Pediatric Institute & Cleveland Clinic Children’s

2012 Outcomes
Measuring Outcomes Promotes Quality Improvement
Measuring and understanding outcomes of medical treatments promotes quality improvement. Cleveland Clinic has created a series of Outcomes books similar to this one for its disease-based institutes. Designed for a physician audience, the Outcomes books contain a summary of many of our surgical and medical treatments, with data on patient volumes and outcomes and a review of new technologies and innovations.

The Outcomes books are not a comprehensive analysis of all treatments provided at Cleveland Clinic, and omission of a particular treatment does not necessarily mean we do not offer that treatment. When there are no recognized clinical outcome measures for a specific treatment, we may report process measures associated with improved outcomes. When process measures are unavailable, we may report volume measures; a relationship has been demonstrated between volume and improved outcomes for many treatments, particularly those involving surgical techniques.

In addition to these institute-based books of clinical outcomes, Cleveland Clinic supports transparent public reporting of healthcare quality data and participates in the following public reporting initiatives:

- Joint Commission Performance Measurement Initiative (qualitycheck.org)
- Centers for Medicare & Medicaid Services (CMS) Hospital Compare (hospitalcompare.hhs.gov)
- Ohio Department of Health (ohiohospitalcompare.ohio.gov)
- Cleveland Clinic Quality Performance Report (clevelandclinic.org/QPR)

Our commitment to transparent reporting of accurate, timely information about patient care reflects Cleveland Clinic’s culture of continuous improvement and may help referring physicians make informed decisions.

We hope you find these data valuable, and we invite your feedback. Please send your comments and questions via email to:

OutcomesBooksFeedback@ccf.org or scan here.

To view all our Outcomes books, please visit Cleveland Clinic’s Quality and Patient Safety website at clevelandclinic.org/outcomes.
Dear Colleague:

Welcome to this 2012 Cleveland Clinic Outcomes book. We distribute Outcomes books for more than 14 specialties. These publications are unique in healthcare. Each one provides a summary overview of medical or surgical trends, innovations, and clinical data for a Cleveland Clinic specialty over the past year.

Cleveland Clinic uses data to manage outcomes across the full continuum of care. Clinical services are delivered through patient-centered institutes, each based around a single disease or organ system. Institutes combine medical and surgical services, along with research and education, under unified leadership. The individual institute defines quality benchmarks for its specialty services and reports longitudinal progress.

All Cleveland Clinic Outcomes books are available in print and online. Additional data are available through our online Quality Performance Report (clevelandclinic.org/QPR). The site offers process measure, outcome measure, and patient experience data in advance of national and state public reporting sites.

Our practice of releasing annual outcomes reports has received favorable notice from colleagues, media, and healthcare observers. We appreciate your interest and hope you find this information useful and informative.

Sincerely,

Delos M. Cosgrove, MD
CEO and President
what’s inside

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Prefer an e-version?

Visit clevelandclinic.org/OutcomesOnline, and we’ll remove you from the hard copy mailing list and email you when next year’s books are online.
Dear Colleague,

Since I came to Cleveland in mid-2012 to take on leadership of Pediatric Institute & Cleveland Clinic Children’s, I have been impressed with Cleveland Clinic’s commitment to measuring and transparently reporting the outcomes of care we provide to our patients. That commitment is exemplified in this latest edition of our institute’s annual Outcomes book.

In addition to documenting our patients’ outcomes and spotlighting some of Cleveland Clinic Children’s recent innovations in research and clinical practice, this book provides a useful window into the breadth of our pediatric offerings and expertise. That expertise has deep roots, as Cleveland Clinic has been caring for children of all ages since it opened its doors more than 90 years ago.

Unlike most children’s hospitals, which are vertically integrated, Cleveland Clinic Children’s is integrated horizontally, with its hub at our main campus in urban Cleveland and essential spokes at several community hospitals, which enables us to offer deep pediatric expertise in surrounding communities. This structure, together with our 40-plus other clinical sites across Northeast Ohio, allows Cleveland Clinic Children’s more than 300 physicians to care for patients with all types of conditions — from the most common to the most complex — at locations that are comfortingly close to home.

This structure also enables us to care for patients in the best setting possible — the one that will optimize their outcomes by matching the appropriate resources to their needs. This focus on care connectivity and value is imperative as implementation of the Affordable Care Act impels all of us to find better ways to provide high-quality care to all children.
To enhance our integration and connectivity, Cleveland Clinic Children’s expanded its services and locations in multiple ways in 2012, some of which are noted in this book. While these efforts bring even more families under the care of our extensive team of primary care providers, they also allow more patients to take advantage of our singular lines of service. These include our Pediatric Pain Rehabilitation Program, the only such pediatric program in the country to receive national accreditation, and our pediatric dialysis unit, the only one of its kind in Northeast Ohio.

These are just two examples of the many ways in which our providers excel. In fact, Cleveland Clinic Children's was recognized for top care in 10 out of 10 specialties by U.S. News & World Report in its “America’s Best Children’s Hospitals” survey for 2012–2013. And 107 Cleveland Clinic Children’s physicians were recognized in March 2013 as “Best Doctors” by Cleveland Magazine in conjunction with the national physician peer-rating service Best Doctors Inc.®

As 2013 proceeds, Cleveland Clinic Children's is building on its many initiatives from 2012 — including creation of a Pediatric Research Center to foster more collaboration across disciplines and with our adult-care colleagues — and launching new initiatives as well. These changes coincide with our new logo and new name — Cleveland Clinic Children’s — which better reflects our mission of providing Cleveland Clinic-quality care to children and the continuing expansion of our services beyond our main campus to our 40-plus other clinical sites across Northeast Ohio and to the rest of the nation and the world.

The outcomes reported here are guiding us in our new and ongoing initiatives, as we use our outcomes tracking across practice settings to drive continuous improvement and innovation. I hope you find this information of interest, and I welcome your feedback and ideas for collaboration.

Respectfully,

Giovanni Piedimonte, MD
Physician-in-Chief, Cleveland Clinic Children’s
Chairman, Pediatric Institute
piedimg@ccf.org
Institute Overview

Cleveland Clinic Children’s has a long, rich history, offering care for infants, children, and adolescents since 1921. Today, more than 300 Cleveland Clinic Children’s physicians offer the full spectrum of primary, specialty, and subspecialty care and conduct pediatric research. The large, diverse staff has the subspecialty expertise required to manage the most complex patients in high-tech yet high-touch surroundings. Cleveland Clinic Children’s staff members provide outpatient and inpatient care at Cleveland Clinic’s main campus and at three community hospitals, two of which have dedicated pediatric emergency departments, at Level III neonatal intensive care units, and at pediatric specialty clinics. For families’ convenience, pediatric care is also available at more than 40 Northeast Ohio locations, including Cleveland Clinic family health centers. Key programs are highlighted below.

Allergy and Immunology

The Center for Pediatric Allergy and Immunology offers diagnostic and management services for primary and inherited immune deficiency disorders, allergic rhinoconjunctivitis, atopic dermatitis, mastocytosis, anaphylaxis, urticaria, angioedema, drug allergy, latex allergy, bee venom allergy, and food allergy. Staff performed more than 100 medically supervised food challenge tests in 2012. No patients experienced complications or allergic reactions requiring subsequent hospitalization or emergency care. The center now offers tests for baked goods containing milk and/or egg to assess tolerance in children with confirmed egg, milk, and/or dairy allergy.

Anesthesia

The institute’s large, dedicated team of pediatric anesthesiologists managed more than 8,000 cases in 2012 at Cleveland Clinic Children’s. This included 120 pediatric open heart surgeries and 538 pediatric cardiac catheterization procedures.

Heart Disease, Pediatric and Congenital

In 2012, Cleveland Clinic Children’s heart surgeons performed 192 congenital heart disease operations, including complex cases referred from around the world. Their surgical innovations address the unique needs of these infants and children throughout childhood, adolescence, and adulthood. In 2012, pediatric cardiologists performed 402 therapeutic catheterizations, including percutaneous valve insertions, and used covered stents when needed. They are actively developing and testing less invasive techniques and new devices and were among the first to implant an MRI-safe pacemaker in a child. A hybrid Pediatric Cardiac Catheterization Laboratory allows surgeons and cardiologists to collaborate on combined surgical and catheter-based treatments. The lab’s advanced imaging reduces radiation output, improving both the safety and accuracy of treatment.

