab in early 2014, including the latest available detector technology, the Artis Q.zen system (see p. 10)
› Opened Pediatric Pacemaker Clinic in early 2014 to provide enhanced framework for managing children with pacemakers and ICDs
› Prepared for launch of Inherited Arrhythmia Clinic, to open in 2014 as a collaborative center of excellence for managing electrical abnormalities that can cause sudden cardiac death in patients with inherited arrhythmia disorders
› Reduced radiation exposure during transcatheter pulmonary valve implantation by 40 percent using new algorithms and techniques
› Tested pediatric applications of a 3-D/2-D registration technology to superimpose anatomic structures from prior imaging studies onto fluoroscopic images, reducing radiation exposure and contrast agent use
› Helped nonprofit PediaWorks develop first intravascular catheters approved for pediatric use by FDA (in January 2013); ours was the world’s first center to use the catheters
› 200th patient seen in comprehensive Neurocardiac Clinic for children with congenital heart disease, one of few such clinics in the U.S.
› Took part in major trials of interventional therapies for congenital heart disease, including a new atrial septal defect closure device and two covered stents for coarctation of the aorta and pulmonary artery repair
› 1,500th operation performed by pediatric cardiac surgery program at Cleveland Clinic-managed Sheikh Khalifa Medical City facility in Abu Dhabi
› Only pediatric cardiology/heart surgery program in northern Ohio ranked by U.S. News & World Report (2013-14)

clevelandclinicchildrens.org/cardiology
Critical Care Medicine / Pediatric ICU

Cleveland Clinic Children’s 25-bed pediatric intensive care unit (PICU) is a state-of-the-art quaternary-level facility for the sickest pediatric patients as well as older patients with congenital conditions. The Department of Critical Care Medicine’s multidisciplinary teams provide exceptional care on a 24/7 basis for patients with complex conditions such as pediatric and adult congenital heart disease or multiorgan failure and for patients undergoing sophisticated procedures like multivisceral transplant. Cleveland Clinic Children’s Critical Care Transport team transfers critically ill pediatric patients to our PICU from around the world.

2013 Developments & Highlights

› 1,690 PICU admissions
› Welcomed new Department Chair, Leticia Castillo, MD, who brings extensive clinical experience in the care of critically ill children and NIH-funded translational research in nutrition biochemistry as applied to critical illness
› Outperformed national benchmarks in rates of CLABSIs (0.92 vs. 1.4 per 1,000 central line days), CAUTIs (0.9 vs. 2.7 per 1,000 central line days) and ventilator-associated pneumonia (0.61 vs. 0.8 per 1,000 ventilator days)
› Outperformed comparable pediatric institutions in disease severity-adjusted mortality risk (2.19 vs. 2.47 percent)

Dermatology

Our four pediatric dermatologists and dermatologic surgeons care for common to complex disorders of the skin, hair and nails, including genetic and infectious conditions. A centerpiece of their efforts is the multidisciplinary Vascular Anomalies Program, one of the few such programs in the nation, which treats anomalies from simple birthmarks to large, disfiguring skin lesions.

2013 Developments & Highlights

› 16,221 outpatient visits
› Marked treatment of the 100th patient with infantile hemangioma since formation of the Vascular Anomalies Program in 2009
› Implemented an innovative protocol, the Standardized Clinical Assessment and Management Plan (SCAMP), for managing infantile hemangiomas with propranolol — the first known application of the SCAMP methodology in an academic dermatologic practice

clevelandclinicchildrens.org/dermatology
Endocrinology

The Center for Pediatric and Adolescent Endocrinology is home to five pediatric endocrinologists who manage children with diverse metabolic and growth disorders through a number of specialized or multidisciplinary clinics, making innovative use of shared medical appointments for select conditions.

2013 Developments & Highlights

› 8,575 outpatient visits
› Completed rollout of Glycogen Storage Disease Program, one of the world’s only dedicated programs for this rare disorder, with more than 50 patients managed in its first year
› Average reduction of > 100 mg/dL in serum triglycerides among Glycogen Storage Disease Program patients with longitudinal data available
› Designed intensive, multidisciplinary three-hour visit to reduce admissions for diabetic ketoacidosis and improve overall disease control for patients with poorly controlled type 1 diabetes mellitus
› Helped develop and implement an EMR-integrated care path to encourage evidence-based practice in inpatient management of diabetic ketoacidosis
› Ranked as a “Best Children’s Hospital” for diabetes and endocrinology by U.S. News & World Report (2013-14)

clevelandclinicchildrens.org/endocrinology

Fetal Care / Special Delivery Unit

The Fetal Care Center pools the talents of 45 specialists in maternal-fetal medicine, neonatology and diverse pediatric subspecialties to provide advanced diagnostic and treatment options and coordinate care for the most complicated of pregnancies and births. Its centerpiece is the Special Delivery Unit, the only facility in the nation designed expressly to provide specialized care for both mothers and newborns with serious medical issues. The unit can accommodate medical teams for both mother and baby.

2013 Developments & Highlights

› Special Delivery Unit completed its first full calendar year of operation with 95 deliveries in 2013
› 29 percent of Special Delivery Unit deliveries were due to critical maternal illness, with cardiac disease the most common maternal condition
› Fetal procedures from percutaneous umbilical blood sampling to fetal intrauterine transfusion were performed

clevelandclinicchildrens.org/fetalcare
clevelandclinicchildrens.org/sdu
Gastroenterology

The Department of Pediatric Gastroenterology’s 11 pediatric gastroenterologists and hepatologists serve one of the largest populations of children with digestive disorders in the nation. Their subspecialty expertise is broad and deep, ranging from pediatric inflammatory bowel disease to GI motility disorders to intestinal rehabilitation and all aspects of liver, small bowel and multivisceral transplantation.

2013 Developments & Highlights

› 15,830 outpatient visits
› Managed the complex IV nutrition, fluid, immunosuppressant, and pre- and post-transplant needs of a 4-year-old recipient of a successful four-organ transplant (intestine, duodenum, liver, pancreas), Cleveland Clinic’s first pediatric multivisceral transplant (see p. 6)
› Launched multidisciplinary Be Well Kids Clinic in conjunction with the Department of General Pediatrics to help children and adolescents learn to achieve and maintain a healthy weight throughout life
› Published novel clinical trial findings demonstrating the promise of exhaled breath analysis for noninvasive detection of fatty liver disease in children
› Conducted innovative research on the impact of visceral adipose tissue on disease activity in pediatric IBD (see p. 22)
› Worked with colleagues from other top children’s hospitals and government officials to reduce risks of accidental magnet ingestion by children nationwide
› Developed and directed hands-on endoscopy training for > 200 pediatric GI trainees and pediatric gastroenterologists from the U.S. and Canada at a national meeting
› Collaborated on 22 IRB-approved research studies
› Ranked top pediatric gastroenterology program in northern Ohio and among top 10 in the nation (U.S. News & World Report, 2013-14)

clevelandclinicchildrens.org/gi
Graduate Medical Education

Cleveland Clinic Children’s directs a pediatric residency program with 39 trainees, including one trainee in an accelerated, five-year combined pediatric/child neurology residency. Residents benefit from research training, a rigorous curriculum in patient safety and quality improvement, and exposure to diverse practice settings (tertiary care and community hospitals, a freestanding rehabilitation hospital and various outpatient clinics). We offer pediatric fellowship programs in 12 areas: allergy/immunology, behavioral medicine/psychology, cardiology, gastroenterology, hematology/oncology, hospital medicine, infectious diseases, neonatology, ophthalmology, orthopaedics, pain psychology (postdoctoral) and primary care sports medicine.

2013 Developments & Highlights

› 100 percent first-time board pass rate among 2013 residents
› Launched a postdoctoral fellowship in pediatric pain psychology
› 32 publications and scientific presentations by pediatric fellows

clevelandclinicchildrens.org/
medicalprofessionals

Hematology and Oncology

The Department of Pediatric Hematology, Oncology and Blood & Marrow Transplant’s eight pediatric hematologist-oncologists provide innovative care for young patients with rare and more common cancers and blood disorders. Their expertise spans brain and spinal cord tumors, all types of blood malignancies, sarcomas and other solid tumors, sickle cell disease and a host of other nonmalignant blood disorders. In collaboration with Cleveland Clinic’s renowned Taussig Cancer Institute, they deploy the most cutting-edge treatments, from intraoperative radiation therapy to haploidentical stem cell transplants to targeted cancer therapy.