Pediatric Critical Care Medicine

Fixed-wing Pediatric Critical Care Transport flies infants, children, and adolescents to Cleveland Clinic Children’s from around the country and across the globe. Board-certified intensivists provide 24/7 coverage in the 25-bed Pediatric Intensive Care Unit (PICU), which has excellent outcomes. The unit’s 2012 Pediatric Index of Mortality (PIM2) of 0.43 was well below the national standard of 0.9 for general mixed PICUs. The unit also maintained a catheter-associated bloodstream infection rate of 1.2 per 1,000 catheter days, below the NACHRI (National Association of Children’s Hospitals and Related Institutions) collaborative rate of 3 per 1,000 catheter days, and a catheter-associated...
urinary tract infection rate of 1 per 1,000 catheter days, well below the NHSN (National Healthcare Safety Network) benchmark of 2.2 per 1,000 catheter days. No ventilator-associated pneumonia or nosocomial viral infections have occurred in more than six years in the PICU.

**Digestive Disease**

The 11 specialists in the Department of Pediatric Gastroenterology are nationally recognized and have one of the nation's largest pediatric inflammatory bowel disease centers. The medical and surgical digestive disease team is one of a handful capable of performing multi-organ pancreas, liver, and/or small bowel transplant. The department's highly successful intestinal rehabilitation program helps children with short bowel syndrome avoid a small intestine transplant. The dedicated Pediatric Endoscopy Suite is equipped with streamlined detection technology, including capsule endoscopy and high-definition endoscopes offering an unparalleled view of the digestive tract. The department offers leading-edge, high-resolution motility testing for pediatric patients of all ages and collaborates on the multidisciplinary evaluation of pediatric metabolic diseases. Its digestive disease specialists are committed to research, ranging from collaborative basic research on fatty liver disease and childhood obesity, to innovative breath testing research in children with inflammatory bowel or liver disease, to collaborative research on multiple aspects of pediatric inflammatory bowel disease.

**Endocrinology**

Specialists in the pediatric and adolescent endocrinology group provide highly advanced care to more than 6,000 children annually, including more than 600 in the Diabetes Clinic. More than 65 percent of these children use insulin pumps. The endocrinology group offers continuous glucose monitoring services to help manage children’s glucose levels 24 hours a day. Endocrinologists also evaluate and manage children with growth, puberty, thyroid, and adrenal disorders as well as adolescent girls with polycystic ovary syndrome and other menstrual irregularities. The group’s endocrinologists are studying whether shared medical appointments for adolescents and toddlers with type 1 diabetes will improve glycemic control. The group has also established shared medical appointments for young adults with type 1 diabetes who are transitioning to adult care providers, and it has started a clinic for girls with Turner syndrome. A new service for children with glycogen storage disease utilizes both inpatient and outpatient visits to maximize nutritional control.

**Epilepsy and Neurology**

Cleveland Clinic Children's neurologists and neurosurgeons are recognized for leading-edge care they provide to more than 11,500 children annually. Epilepsy specialists see more than 1,900 children annually. Each year, more than 560 children with uncontrolled seizures are evaluated in the nine-room Pediatric Epilepsy Monitoring Unit, and 80 undergo surgery with 3-D mapping employed to pinpoint seizure foci. The hospital’s pediatric neurosurgeons are experienced in brain tumor surgery, craniofacial procedures involving the skull, and surgery to relieve hydrocephalus and spasticity. They also helped refine neuroendoscopy, a technique for navigating the ventricles in the brain.

**General and Community Pediatrics**

Eighty-five board-certified pediatricians provide comprehensive well and acute care to approximately
85,000 children and adolescents annually at 20 Northeast Ohio locations. Services include adolescent medicine (including nonsurgical gynecologic/reproductive care), overweight and obesity management, diagnosis and management of eating disorders, medication monitoring in attention-deficit/hyperactivity disorder, learning differences evaluation, and international adoption medicine. Pediatricians perform preoperative assessments for every child and adolescent, triage complex patients, and coordinate care across all pediatric specialties. The General Pediatrics and Community Pediatrics staffs also provide education for medical students and residents and participate in quality collaboratives on asthma, obesity, and child safety. They are also conducting research on obesity, sports concussions and school-based care.

**Hematology-Oncology**

Pediatric oncologists participate in the Children’s Oncology Group and other national study groups to give children with leukemia, lymphoma, sarcoma, brain tumors and rare cancers access to more than 100 national pediatric trial protocols. These regimens are designed to optimize young patients’ chances of cure while decreasing long-term treatment side effects. Promising bone marrow transplant protocols are being studied in the new Pediatric Hematopoietic and Stem Cell Transplant Program, where autologous, allogeneic, and cord-blood transplants are offered. Basic research is also being conducted on genetic markers to improve donor selection in pediatric bone marrow transplant. Pediatric oncology staff just concluded a five-year, $1.2 million National Institutes of Health (NIH) grant to support preclinical analysis of cancer vaccines derived from malignant brain tumor cells.

**Neonatology**

Cleveland Clinic Children’s neonatologists oversee a total of 85 beds at Level III Neonatal Intensive Care Units at the main campus, Hillcrest and Fairview hospitals. Neonatologists collaborate with high-risk obstetricians, fetal MRI specialists, pediatric surgeons, and other specialists in Cleveland Clinic’s Fetal Care Center. This center streamlines the diagnosis and management of fetal anomalies. Key components of the center are a leading-edge Special Delivery Unit and a Pediatric Cardiac Catheterization Laboratory. The Special Delivery Unit features a labor and delivery suite, an operating room for cesarean sections, and an advanced newborn resuscitation and treatment room. Neonatologists also collaborate with neonatal neurologists, pediatric neurosurgeons, neuroradiologists, and epilepsy specialists in the first dedicated neonatal neurointensive care program in the region. Neurally adjusted ventilatory assist is available to manage respiratory failure in critically ill infants.

**Palliative Care**

The Pediatric Palliative Care team provides inpatient consults for children and families at Cleveland Clinic Children’s, main campus. In 2012, the team provided more than 100 consults involving children admitted for bone marrow transplant, congenital heart disease, or chronic complex health conditions. The Pediatric Palliative Care staff works with the Fetal Care Center staff in prenatal meetings and provides ongoing follow-up of newborn infants in the
Special Delivery Unit, NICU, and PICU. The Pediatric Palliative Care team continues to partner with Child Life in providing support and honoring children through the Compassionate Hearts bereavement program and an annual remembrance ceremony.

**Pulmonary Medicine**

The Center for Pediatric Pulmonary Medicine offers comprehensive evaluation and management for the entire spectrum of pediatric pulmonary diseases, emphasizing asthma, chronic lung disease of prematurity, childhood interstitial lung diseases, pulmonary complications of neuromuscular diseases, hematologic and rheumatologic conditions, and complex airway and chest wall abnormalities. Special care for complex airway and swallowing disorders is provided through an interdisciplinary program uniting pediatric pulmonologists, gastroenterologists, otolaryngologists, physiatrists, registered dietitians, speech/language therapists, and social workers in a single clinical setting. The wide range of advanced diagnostic services and therapies offered includes flexible bronchoscopy, pulmonary function testing (including impulse oscillometry and infant testing, bronchoprovocation testing, exercise and full cardiopulmonary stress testing, and exhaled nitric oxide), sweat chloride tests, and a full array of genetic testing. Children with sleep-disordered breathing receive evaluation and treatment through the Pediatric Sleep Program, offered in conjunction with the Neurological Institute.

**Rheumatology**

The Center for Pediatric Rheumatology provides access to cutting-edge, comprehensive therapy for children and families dealing with chronic rheumatologic conditions. In 2012, rheumatologists treated more than 300 children with juvenile idiopathic arthritis and participated in numerous clinical trials. Patients with juvenile idiopathic arthritis and their families were invited to attend innovative shared medical appointments to share their knowledge and experience with other families in a supportive group setting. The center remains a national referral center for children with all forms of chronic vasculitis and autoinflammatory conditions. In 2012, physicians saw more than 30 new patients with these life-threatening conditions and conducted therapeutic, genetic, and outcomes-based research in this unique patient population. The center also provides care for children with uveitis, autoimmune encephalitis, and rare conditions such as Melkersson-Rosenthal syndrome and Susac syndrome.