2013 Developments & Highlights

› 5,000 outpatient visits
› Welcomed new Department Chair, Johannes Wolff, MD, who established here one of only three pediatric targeted therapy programs in the nation (see p. 14)
› Received accreditation from the Foundation for the Accreditation of Cellular Therapy (FACT) for all blood and marrow transplant services and facilities assessed
› 8 blood and marrow transplants performed, with 100 percent survival at 100 days
› Developed an original protocol using myeloablative conditioning to reduce relapses and improve survival in children undergoing haploidentical stem cell transplant
› Broadened participation in the Children’s Oncology Group and other national consortia to provide access to more than 100 advanced pediatric trials
› Ranked as a “Best Children’s Hospital” for cancer by U.S. News & World Report (2013-14)

clevelandclinicchildrens.org/hemonc
clevelandclinicchildrens.org/BMT
Hospital Medicine

Twenty-five pediatric hospitalists provide 24/7 coverage at five hospitals in the Cleveland Clinic health system, making our Department of Pediatric Hospital Medicine one of the nation’s largest such programs. Along with coordinating care among the many pediatric subspecialists who contribute to managing our complex inpatient cases, our hospitalists lead key Cleveland Clinic Children’s quality initiatives.

2013 Developments & Highlights
› Avoided CLABSIs among all Cleveland Clinic Children’s inpatients for a period of more than 365 days
› 50 percent increase in Safety Event Reporting System (SERS) reporting and 60 percent decrease in serious safety events
› Played key roles in national Value in Inpatient Pediatrics and Choosing Wisely quality initiatives
› Developed an evidence-based electronic care path for neonatal hyperbilirubinemia for implementation across the Cleveland Clinic health system
› Helped implement electronic care paths to encourage evidence-based practice in inpatient management of asthma, bronchiolitis and diabetic ketoacidosis

clevelandclinicchildrens.org/hospitalmed

Infectious Diseases

The four pediatric infectious diseases specialists in the Center for Pediatric Infectious Diseases provide around-the-clock consultation on treatment and management of common to highly complex infectious diseases, including those related to organ transplant and malignancies. They evaluate hospitalized children seven days a week, including in the pediatric and neonatal ICUs. They also see children daily in clinic for urgent and follow-up care and manage and care for all children on outpatient antibiotic therapy after discharge.

2013 Developments & Highlights
› 492 inpatient and 355 outpatient consults
› Provided comprehensive pre-transplant evaluation of all 19 children who underwent solid organ or hematopoietic stem cell transplantation
› Completed implementation of a real-time electronic database developed to help track and prevent pediatric surgical site infections

clevelandclinicchildrens.org/id

Neonatology

Cleveland Clinic Children’s is the largest provider of neonatal intensive care in Northeast Ohio, with level III NICUs at two community hospitals and on our main campus that collectively house 87 NICU beds. Ours is the region’s only children’s hospital providing 24/7 in-house coverage by board-certified/eligible neonatologists; that coverage is provided at the NICUs mentioned above and at an additional community hospital. Our Department of Neonatology’s other points of distinction include a neonatal neurointensive care unit, a neonatal short gut syndrome ICU, NICU Follow-Up Clinics at three community locations and a Special Delivery Unit (see p. 33).

2013 Developments & Highlights
› 1,330 NICU admissions
› 545 patient visits to NICU Follow-Up Clinics
› Collaborated with fetal care colleagues to care for the 95 babies delivered in Special Delivery Unit
› Helped develop and implement a Cleveland Clinic Children’s care path for hyperbilirubinemia in term neonates to ensure evidence-based practice through EMR integration

clevelandclinicchildrens.org/nicu
Nephrology and Urology

Cleveland Clinic Children’s Center for Pediatric Nephrology and Center for Pediatric Urology take a collaborative approach to routine and complex conditions of the kidney, bladder and genitourinary tract, modeling themselves on the culture and integrated services of Cleveland Clinic’s celebrated Glickman Urological & Kidney Institute. The centers’ five pediatric nephrologists, two pediatric urologists and one adolescent/transitional urology specialist staff the only program in northern Ohio with both a dedicated pediatric outpatient dialysis center and a pediatric kidney transplant program (see list at right).

2013 Developments & Highlights

› 5,573 outpatient visits

› Welcomed pediatric nephrologist Katherine Dell, MD, on staff, who brings NIH funding to study autosomal recessive polycystic kidney disease progression using quantitative MRI and is an investigator in the CKID and NEPTUNE multicenter trials

› Marked Cleveland Clinic’s 50th year of pediatric kidney transplantation with 362 pediatric kidney transplants to date

› Achieved highest hemodialysis patient population to date (N = 15) and doubling of peritoneal dialysis population

› Exceeded national benchmarks for urea reduction ratio and another measure of hemodialysis adequacy (Kt/V)

› Exceeded national benchmark for arteriovenous fistula rate for all children receiving hemodialysis and those receiving it for ≥ 6 months

› Ranked top pediatric urology program in northern Ohio (U.S. News & World Report, 2013-14)

clevelandclinicchildrens.org/nephrology
clevelandclinicchildrens.org/urology

Points of Distinction in Pediatric Renal and Urological Care

› Judith M. Power Center for Dialysis, offering in-center hemodialysis and home-based peritoneal dialysis

› 50 years of pediatric kidney transplantation, supporting donations from living and deceased donors

› Minimally invasive treatment of recurrent urinary tract infection, incontinence, genital and urinary anomalies, urinary tract stones, and congenital anomalies

› Advanced surgical management of tumors of the kidneys, bladder and genitalia; sexual differentiation disorders; and genitourinary tract reconstruction

› Comprehensive transition care program well before the 21st birthday for young adults with congenital diseases and those on dialysis or who have had kidney transplant or advanced chronic kidney disease

clevelandclinicchildrens.org/nephrology
clevelandclinicchildrens.org/urology

BEST CHILDREN'S HOSPITALS

2013-14

BEST HOSPITALS

NATIONAL

2013-14
Neurology and Neurosurgery

More than two dozen specialists in pediatric neurology, neurosurgery, epilepsy, brain tumors and sleep disorders constitute the Center for Pediatric Neurology and Neurosurgery. They direct a multitude of specialized clinical programs, many of them interdisciplinary, for challenging pediatric brain and spine disorders. The center’s points of distinction include a nearly unsurpassed experience base in epilepsy surgery, continuous 24/7 EEG monitoring services, and one of the nation’s few dedicated pediatric syncope and dysautonomia programs with a fully equipped pediatric autonomic lab.

2013 Developments & Highlights

› 24,740 outpatient visits
› 465 neurosurgical procedures
› Began use of Cleveland Clinic’s new 7-tesla MRI scanner, one of only a few in the U.S., for adolescent neuropsychiatric research applications
› > 200 patients now seen by Cyclic Vomiting Program, one of only two such programs in U.S.
› > 200 patients now seen in the Neurocardiac Clinic, one of only a handful of such clinics in the nation
› Established Ketogenic Diet Clinic for children requiring a special diet for epilepsy treatment
› Serving as lead national site for study of the natural history of Pearson syndrome
› Published largest single-center experience to date on seizure outcome after pediatric hemispherectomy (see p. 18)
› Initiated work to adapt the validated Cleveland Clinic Concussion App for use as an unprecedented tool in athletes 5 to 12 years old
› Ranked top pediatric neurology/neurosurgery program in northern Ohio and among top 10 in the nation (U.S. News & World Report, 2013-14)

clevelandclinicchildrens.org/neurology
Ophthalmology

The six pediatric ophthalmologists in the Department of Pediatric Ophthalmology and Strabismus are an integral part of Cleveland Clinic’s Cole Eye Institute, one of the world’s premier eye centers. Their expertise ranges from all types of strabismus to congenital cataracts, retinopathy of prematurity, lid and orbit disorders, and more. With Cole Eye Institute’s Center for Genetic Eye Diseases, they treat inherited eye disorders, and an ocular oncologist manages retinoblastoma and other pediatric eye tumors.