**Surgery**

Cleveland Clinic Children’s four board-certified pediatric surgeons are experienced in treating congenital structural anomalies in infants, complex gastrointestinal diseases in children of all ages, pediatric chest and abdominal tumors, and chest wall deformities of all types. The team also treats common conditions such as pediatric hernias, undescended testes, and appendicitis. Patients range in age from newborns to young adults. The surgeons emphasize emerging surgical techniques that minimize surgical trauma for children, such as minimally invasive surgery and single-port procedures. With leading-edge, high-definition surgical imaging in the renovated pediatric operating rooms, these technologies can be applied to the smallest of patients. The four surgeons and two full-time pediatric nurse practitioners provide inpatient consultative and surgical services at main campus and 24/7 coverage of the emergency rooms, Level III NICUs, and pediatric wards at Hillcrest and Fairview community hospitals. The surgeons perform outpatient procedures at Fairview and Hillcrest and see patients in their outpatient offices as well as at family health centers in Twinsburg and Avon, Ohio.
Urology
The Division of Pediatric Urology provides expert and compassionate medical and surgical care for children with urological disorders. These include recurrent urinary tract infections, incontinence, and kidney stones, as well as genital and urinary anomalies, dysfunctional elimination, and neuropathic bladder and bowel. Staff employ innovative minimally invasive approaches (such as robotic surgery and endoscopic removal of kidney stones) and offer prenatal counseling and evaluation, plus counseling along with surgical management for disorders of sexual differentiation. They perform outpatient surgery at three community locations and inpatient surgery at main campus. When complex pediatric urological patients are ready, the division facilitates their transfer to adult medical/surgical specialists for care.

Child Life Services
Members of the Child Life Department recognize that hospitalization and illness can be stressful and frightening for both children and families. Child Life Specialists work alongside medical staff to help children and families understand and manage the healthcare experience. They have either a bachelor’s or master’s degree in human growth and development, education, psychology, or a related field. All Certified Child Life Specialists must complete a supervised 480-hour clinical internship, pass an examination, and adhere to the code of ethics and standards of the Child Life Council, the national organization in charge of credentialing.

Rehabilitation
Cleveland Clinic Children’s Hospital for Rehabilitation is one of 13 accredited, freestanding pediatric rehabilitation hospitals in the United States. This hospital, on the Shaker campus, offers comprehensive rehabilitation for children recovering from trauma, surgery, or a complex medical or surgical acute-care stay due to traumatic brain injury, spinal cord injury, stroke, or a complex seizure disorder. Post-NICU rehabilitation is also provided. Children with chronic illnesses are also treated at the hospital, which offers a full range of inpatient and outpatient physical, occupational, and recreational therapy and speech/language pathology. The hospital has a unique Feeding Disorders Program, along with the following programs:

- **ADHD Center for Evaluation and Treatment.** With its innovative Medical Monitoring Program and successful Summer Treatment Program, this center helps children with ADHD experience success in school and social settings.

- **Cleveland Clinic Children’s Center for Autism.** This center, housed in the Debra Ann November Wing of the Children’s Hospital for Rehabilitation, is dedicated to the diagnosis and evidence-based treatment of autism spectrum disorder. Center for Autism staff work with children as well as families. The Lerner School for Autism provides a year-round, cutting-edge learning environment for students aged 2 to 22. Specialists use a unique vocational training program to help the growing number of adolescent students with autism spectrum disorder transition to adulthood. The center’s research director has received an NIH training grant to identify and characterize the effects of genetic changes leading to autism.

- **The Pediatric Pain Rehabilitation Program.** This is the first and only pediatric pain rehabilitation program in the world to be accredited by the Commission on Accreditation of Rehabilitation Facilities. The program is geared to children whose chronic pain...
affects school attendance and limits everyday activities. During the intensive three-week inpatient and one-week outpatient program, the multidisciplinary team provides individualized care focused on both the child and the family for lasting success.

Transplantation

Cleveland Clinic Children’s is the only comprehensive pediatric transplant center in northern Ohio offering heart, liver, lung, pancreas, and kidney transplantation for patients from infancy through young adulthood. The center also has a small bowel transplant program to help children with intestinal failure.

- **Pediatric hematopoietic stem cell transplant.** This program brings the latest evidence-based treatments and clinical research to infants, children, and young adults for whom bone marrow transplant (BMT) and other cellular therapies offer the potential for cure. It is part of many multicenter and national collaboratives to improve the outcomes of BMT. Clinical research focuses on optimizing preparative regimens for BMT, decreasing the toxicity of BMT, and improving the quality of life after transplant. Staff are also very active in laboratory research to identify the role of many new genetic markers. The ultimate goal is to identify better donors in order to decrease graft vs. host disease and improve overall survival in unrelated donor transplantation.

- **Heart transplant.** Cleveland Clinic Children’s success rate for heart transplant is consistently higher than the national average, and the Transplant Center is one of a select number worldwide to have performed more than 100 pediatric heart transplants. Pediatric heart surgeons performed three heart transplants and implanted one ventricular assist device in 2012. The center offers young patients awaiting donor hearts lifesaving “bridge” treatment with mechanical hearts, including the Berlin Heart® EXCOR® ventricular assist device. Cleveland Clinic Children’s also participated in a 10-year NIH program to develop an artificial heart small enough for infants.

- **Pediatric liver transplant.** The pediatric liver transplant team is one of the most experienced in the nation, offering live-donor, split-graft, and deceased-donor transplants as well as multiorgan transplantation.

- **Pediatric kidney transplant.** The Kidney Transplant Center has more experience with kidney transplantation than any other program in Northeast Ohio and is affiliated with the dedicated Pediatric Dialysis Unit at the Shaker campus.

Pediatric Residency and Fellowship Training

Cleveland Clinic Children’s offers traditional Pediatrics residencies as well as preliminary pediatric transitional training in Pediatric Dermatology. The robust pediatric training program includes fellowships in Child Neurology, Congenital Cardiac Surgery/Cardiothoracic Surgery, Neonatal-Perinatal Medicine, Neurosurgery with training in Pediatrics, Pediatric Cardiology, Pediatric Endocrinology, Pediatric Gastroenterology, Pediatric Hematology-Oncology, Pediatric Nephrology, Pediatric Orthopaedics, Neuroradiology/Interventional Radiology with training in Pediatrics, Pediatric Pulmonology, Pediatric Urology, Thoracic Surgery with training in Pediatrics, and Pediatric Infectious Diseases. Physician sponsors and mentors offer clinical support, and two full-time coordinators and a full-time manager administer the programs.
## Institute Overview

<table>
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<td>Dermatology</td>
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### Surgical Cases

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<td>General Surgery</td>
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<td>Cardiothoracic Surgery</td>
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### Pediatric Cardiology

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<td>Cardiac Catheterization Procedures</td>
<td>497</td>
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<td>Pediatric Echocardiograms</td>
<td>7,116</td>
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<td><strong>7,613</strong></td>
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### Pediatric Gastroenterology

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<td>Other Diagnostic Procedures</td>
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### Patient Days

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</tr>
<tr>
<td><strong>Total Days</strong></td>
<td><strong>67,363</strong></td>
</tr>
</tbody>
</table>
Pediatric Cardiology

Center for Pediatric and Adult Congenital Heart Disease, Cleveland Clinic Children’s

Cardiac Catheterization and Intervention

Cleveland Clinic Children’s interventional cardiologists use new technologies to optimize treatment modalities for patients. Three-dimensional rotational angiography and real-time guidance from 3-D computed tomography and magnetic resonance reconstructions in the catheterization laboratory have the potential to reduce radiation exposure to patients and enhance the precision of procedures.