2013 Developments & Highlights

- 27,005 outpatient visits
- Enrolled children in clinical trials of atrophy progression secondary to Stargardt disease and of differing lateral rectus muscle recession approaches to intermittent exotropia
- Published papers on research projects ranging from childhood retinal dystrophies to the genetics of retinal findings in tuberous sclerosis complex

clevelandclinicchildrens.org/eye

Orthopaedics and Sports Health

The six pediatric orthopaedic surgeons in the Center for Pediatric Orthopaedics and Spine Deformity are joined by 21 sports health physicians who deliver comprehensive musculoskeletal care to growing children and adolescents. Their expertise ranges from scoliosis surgery to cartilage injuries in throwing arms to surgical and nonsurgical interventions for congenital deformities of the extremities. Arthroscopic procedures are used whenever possible to minimize pain and scarring and reduce risks to growth plates.

2013 Developments & Highlights

- 47,169 outpatient orthopaedic and sports health visits
- Conducted NIH-funded research that developed an in vitro cell culture model replicating critical features of the network regulating columnar morphogenesis in growth plates
- Devised a new classification system for elbow osteochondritis dissecans (OCD) in young athletes, to refine treatment guidance provided by earlier systems
- Published a descriptive lab study mapping cartilage depths in the knee and elbow to optimize depth matching for osteochondral autograft procedures for elbow OCD in young athletes
- Instituted infection prevention protocol that reduced surgical site infections in complex spine deformity procedures by 78 percent from 2009 to 2013
- Expanded use of cutting-edge minimally invasive hip arthroscopy for joint preservation in adolescents with labral tear and femoroacetabular impingement

clevelandclinicchildrens.org/orthopaedics
clevelandclinicchildrens.org/sportshealth
Otolaryngology

The pediatric otolaryngologists and ENT nurses in the Section of Pediatric Otolaryngology are supported by pediatric specialists in audiology, speech and respiratory therapy, and other disciplines to deliver comprehensive care across a range of conditions. Their expertise spans hearing loss, airway obstruction, congenital neck masses and other ENT anomalies, facial trauma, head and neck cancers, and more. They draw on the resources of Cleveland Clinic’s renowned Head & Neck Institute and play a primary role in specialized centers for aerodigestive, craniofacial and hearing disorders.

2013 Developments & Highlights
› 19,044 outpatient visits
› Added third fellowship-trained pediatric otolaryngologist with expertise in surgical correction of craniofacial abnormalities (cleft lip/palate, micrognathia)
› From 2009 to 2013, the Pediatric Clinic for Aerodigestive, Voice and Swallowing Disorders achieved a 14.8-day average reduction per patient in hospitalization among children with severe disorders of this type

clevelandclinicchildrens.org/ent

Plastic Surgery

Our nationally renowned pediatric plastic surgeons care for children with cleft lip and palate, craniosynostosis, hemifacial microsomia, other congenital facial deformities, and diverse cases of facial and other trauma. They use pioneering minimally invasive approaches whenever possible. Our plastic surgeons lead highly recognized multidisciplinary clinics for cleft lip/palate and for craniofacial-orbital deformities and play a leading role in the interdisciplinary Vascular Anomalies Program.

2013 Developments & Highlights
› Achieved 0 percent nasal fistula rate across 64 consecutive cleft palate repairs from 2010 through 2013
› 100 percent satisfaction among parents of children who underwent cleft lip surgery

clevelandclinicchildrens.org/plasticsurgery

Pulmonary Medicine

The Center for Pediatric Pulmonary Medicine’s five pediatric pulmonologists provide specialized diagnostic and treatment services for conditions from bronchopulmonary dysplasia to interstitial lung diseases to cystic fibrosis. Their expertise is pooled in several specialized multidisciplinary pediatric centers, including centers for airway, voice and swallowing disorders; sleep problems; and asthma. They evaluate and manage children seeking lung transplant and those with pulmonary complications of other transplant types.