The transcatheter pulmonary valve program continues to grow. Cleveland Clinic Children’s physicians implanted 14 of the valves in 2012. Cleveland Clinic has the only program in Northeast Ohio that offers this procedure. Despite the complexity of cases, complication rates remain low.

Pediatric Catheterization by Age

2008 – 2012

Number of Cases

<table>
<thead>
<tr>
<th>Age</th>
<th>2008 (N = 435)</th>
<th>2009 (N = 495)</th>
<th>2010 (N = 507)</th>
<th>2011 (N = 488)</th>
<th>2012 (N = 538)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 28 Days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 28 Days to 1 Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 1 Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Outcomes 2012
Pediatric Catheterization by Type

2008 – 2012

Number of Catheterizations

- Diagnostic
- Therapeutic
- Electrophysiologic

Pediatric Interventional Catheterization by Type (N = 433)

2012

Number of Procedures

- Biopsy
- Line/ Broviac® Insertion
- ASD*/ PFO* Closure
- Angioplasty
- Stenting
- PDA*/ Collateral Closure
- Valvuloplasty
- Melody® Valve Insertion
- Pericardiocentesis
- ASD* Creation
- Hybrid Procedures
- Foreign Body Removal

*ASD = atrial septic defect, PFO = patent foramen ovale, PDA = patent ductus arteriosus
Pediatric Catheterization Complication Rate

2008 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Minor*</th>
<th>Major†</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.8</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>0.8</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>0.8</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>0.8</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>0.8</td>
<td>0.2</td>
<td>0</td>
</tr>
</tbody>
</table>

*Minor complications include minor hematomas, bruises, and minor rashes.
†Major complications include surgical intervention, unanticipated ICU admission, unanticipated intubation, stroke, and CPR.

Pediatric Echocardiography and Outpatient Services

Fetal Echocardiography

In 2012, the Center for Pediatric and Adult Congenital Heart Disease incorporated 3-D transesophageal echocardiography and 3-D transthoracic echocardiography in the assessment of complex congenital heart lesions. This technology has proven to be a useful tool in assisting the surgeon in discerning anatomical abnormalities not clearly seen with standard transesophageal echocardiography and transthoracic echocardiography studies.
In 2012, a total of 385 fetal echocardiograms were performed for ruling out or confirming congenital heart disease in the fetus. Abnormalities were found in 52 patients. Of those undergoing fetal echocardiography, 265 patients received services from the comprehensive Fetal Care Center; 20 pregnant women had congenital or acquired heart conditions themselves. The Special Delivery Unit opened in 2012 to accommodate labor and delivery services for women with high-risk pregnancies who required the care of Cleveland Clinic physicians for themselves or their infants. Eighty-six infants have been delivered in the Special Delivery Unit, exceeding expectations. Twenty-one of these infants had prenatally detected cardiac anomalies.

**Pediatric Outpatient Encounters**

2005 – 2012

**Number of Encounters**

<table>
<thead>
<tr>
<th>Year</th>
<th>Outreach visits</th>
<th>Outreach-NIL* studies</th>
<th>Total clinic visits</th>
<th>Total NIL studies</th>
<th>Total encounters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>11,437</td>
<td>1,100</td>
<td>12,537</td>
<td>12,537</td>
<td>12,537</td>
</tr>
<tr>
<td>2006</td>
<td>14,431</td>
<td>1,531</td>
<td>15,962</td>
<td>15,962</td>
<td>15,962</td>
</tr>
<tr>
<td>2007</td>
<td>14,930</td>
<td>2,200</td>
<td>17,130</td>
<td>17,130</td>
<td>17,130</td>
</tr>
<tr>
<td>2008</td>
<td>15,220</td>
<td>3,000</td>
<td>18,220</td>
<td>18,220</td>
<td>18,220</td>
</tr>
<tr>
<td>2009</td>
<td>17,960</td>
<td>4,791</td>
<td>22,751</td>
<td>22,751</td>
<td>22,751</td>
</tr>
<tr>
<td>2010</td>
<td>18,061</td>
<td>5,411</td>
<td>23,472</td>
<td>23,472</td>
<td>23,472</td>
</tr>
<tr>
<td>2011</td>
<td>20,243</td>
<td>6,193</td>
<td>26,436</td>
<td>26,436</td>
<td>26,436</td>
</tr>
<tr>
<td>2012</td>
<td>21,290</td>
<td>6,861</td>
<td>28,151</td>
<td>28,151</td>
<td>28,151</td>
</tr>
</tbody>
</table>

*NIL = noninvasive laboratory
Quality Initiatives — Hypoplastic Left Heart Syndrome and Neurocardiology

The Center for Pediatric and Adult Congenital Heart Disease is one of 55 programs across the nation participating in the National Pediatric Cardiology Quality Improvement Collaborative (NPC-QIC). The center is committed to the collaborative’s main goal: improving the survival and quality of life of patients with hypoplastic left heart syndrome after the Norwood operation and before admission for the bidirectional Glenn operation — the “interstage” period.

Since standardizing the care of patients with hypoplastic left heart syndrome and extending that experience to other neonates with complex congenital heart disease, the center continues to improve its interstage survival. Additionally, best practices put into place for high-risk neonates during discharge planning have made critical differences in patients’ outcomes over the past few years. At least four patients had a lifesaving event in 2012 because of the home monitoring program and discharge education.

Since its inception in September 2011, Cleveland Clinic Children’s neurocardiology program has evaluated 174 children with congenital heart disease. Specialists from multiple disciplines evaluate patients during one coordinated office visit. Given the increased incidence nationally of neurodevelopmental disabilities in children with congenital heart disease, 113 patients have undergone neurodevelopmental screening.
**Electrophysiology**

Sophisticated 3-D mapping systems allow pediatric electrophysiologists to perform catheter ablations using limited or no fluoroscopy. This approach, which is offered in few centers in the country, reduces or eliminates radiation exposure in the pediatric patient population.

**Catheter Ablations Performed, Based on Fluoroscopy Use**

2011 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Ablations</th>
<th>Limited Fluoroscopy</th>
<th>No Fluoroscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>40</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>20</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

Cleveland Clinic began performing catheter ablations using limited or no fluoroscopy in October 2012 in pediatric patients with supraventricular tachycardia. To date, pediatric electrophysiologists have performed 17 of these procedures, with no complications.

A 3-D map using the Carto™ XP navigation system. The geography of the right atrium is highlighted, along with the superior vena cava, the inferior vena cava, the coronary sinus (coursing toward the right of the image), and the tricuspid valve (facing anterior). Yellow dots denote His bundle points. The red dots represent ablated lesions in the area of the slow pathway. This ablation was performed for atrioventricular nodal reentry tachycardia without fluoroscopy.
**Congenital Heart Disease**

Congenital heart disease affects 1 million people in America. Each year, approximately 1 in every 120 babies born in the United States has a congenital heart defect. In some cases, the disease is life-threatening at birth. However, many people with a congenital heart condition do not know about it for years. Experts at Cleveland Clinic have extensive experience in the diagnosis and treatment of patients with all forms of congenital heart disease. The Center for Pediatric and Adult Congenital Heart Disease's services are further enhanced by The Special Delivery Unit. The unit provides in utero diagnosis of complex heart conditions and immediate treatment after birth.

**Adult Congenital Heart Disease Volume (N = 1,450)**

2012

Cleveland Clinic’s Adult Congenital Heart Disease Center is staffed by cardiologists who specialize in adult care, pediatric care, intervention and cardiovascular surgery. This collaboration offers patients unique care and treatment options designed to provide the best outcomes possible for their particular needs. We saw 1,450 patients in 2012, including 487 new referrals.

**Percutaneous Interventional Procedures for Adult Congenital Heart Disease**

**Volume and Outcomes (N = 214)**

2012

Many of the 214 patients who received interventional treatment for congenital heart disease had complex cases. Despite this increased level of care, Cleveland Clinic physicians achieved a 100 percent success rate and 0 percent mortality.

**Percutaneous Closure Procedures**

**Volume and Outcomes (N = 66)**

2012

A total of 66 patients had percutaneous closure procedures at Cleveland Clinic in 2012. The success rate was 99 percent, with 0 percent mortality.

*Based on one complication, including stroke, myocardial infarction or need for surgery. Abbreviations: ASD, atrial septal defect; PFO, patent foramen ovale.*
**Congenital Heart Surgery Mortality (Adult & Pediatric)**

2012

Cleveland Clinic’s Department of Congenital Heart Surgery treats adults and children using a wide variety of treatments. The mortality rate associated with these procedures was 1.3 percent in 2012, which was well below the expected rate of 3.6 percent.

![Bar graph showing Cleveland Clinic's actual mortality rate compared to expected rate for congenital heart surgery.](uhc.edu)

**Pediatric Congenital Surgery Volume and Type (N = 117)**

2012

In 2012, Cleveland Clinic surgeons performed 117 pediatric congenital surgeries of varying complexity. The procedures within the majority “other” category included coarctation repair, truncus arteriosus repair, etc.

![Bar chart showing the volume of various congenital surgery procedures.](uhc.edu)

Abbreviations: ASD, atrial septal defect; AV, atrioventricular; ECMO, extracorporeal membrane oxygenation; PA, pulmonary artery; PDA, patent ductus arteriosus; RV, right ventricle; TOF, tetralogy of Fallot; VSD, ventricular septal defect.
Outcomes 2012

Center for Pediatric and Adult Congenital Heart Disease

**Outcomes 2012**

**Center for Pediatric and Adult Congenital Heart Disease**

**Treatment of Patient With Persistent Left Superior Vena Cava**

During normal heart development, the heart starts with two superior vena cavae. The left superior vena cava usually regresses but can persist in some cases. This normally has no consequences other than rerouting the venous blood flow from the left arm into the coronary sinus (a venous structure), which becomes larger than normal. In rare cases, the persistent left superior vena cava can abnormally connect to the left atrium. In such cases, blood low in oxygen can drain into the left atrium (where blood high in oxygen coming back from the lungs normally drains).

A patient with prior operative repairs of atrial and ventricular septal defects presented to the Adult Congenital Heart Disease Clinic with progressive fatigue and diminished oxygen saturation at rest that worsened with exercise. CT scan imaging suggested the presence of an abnormal communication between the persistent left superior vena cava to the left atrium. Treatment involved catheterization and placement of sheaths (IV lines) in the left neck and right groin. The right superior vena cava was injected by a catheter placed via the right groin (SVC = superior vena cava; RA = right atrium).

---

**Adult Congenital Surgery Volume and Type (N = 282)**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>2012 Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAOCA Repair</td>
<td>50</td>
</tr>
<tr>
<td>Aorta Surgery</td>
<td>60</td>
</tr>
<tr>
<td>ASD Repair</td>
<td>50</td>
</tr>
<tr>
<td>Aortic Valve Surgery</td>
<td>40</td>
</tr>
<tr>
<td>CABG</td>
<td>30</td>
</tr>
<tr>
<td>Coarctation Repair</td>
<td>20</td>
</tr>
<tr>
<td>Coronary Artery Surgery</td>
<td>10</td>
</tr>
<tr>
<td>Heart Transplant</td>
<td>0</td>
</tr>
<tr>
<td>Mitral Valve Surgery</td>
<td>0</td>
</tr>
<tr>
<td>Other Congenital Cardiac</td>
<td>0</td>
</tr>
<tr>
<td>Pulmonic Valve Surgery</td>
<td>0</td>
</tr>
<tr>
<td>Septal Myectomy</td>
<td>0</td>
</tr>
<tr>
<td>Tricuspid Valve Surgery</td>
<td>0</td>
</tr>
<tr>
<td>VAD</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviations: AAOCA, anomalous aortic origin of a coronary artery; ASD, atrial septal defect; CABG, coronary artery bypass grafting; PVC, premature ventricular contraction; VAD, ventricular assist device.
Treatment of Patient With Persistent Left Superior Vena Cava (cont’d)

The persistent left superior vena cava (LSVC) was injected through a catheter placed via the left neck (upper right of picture). This showed a communication to the left atrium, through which a catheter was placed (arrow).

This diagram shows superimposed anatomic borders, which cannot be seen without separate contrast injections (LA = left atrium; RA = right atrium; SVC = superior vena cava). The arrow points to the abnormal communication from the LSVC to the LA.

An 8 mm Amplatzer® Vascular Plug II was placed into the abnormal communication. This needs to be carefully sized and placed to adequately occlude the defect and prevent dislodgement (arrow). It is critically important to perform angiograms before delivering the device. Flow is expected to be seen initially beyond the device.

The final injection of the LSVC shows the Amplatzer Vascular Plug II in good position (arrow). There is no longer any blood flow beyond it. The patient’s oxygen saturation increased after the procedure, and the fatigue significantly improved.
Efficacy of Radioactive Iodine Ablation for Treatment of Graves Disease

Treatment options for pediatric patients with Graves disease include an antithyroid drug, radioactive iodine (RAI) ablation, and surgical excision of the thyroid. If remission does not occur within three years after the initiation of pharmaceutical treatment, RAI ablation or subtotal thyroidectomy should be performed.

RAI ablation does not increase the risk for thyroid neoplasia. However, thyroid antibody titers increase after ablation therapy, and the increase may be responsible for the temporary worsening of eye symptoms in patients with Graves disease.

Radioactive Iodine Ablation Therapy in Pediatric Patients With Graves Disease

2000 – 2012

<table>
<thead>
<tr>
<th>Patients, N</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range, years (mean)</td>
<td>7–20 (13)</td>
</tr>
<tr>
<td>Male/female, N</td>
<td>3/9</td>
</tr>
<tr>
<td>Time to resolution of hypothyroidism, days</td>
<td>40–166</td>
</tr>
<tr>
<td>% resolution</td>
<td>100*</td>
</tr>
<tr>
<td>Side effects, N</td>
<td>0</td>
</tr>
</tbody>
</table>

*One 7-year-old patient required two RAI treatments for his Graves disease.

RAI ablation as practiced by the Center for Pediatric and Adolescent Endocrinology has been safe and effective during the past 12 years.
Cleveland Clinic offers a program for children and adolescents aged 6 to 16 years who are serious about wanting to lose weight. Specifically designed for children and their parents, Fit Youth brings families together for a 12-week comprehensive program. Group leaders include a psychologist, dietitian, and exercise physiologist. Between meetings, the children are expected to keep a diary, listing all food that they eat and their physical activity. In addition to weight loss, the program helps the children develop new eating and exercise habits.

In 2012, 54 children and teenagers enrolled in Fit Youth sessions at Cleveland Clinic and 46 completed the program. Sessions were held at five family health centers: Beachwood (N = 16), Independence (N = 13), Strongsville (N = 7), Stephanie Tubbs Jones Health Center (data not available), and Willoughby Hills (N = 10). The median age of those enrolled was 10.5 years (range, 6 to 15). Fifty-nine percent were female and 41% were male.

**Clinical Data of Fit Youth Participants Who Completed the 12-Week Program* (N = 46)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Week 1</th>
<th>Week 12</th>
<th>Change (Week 1 to Week 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, kg</td>
<td>Median</td>
<td>59.7</td>
<td>58.6</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(33.9–111.9)</td>
<td>(33.6–112.9)</td>
</tr>
<tr>
<td>Body mass index (BMI), kg/m²</td>
<td>Median</td>
<td>26.9</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(21.2–38.4)</td>
<td>(19.6–38.6)</td>
</tr>
<tr>
<td>BMI z-score</td>
<td>Median</td>
<td>2.2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(1.2–2.7)</td>
<td>(1.1–2.7)</td>
</tr>
<tr>
<td>BMI percentile</td>
<td>Median</td>
<td>98.5</td>
<td>97.7</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(89.3–99.7)</td>
<td>(86.3–99.6)</td>
</tr>
<tr>
<td>Waist, cm</td>
<td>Median</td>
<td>82</td>
<td>81.5</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(64.5–110.2)</td>
<td>(66–107.5)</td>
</tr>
</tbody>
</table>

*Stephanie Tubbs Jones Health Center data not available*

At the program’s completion, the median decrease in waist girth was 1 cm, and the median weight gain was 0.3 kg, which is equivalent to a median decrease in BMI percentile of 0.2. Sixty-three percent of the participants showed a decrease in BMI, 83% showed a decrease in BMI percentile, and 58% lost waist girth.
Pediatric Gastroenterology

**Pediatric Ambulatory Endoscopy**

In 2012, 1,134 pediatric patients underwent upper endoscopy, colonoscopy, or both. All procedures were performed in either the Pediatric Ambulatory Endoscopy Unit or pediatric operating rooms. Procedures were performed under general anesthesia, which was administered by a pediatric anesthesiologist.