2013 Developments & Highlights
› 3,451 outpatient visits
› Helped develop and implement a Cleveland Clinic Children’s care path for inpatient asthma management designed to ensure evidence-based practice through EMR integration
› Welcomed cystic fibrosis specialist Nathan Kraynack, MD, on staff, who is working with adult-care specialists in Cleveland Clinic’s Respiratory Institute to deepen and expand pediatric lung transplant services
› Published an NIH-funded study that replicated respiratory syncytial virus (RSV) infection in an animal model, demonstrating placental transfer of RSV from mother to fetus and suggesting fetal origins for some pediatric asthma cases
› Ranked as a “Best Children’s Hospital” for pulmonology by U.S. News & World Report (2013-14)

clevelandclinicchildrens.org/pulmonology
Quality and Patient Safety

Cleveland Clinic Children’s Quality Council works with its interdisciplinary Quality and Patient Safety Steering Team to ensure the quality and safety of clinical care provided throughout the network. This entails overseeing development and review of safety and quality policies, procedures, programs and performance improvement initiatives. A major focus is actively communicating best practices and key quality and patient safety initiatives to all caregivers.

2013 Developments & Highlights

› 50 percent increase in Safety Event Reporting System (SERS) reporting and 60 percent decrease in serious safety events
› No adverse drug events (ADEs) that led to serious harm since October 2011
› Expanded error prevention training to Department of Community Pediatrics, with > 3,000 caregivers now trained in error prevention techniques
› Nearly 50 percent reduction in ICU CLABSI rate

Research

The recently formed Center for Pediatric Research serves to build and expand high-impact research programs for both common and rare childhood diseases. Directed out of Cleveland Clinic Children’s by two pediatric clinician-researchers, the center prioritizes collaboration with scientists in Cleveland Clinic’s eminent Lerner Research Institute as well as leading researchers among the health system’s adult-care specialists. Research mentorship of junior pediatric staff is another key focus.

2013 Developments & Highlights

› Increased NIH research funding by >10 percent
› Welcomed pediatric nephrologist and researcher Katherine Dell, MD, as new Director of Pediatric Clinical and Translational Research
› Staff published significant research in autism spectrum disorder, fetal transmission of respiratory syncytial virus, exhaled breath analysis for noninvasive detection of fatty liver disease and juvenile idiopathic arthritis, and many other areas
› Teams conducted novel research ranging from development of an in vitro cell culture model of the network regulating growth plate formation to the effect of visceral adipose tissue on disease activity in pediatric inflammatory bowel disease

clevelandclinicchildrens.org/rheumatology

Rheumatology

Staffed by three pediatric rheumatologists, the Center for Pediatric Rheumatology is a national referral center for chronic vasculitis and recurrent fever syndromes in children, with support from colleagues in Cleveland Clinic’s internationally renowned vasculitis program for adults. The center’s staff offers pediatric infusion services, imaging, lab services and bone density testing at multiple community locations for children with common and rare rheumatic and immunologic disorders.

2013 Developments & Highlights

› 3,137 outpatient visits
› Expanded pediatric-dedicated services for infusion of biologic agents to a fourth community location
› Published one of the largest case series to date of childhood-onset eosinophilic granulomatosis with polyangiitis
› Completed innovative study (published early 2014) suggesting that exhaled breath analysis is a promising noninvasive means for identifying children with juvenile idiopathic arthritis

clevelandclinicchildrens.org/rheumatology
Transplant

Cleveland Clinic Children’s is one of the few centers in the world where a child can receive virtually any type of transplant — solid organ, multivisceral, dual-organ, cellular or composite tissue — under a single roof. Our Transplant Center’s team of pediatric transplant medical directors works closely with Cleveland Clinic’s world-renowned transplant surgeons, pediatric immunologists and infectious disease specialists, and expert supporting clinicians to ensure the best outcomes and experience for the youngest transplant patients.

2013 Developments & Highlights

› 19 pediatric solid organ or blood and marrow transplants performed
› Successfully completed Cleveland Clinic’s first pediatric multivisceral transplant (intestine, duodenum, liver, pancreas) in a 4-year-old with rare and deadly Martinez-Frias syndrome (see p. 6)
› Received accreditation from the Foundation for the Accreditation of Cellular Therapy (FACT) for all blood and marrow transplant services and facilities assessed
› Continued offering living-donor liver transplants to both children and adults, the only program in Ohio to do so
› Developed original protocol using myeloablative conditioning to reduce relapses and improve survival in children undergoing haploidentical stem cell transplant
› Marked 50-year anniversary of Cleveland Clinic’s first pediatric kidney transplant

clevelandclinicchildrens.org/transplant

Wellness

Wellness initiatives increasingly infuse clinical offerings across all of Cleveland Clinic Children’s. A centerpiece is the Be Well Kids Clinic, opened in 2013 to empower children and teens to lose unhealthy excess pounds and learn to maintain a lifelong healthy weight. Other offerings include Fit Youth, a family weight management program at four community locations; a preventive cardiovascular and metabolic clinic; and 5 to Go!™, a program that teaches students an easy countdown of steps for health, fitness, civility and media mindfulness.

2013 Developments & Highlights

› Launched multidisciplinary Be Well Kids Clinic to help children and teens overcome issues surrounding unhealthy weight through comprehensive evaluation, motivational interviewing and family engagement
› 5 to Go! program was spotlighted by First Lady Michelle Obama’s Let’s Move! initiative and in U.S. Department of Agriculture communications
› Exceeded National Committee for Quality Assurance 90th-percentile benchmarks for rates of childhood and adolescent immunizations
› Enhanced EMR templates for well-child visits to improve rates of BMI classification (done at 96 percent of visits), nutrition counseling (90 percent) and physical activity counseling (89 percent)
› Expanded Food Is Knowledge® program in early childhood settings and through collaborations with Greater Cleveland Food Bank and Girl Scouts of Northeast Ohio
› Worked with Cleveland public schools to have our Healthy Futures program adopted in the science program for the school district’s 3,000 fourth-graders
› Introduced Be Well Moms maternal weight management program to promote healthy weight in pregnant women to reduce their babies’ risks of obesity and other conditions
All the centers and departments profiled above benefit from the following expert clinical services that impact patients and their families in essential ways across the entire Cleveland Clinic Children’s network:

**Department of General Pediatrics** — 11 pediatricians providing general and preventive care services while also fulfilling education and academic medicine roles and pursuing research

**Department of General and Community Pediatrics** — 70 general pediatricians, nurse practitioners and physician assistants serving as the primary point of wellness and acute care for 80,000 children and adolescents in Northeast Ohio across 20 practice sites

**Department of Pediatric Anesthesiology** — 14 fellowship-trained pediatric anesthesiologists and eight pediatric CRNAs providing anesthesia support for 13,000+ pediatric surgeries and procedures

**Section of Pediatric Imaging** — Nine pediatric radiologists and neuroradiologists using the most advanced imaging equipment and techniques for evaluation of all body systems, performing over 8,500 MRIs (including ultrafast fetal MRI), 10,000 CTs and 13,000 ultrasound procedures annually

**Nursing** — 883 pediatric nurses practicing at the top of their profession, as reflected in 2013 Magnet® redesignation from the American Nurses Credentialing Center for Cleveland Clinic’s main campus (including Children’s Hospital for Rehabilitation) and Fairview Hospital

**Child Life Services** — 22 child life specialists counseling and supporting young patients and their families through all stages of their care and recovery

**Pediatric Nutrition Support Team** — 10 registered dietitians, all board-certified in pediatrics, working with physicians to provide comprehensive, individualized nutritional care to patients from birth through adolescence in inpatient, outpatient and rehabilitation settings

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**Expert Services Across the Network**
Cleveland Clinic Children’s

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Cleveland Clinic Children's is backed by the full resources of Cleveland Clinic and offers complete medical, surgical and rehabilitative care for infants, children and adolescents. More than 300 pediatricians and pediatric subspecialists accommodate 800,000 patient visits annually at our main campus, at Cleveland Clinic Children's Hospital for Rehabilitation, at community hospitals and at family health centers. Cleveland Clinic Children’s earned national rankings in seven specialties in the 2013-14 edition of U.S. News & World Report's "Best Children's Hospitals" survey.