All patient records were reviewed to identify adverse events observed at the time of the procedure or that occurred within seven days of the procedure, including hemodynamic instability, severe medication reactions, gastrointestinal bleeding, and procedural complications. In 2012, no serious adverse events were identified.

**Postprocedural Symptom Rates of Pediatric Patients Who Underwent Upper Endoscopy and/or Colonoscopy**

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>561</td>
<td>706</td>
<td>625</td>
<td>631</td>
<td>1,134</td>
</tr>
</tbody>
</table>

Patient medical records were also reviewed to identify postprocedural symptoms self-reported by patients within seven days of their procedure. Postprocedural symptoms were reported in 4.4% of pediatric patients and included abdominal pain, chest pain, nausea, vomiting, diarrhea, fever, dysphagia, and rectal bleeding.

**Pediatric Liver Transplantation**

From 2005 to 2012, the Department of Pediatric Gastroenterology performed 40 pediatric liver-only transplants and one liver-pancreas transplant in patients aged 6 months to 19 years (mean, 7.6 ± 7.2 years; median, 5 years). Nineteen males and 18 females received transplants, with two males and two females each receiving a retransplant for a failed liver allograft.

After the initial evaluation, all patients were listed for a deceased-donor graft, but other possibilities explored included obtaining a graft from a living donor, a split liver, or whole organ transplantation from a deceased donor. Eighteen patients received a whole organ from a deceased donor, 14 patients received a split liver from a deceased donor, and nine received a partial liver (all left lateral segments) from a living donor.
**Pediatric Liver-Only Transplant*: Three-Year Patient Survival (N = 34)**

2005 – 2012

For primary liver-only pediatric transplants, patient survival was 91.1% at one and three years.

**Pediatric Liver-Only Transplant*: Three-Year Graft Survival (N = 40)**

2005 – 2012

For liver-only pediatric transplants, graft survival was 81.9% at one and three years.

*All liver transplant outcomes are reported to the Scientific Registry of Transplant Recipients (SRTR). For detailed liver transplant national benchmarks and outcome comparisons, go to [srtr.org](http://srtr.org).
Single-Port Laparoscopic Surgery

First used in adults, single-port laparoscopic techniques were quickly adopted by pediatric surgeons for use in children. However, the specialized ports employed in adult surgery were often too large for children and adolescents, and their use could result in more pain and cosmetically unappealing scars. Cleveland Clinic Children’s Department of Pediatric Surgery has been pioneering an alternative method of performing single-port surgery in children. The method uses a small operating laparoscope, camera, working channel, and other unique tools that eliminate the need for the larger ports. The technique has been applied to appendectomies and cholecystectomies in children of all ages, with excellent early results.

Pediatric Laparoscopic Cholecystectomy

2010 – 2012

Number of Procedures

The department employed the single-port approach for laparoscopic cholecystectomy in about 15% of cases in 2010. By 2012, the proportion of single-port cases rose to more than 65%. There were no instances of bile duct injury, cystic duct leak, infection, or other complications in the single-port group, and cosmetic results were excellent. The length of stay remains about one day.
The use of single-port techniques for pediatric laparoscopic appendectomy has increased by more than 25% over the past two years. The majority of nonperforated appendices can be removed using the single-port technique, including retrocolic and pelvic appendices. A large number of perforated appendices also can be removed by single-port surgery, although complicated cases still require a conventional multiport approach.

The length of stay for appendectomy is determined by the need for postoperative antibiotics and supportive care; therefore, it is not affected by the choice of single- or multiple-port approaches.
Pectus Excavatum

Cleveland Clinic’s pectus excavatum program is designated as one of only six national Centers of Excellence for the minimally invasive repair of pectus excavatum. The program maintained its high volume during 2011 and 2012.

Pectus Excavatum Cases by Age

2011 – 2012

The largest developing area of the practice is the adult population (patients older than 18 years of age). In 2012, adult patients accounted for 24% of all cases, an increase from 22% of cases in 2011. The mean age of adult patients increased from 20 years in 2011 to 31.4 years in 2012. The rise in patient age has been accompanied by an increasing degree of complexity and an expansion in the geographic distribution of cases, with adult patients traveling from all regions of the country and Canada. The overall postoperative complication rate remained less than 1% for 2011 and 2012.
Complications Related to Sedation

Bone marrow aspiration, bone marrow biopsy, and lumbar puncture are procedures that can be used in the diagnosis of leukemia, in conjunction with intrathecal chemotherapy, and to determine whether a solid tumor has metastasized. For the comfort and safety of the patient, these procedures typically are performed under general anesthesia.

Since 2010, many of these procedures have been performed safely and successfully by practitioners in Cleveland Clinic Children's Outpatient Hematology/Oncology Clinic in conjunction with the anesthesia department. On Tuesdays, a pediatric anesthesiologist and nurse anesthetist are available to provide sedation, and all outpatient clinic nurses are PALS (Pediatric Advanced Life Support) certified. If a patient is able to tolerate an initial bone marrow aspiration, bone marrow biopsy, or lumbar puncture in the pediatric operating room with no complications, then all subsequent procedures can be completed in the outpatient clinic.

Patient satisfaction has increased since sedation services have been offered in the outpatient clinic. Parents appreciate the convenience of having the procedure performed in the department by the providers with whom they are familiar.

Outpatient Clinic Outcomes: Complications Related to Sedation

2010 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>12</td>
</tr>
<tr>
<td>2011</td>
<td>54</td>
</tr>
<tr>
<td>2012</td>
<td>57</td>
</tr>
</tbody>
</table>

Pediatric patients have tolerated and recovered well after procedures requiring sedation in both the Outpatient Hematology/Oncology Clinic and in the postanesthesia care unit of the pediatric operating room. There has been only one complication: One patient experienced delirium related to the anesthesia drug and woke up combative and screaming. The complication was quickly addressed, and the patient was discharged after the complication was resolved.
**Extravasation Rate**

When central venous catheter lines cannot be placed to decrease the discomfort and emotional trauma of venipuncture in pediatric cancer patients, vesicant chemotherapy must be administered through a peripheral IV. The number of children receiving vesicant chemotherapy is increasing. One of the reasons is that many patients are electing to have their lines removed to participate in activities such as sports.

In August 2010, during the peripheral administration of vincristine through a butterfly needle, the agent extravasated in one patient. Consequently, outpatient pediatric hematology/oncology nurses reviewed the case of a patient who had received 316 doses of vinblastine over the past eight years to determine why there had been no instances of extravasation in that patient. They found that the chemotherapy had been delivered through an angiocatheter. To reduce the incidence of extravasation, the nurses then instituted a protocol that all peripheral vesicant chemotherapy be administered through an angiocatheter.

**Extravasation Rate for Vesicant Chemotherapy**

**2010 – 2012**

Following institution of the new protocol, the extravasation rate has greatly decreased. No extravasations occurred in 2011 or 2012.
Antibiotic Delivery Time for Fever

At the Outpatient Hematology/Oncology Clinic, fever is the most common complaint during unplanned visits. When a greater-than-60-minute delay in the delivery of antibiotics was found to be a cause of adverse outcomes in patients with neutropenic fever, standardized STAT fever orders were initiated in an effort to decrease the time to antibiotic delivery. These orders also were applied to oncology patients with non-neutropenic fever and to sickle cell patients with fever.

Percentage of Patients With Neutropenic Fever* Who Received Antibiotics Within 60 Minutes of Arrival

2009 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>40</td>
</tr>
<tr>
<td>2010</td>
<td>36</td>
</tr>
<tr>
<td>2011†</td>
<td>N/A</td>
</tr>
<tr>
<td>2012</td>
<td>45</td>
</tr>
</tbody>
</table>

N = 40

*The data represent patients 21 years old or younger with a primary or secondary diagnosis of neutropenia unspecified, neutropenia due to infection, or other neutropenia.
†No data due to organizational transition

Since the initiation of fever orders, the percentage of patients who were administered antibiotics within 60 minutes of their arrival substantially increased. The fever orders have also improved patient safety through creation of a consistent, clear order set with preprinted pediatric doses, ensuring that all patients receive the appropriate empiric antibiotics with significantly less delay and less room for error. The use of fever orders is also more convenient for providers, nurses, and pharmacy staff, resulting in increased caregiver satisfaction.
Asthma

Pediatric hospitalists at Cleveland Clinic Children’s use clinical care pathways, which are management tools developed through the use of evidence-based medicine to standardize practice and to improve quality of care. The asthma care pathway being used has consistently supported a relatively short length of stay without adversely affecting quality-of-care measure outcomes or readmission rates.

Hospital Mean Length of Stay of Asthma Patients

2010 – 2012

Days

3

2

1

0

Cleveland Clinic Children's (CCC)
UHC*

CCC N =
2010
49
2011
46
2012
50

30-Day Readmission Rates of Asthma Patients

2010 – 2012

Percent

4

3

2

1

0

Cleveland Clinic Children’s (CCC)
UHC*

CCC N =
2010
47
2011
51
2012
49

*These data are prepared using the University HealthSystem Consortium (UHC) Clinical Database. uhc.edu
Using the asthma care pathway has resulted in 100% compliance with two of The Joint Commission’s core measures: use of systemic corticosteroids and use of asthma relievers (bronchodilators).

**Patients With Asthma Who Received Home Management Plan of Care**

**2011 – 2012**

A 99% compliance rate with a third Joint Commission core measure, the Home Management Plan of Care, was achieved during 2012. This measure is traditionally the most difficult one to comply with.

*Benchmark: The Centers for Medicare & Medicaid Services’ Hospital Compare report, which compares quality measures among similar local hospitals and with national percentages (hospitalcompare.hhs.gov)*
**Bronchiolitis**

Bronchiolitis is the top reason for inpatient admission of children less than 2 years of age in the United States. Many healthcare dollars are spent on the treatment of this illness each year. Although bronchiolitis is a self-limiting disease, significant morbidity and mortality are associated with it.

A bronchiolitis care pathway was developed at Cleveland Clinic Children’s to help reduce the use of non-evidence-based treatments for bronchiolitis. The care pathway includes a respiratory scoring system to direct treatments and course of action, and a standard order set.

**Hospital Mean Length of Stay of Bronchiolitis Patients**

<table>
<thead>
<tr>
<th>Days</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>47</td>
<td>53</td>
<td>33</td>
</tr>
</tbody>
</table>

*These data exclude patients who spent time in the PICU during their admission.

Since the care pathway was implemented, the hospital mean length of stay of bronchiolitis patients has steadily decreased.

**Readmission Rates Within Three Days of Discharge for Bronchiolitis Patients**

<table>
<thead>
<tr>
<th>Percent</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>47</td>
<td>53</td>
<td>33</td>
</tr>
</tbody>
</table>

Since the care pathway was instituted, the readmission rate within three days of discharge for bronchiolitis patients has substantially decreased. There were no readmissions for this patient population in 2012.
Since the care pathway was implemented, the treatment of bronchiolitis patients with bronchodilators has decreased, in accordance with the American Academy of Pediatrics guidelines for treatment of bronchiolitis.

Bronchiolitis Patients Treated With a Bronchodilator While Hospitalized*

2010 – 2012

Since the care pathway was implemented, the treatment of bronchiolitis patients with steroids has decreased, in accordance with the American Academy of Pediatrics guidelines for treatment of bronchiolitis.

Bronchiolitis Patients Treated With a Steroid While Hospitalized*

2010 – 2012

*These data exclude patients who spent time in the PICU during their admission.
Surgical Site Infection

Cleveland Clinic Children’s is a member of the Ohio Children’s Hospitals’ Solutions for Patient Safety, a collaborative of eight children’s hospitals devoted to developing and sharing quality initiatives. As part of the collaborative, Cleveland Clinic Children’s initiated an enhanced surveillance program aimed at tracking surgical site infection rates and compliance with measures to prevent these infections. Measures introduced included:

1. Adding the need for antibiotics to the preoperative surgical safety checklist
2. Adopting recommendations for optimal pediatric dosing (mg/kg)
3. Changing recommended antibiotic re-dosing intervals for long procedures to every three hours (every six hours for vancomycin)
4. Introducing in the OR an electronic reminder for antibiotic re-dosing
5. Adding standard pediatric antibiotic doses to the operating room Pyxis® medication management system

In Ohio, hospitals publicly report pediatric surgical site infection rates for specific cardiac, neurologic, and orthopaedic surgery procedures. The data presented below correspond to the procedure codes used for Ohio public reporting.

Across Cleveland Clinic Children’s, compliance with preoperative antibiotic guidelines was 91.4% in 2009, 98.2% in 2010, and 100% in both 2011 and 2012 for major cardiac, neurologic, and orthopaedic surgical procedures ($P < 0.001$ for 2009 vs. 2011–2012). Correspondingly, the aggregate mean infection rate has consistently decreased, falling from 6.1% in 2009 to 4% in 2010 to 1% in 2011 and to 1.2% in 2012 ($P < 0.001$ for 2009 vs. 2011–2012).
The mean infection rate after orthopaedic spine procedures decreased from 9.9% in 2009 to 4.9% in 2010 to 2.1% in 2011 and then increased slightly to 2.7% in 2012 (P < 0.01 for 2009 vs. 2011–2012). Compliance with preoperative antibiotic timing guidelines improved from 90.1% in 2009 to 96.3% in 2010, then to 100% in both 2011 and 2012 (P < 0.001 for 2009 vs. 2011–2012). The proportion of patients (N = 183) who required re-dosing and received a dose by hour 4 fluctuated between 88% in 2010 and 86% in 2012 but increased to 100% in the fourth quarter of 2012 following the September introduction of an electronic reminder.

For primary neurosurgical shunt procedures, compliance with preoperative antibiotic timing recommendations increased from 78.6% in 2009 to 100% for 2010 through 2012 (P = 0.02 for 2009 vs. 2010–2012). During the past three years, no child developed an infection following placement of a primary neurosurgical shunt (P = 0.02).
Compliance With Antibiotic Timing Guidelines and Corresponding Infection Rate for Cardiac Surgery Procedures (N = 411)

2009 – 2012

Significant improvement in compliance with preoperative antibiotic guidelines was also observed among patients undergoing cardiac surgery, with an increase from 94.2% in 2009 to 99.2% in 2010, then to 100% in both 2011 and 2012 ($P = 0.002$ for 2009 vs. 2011–2012). Mean infection rates were 1% for 2009, 3.9% for 2010, and 0% for both 2011 and 2012. The proportion of patients (N = 191) who required re-dosing and received a dose by hour 4 fluctuated between 88% in 2010 and 86% in 2012 but increased to 100% in the fourth quarter of 2012 following the September introduction of an electronic reminder.

Influenza and Invasive Pneumococcal Disease

To identify and vaccinate hospitalized children at risk for influenza or invasive pneumococcal disease, Cleveland Clinic Children's has developed a unique nursing-driven screening and vaccination protocol. A nurse using a checklist that is part of the electronic patient record performs the screening during a patient's admission to the hospital. A standing physician-signed hospital order allows vaccination by the nurse without an additional physician order.