Year in Review is written for physicians and should be relied on for medical education purposes only. It does not provide a complete overview of the topics covered and should not replace the independent judgment of a physician about the appropriateness or risks of a procedure for a given patient.

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Our Referring Physician Hotline, 855.REFER.123 (855.733.3712), provides 24/7 access to information on Cleveland Clinic Children's more than 350 pediatric specialists and subspecialists.
Cleveland Clinic Children’s Locations

Cleveland Clinic Children’s 350+ pediatricians and pediatric subspecialists offer comprehensive medical, surgical and rehabilitative care at more than 40 community locations (dots in map below) throughout Northeast Ohio.

Highlights of our facilities and broad-ranging services include:

- Inpatient units at our main campus and Fairview and Hillcrest hospitals with 24/7 pediatric hospitalist staffing and dedicated pediatric ancillary services
- 87 level III NICU beds at our main campus and Fairview and Hillcrest hospitals
- 24/7 pediatric EDs at Fairview and Hillcrest hospitals
- Special Delivery Unit on our main campus
- Pediatric dialysis unit at our Hospital for Rehabilitation
- Diverse subspecialty program offerings at our main campus and Fairview, Hillcrest and Medina hospitals as well as at family health centers across Northeast Ohio

The reach of our care extends beyond Northeast Ohio thanks to Cleveland Clinic Children’s Critical Care Transport fleet. To arrange a pediatric transfer from anywhere in the world, call 216.448.7000 or 866.547.1467.
Resources for Pediatricians

24/7 Hospital Transfers/Admissions
Children’s hospital, main campus
216.448.7000 or 866.547.1467
Cleveland Clinic Children’s Hospital for Rehabilitation
216.448.6400 or 800.635.2417

Pediatric Physician Liaison
For service-related issues or information about our specialists and services, contact Pediatric Physician Liaison Janet Zaibek, RN, at zaibekj@ccf.org or 216.312.6178.

Referring Physician Hotline
For 24/7 access to information on our pediatric specialists and services, call 855.REFER.123 (855.733.3712).

Staff Directory and Services
Visit clevelandclinicchildrens.org/staff to view Cleveland Clinic Children’s staff and services online.

Track Your Patients’ Care Online
Establish a secure online DrConnect account for real-time information about your patients’ treatment at Cleveland Clinic at clevelandclinic.org/drconnect.

Critical Care Transport Worldwide
To arrange for a critical care transfer, call 216.448.7000 or 866.547.1467. For STEMI (ST elevated myocardial infarction), acute stroke, ICH (intracerebral hemorrhage) or aortic syndrome transfers, call 877.379.CODE (2633). Visit clevelandclinic.org/criticalcaretransport to learn more.

Outcomes Data
View Outcomes books for Cleveland Clinic institutes, including Cleveland Clinic Children’s & Pediatric Institute, at clevelandclinic.org/outcomes.

Consult QD Blog for Physicians
Discover the latest research insights, treatment trends and more at consultqd.org.

Same-Day Appointments
Cleveland Clinic offers same-day appointments to help your patients get the care they need, right away. Have your patients call our same-day appointment line, 216.444.CARE (2273) or 800.223.CARE (2273).

CME Opportunities: Live and Online
Visit ccfcmce.org to learn about the Cleveland Clinic Center for Continuing Education’s convenient, complimentary learning opportunities.

About Cleveland Clinic
Cleveland Clinic is an integrated healthcare delivery system with local, national and international reach. At Cleveland Clinic, more than 3,000 physicians and researchers represent 120 medical specialties and subspecialties. We are a nonprofit academic medical center with a main campus, eight community hospitals, more than 75 northern Ohio outpatient locations (including 16 full-service family health centers), Cleveland Clinic Florida, Cleveland Clinic Lou Ruvo Center for Brain Health in Las Vegas, Cleveland Clinic Canada, Sheikh Khalifa Medical City and Cleveland Clinic Abu Dhabi.

In 2013, Cleveland Clinic was ranked one of America’s top 4 hospitals in U.S. News & World Report’s annual “America’s Best Hospitals” survey. The survey ranks Cleveland Clinic among the nation’s top 10 hospitals in 14 specialty areas, and the top in heart care for the 19th consecutive year.

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