The protocol conforms to and goes beyond new Centers for Medicare & Medicaid Services core measures that require hospitals to offer 1) pneumococcal vaccine to children 5 years of age or older if they are at high risk for invasive pneumococcal infection and 2) influenza vaccine to children 6 months of age or older. Cleveland Clinic Children's protocol also identifies children requiring a second dose of the influenza vaccine or a dose of the 13-valent pneumococcal conjugate vaccine before receipt of the 23-valent pneumococcal polysaccharide vaccine, as well as children who have additional pediatric-specific indications for pneumococcal vaccination.
Incorporation of the screening tool into the pediatric nursing admission navigator resulted in 100% compliance with screening. The nursing-driven pneumococcal vaccination protocol was implemented in early April 2012. When comparing the number of 23-valent and 13-valent pneumococcal vaccine doses dispensed from April through December 2011 vs. the same months of 2012, implementation of the protocol resulted in a 255% increase (40 vs. 142) in the number of children who received a pneumococcal vaccine.
Incorporation of the screening tool into the pediatric nursing admission navigator resulted in 100% compliance with screening. The nursing-driven influenza vaccination protocol was implemented in early September 2012. When comparing the number of vaccine doses dispensed from September through December 2011 vs. the same months of 2012, implementation of the protocol resulted in a 79% increase (156 vs. 279) in the number of children who received an influenza vaccine.

Despite the success of the pneumococcal and influenza vaccine protocols, opportunity remains for improvement. Only 51% of the patients screened received a vaccine. The major indication for deferral was fever.
Attending physicians in Cleveland Clinic's 25-bed pediatric intensive care unit (PICU) provide around-the-clock in-house coverage, whereas only 61% of a reference group in similar facilities do so.* Implementation of 24/7 coverage by pediatric intensivists has been shown to reduce mortality, decrease length of stay, and improve decision-making and quality of care at the end of life. Additionally, at Cleveland Clinic Children's, parents are invited to participate in multidisciplinary morning rounds.

*Comparative data provided by Virtual PICU Systems (VPS), LLC, a partnership of Children's Hospital Los Angeles, the National Association of Children's Hospitals and Related Institutions (part of Children's Hospital Association), and the National Outcomes Center

**Quality Measures**

**Standardized Mortality Ratio**

PICU standardized mortality ratio (SMR) is measured as the ratio of actual deaths to predicted deaths. The number of predicted deaths is calculated using the Pediatric Risk of Mortality III (PRISM III) score or the Pediatric Index of Mortality 2 (PIM2) score, physiologic-based mortality-risk tools widely used to predict the intensive care outcomes of children.

An SMR of 1 indicates that observed mortality is equal to predicted mortality. An SMR greater than 1 suggests that more patients had an outcome of death than were predicted using PRISM III or PIM2, whereas an SMR less than 1 indicates that fewer patients than predicted died.

**PICU Standardized Mortality Ratios Based on PRISM III**

2010 – 2012

**PICU Standardized Mortality Ratios Based on PIM2**

2010 – 2012

Regardless of whether PRISM III or PIM2 was used, Cleveland Clinic Children's PICU SMRs remained lower than expected and also lower than those of national peers in 2012.

*PRISM III = Pediatric Risk of Mortality III
Source: Virtual PICU Systems, LLC (https://portal.myvps.org)*

*PIM2 = Pediatric Index of Mortality 2
Source: Virtual PICU Systems, LLC (https://portal.myvps.org)
The percentage of patients who are unexpectedly readmitted to the PICU within 24 hours of being discharged is closely monitored. Over the past two years, this percentage has been less than 1%, which is less than the percentages reported by other PICUs.
Unplanned Extubations

Despite the staff’s best efforts, unplanned extubations occur. Cleveland Clinic Children’s PICU monitors the number of unplanned extubations as a quality care metric.

**PICU Unplanned Extubations per 100 Ventilator Days**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1.5</td>
</tr>
<tr>
<td>2011</td>
<td>2.0</td>
</tr>
<tr>
<td>2012</td>
<td>0.5</td>
</tr>
</tbody>
</table>

There are no benchmark data for this metric. Unplanned extubation rates of 0.11 to 2.27 per 100 intubation days have been reported. One study (see reference below) recommended a benchmark target of one unplanned extubation per 100 ventilator days.

In 2012, Cleveland Clinic Children’s PICU had only two unplanned extubations. The number of unplanned extubations per 100 ventilator days was 0.11, which was substantially lower than the rate in preceding years. It was also lower than the suggested benchmark of the study referenced below.

Reference

Hospital-Acquired Infections

PICU Central Line-Associated Bloodstream Infections per 1,000 Central Line Days

2010 – 2012

The percentage of central-line associated bloodstream infections was lower in 2012 compared with the previous two years. Cleveland Clinic Children’s is a member of Ohio Children’s Hospitals’ Solutions for Patient Safety (OCHSPS), a statewide network of children’s hospitals that works to improve quality and reduce costs. Best practices recommended by the network and the National Association of Children’s Hospitals and Related Institutions are followed to reduce the risk of these infections.

PICU Catheter-Associated Urinary Tract Infections

2010 – 2012

Cleveland Clinic Children’s PICU had a single case of catheter-associated urinary tract infection in 2012.
**Ventilator-Associated Pneumonia**

Cleveland Clinic Children’s PICU did not have any ventilator-associated pneumonia cases in 2012.

**Standardized Length of Stay**

As a measure of efficiency, the number of days that patients spend in the PICU is scrutinized. Utilizing PRISM III as an indicator of severity of illness, standardized length-of-stay ratios are calculated by comparing the observed to expected length of stay.

**Standardized Length-of-Stay Ratios Based on PRISM III***

2010 – 2012

<table>
<thead>
<tr>
<th>Observed to Expected Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Cleveland Clinic Children’s</td>
</tr>
</tbody>
</table>

*PRISM III = Pediatric Risk of Mortality III

Although the observed length of stay exceeded the expected in 2012, a substantial decrease in the standardized length-of-stay ratio was seen when compared with 2011.
Neurodevelopmental Outcomes

Preterm and high-risk infants discharged from the neonatal intensive care units (NICUs) within the Cleveland Clinic health system are referred to the NICU Follow-Up Clinic. In 2012, the NICU Follow-Up Clinic at Cleveland Clinic Children’s Hospital for Rehabilitation Shaker Campus was expanded to a twice-weekly clinic, with new locations at Fairview and Hillcrest hospitals. Babies are typically seen at 4, 8 to 12, and 18 to 24 months corrected age. Follow-up visits may start as early as one month after discharge and may extend until a child reaches 3 years of age, depending on the child’s needs.

In 2012, 152 new patients were evaluated and the follow-up of established NICU patients continued. Neurodevelopmental testing using the Bayley Scales of Infant and Toddler Development®, 3rd Edition (Bayley-III) was completed. This assessment helps compare a child’s development with normally developing children of the same age. It can determine the need for further assessments or indicate specific therapeutic areas to focus on, such as physical, occupational, and/or speech therapy. Cognitive, language (receptive and expressive), and motor (gross and fine) composite Bayley-III scores between 85 and 115 are considered normal.

Neurodevelopmental Outcomes for Preterm and High-Risk Infants (N = 193)

<table>
<thead>
<tr>
<th></th>
<th>Infants &lt; 12 Months Corrected Age</th>
<th>Infants ≥ 12 Months Corrected Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median (Range)</td>
<td>Median (Range)</td>
</tr>
<tr>
<td>Median birth weight, grams (range)</td>
<td>1,440 (447–4,617)</td>
<td>1,314 (570–4,630)</td>
</tr>
<tr>
<td>Median gestational age, weeks (range)</td>
<td>31 (23–40)</td>
<td>30 (24–41)</td>
</tr>
<tr>
<td>Median corrected age at testing, months (range)</td>
<td>10 (7–11.5)</td>
<td>20 (12–36)</td>
</tr>
<tr>
<td>Median Bayley-III† composite score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive (range)</td>
<td>105 (55–125)</td>
<td>100 (55–130)</td>
</tr>
<tr>
<td>Language (range)</td>
<td>100 (59–127)</td>
<td>94 (53–138)</td>
</tr>
<tr>
<td>Motor (range)</td>
<td>97 (46–127)</td>
<td>97 (46–145)</td>
</tr>
</tbody>
</table>

*VLBW = very low birthweight. VLBW infants are defined as infants weighing less than 1,500 grams at birth.
†Bayley-III = Bayley Scales of Infant and Toddler Development, 3rd Edition
Outcomes for Very Low Birthweight NICU Graduates at 18 to 24 Months Corrected Age (N = 41)

2012

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehospitalized after NICU discharge</td>
<td>15 (37)</td>
</tr>
<tr>
<td>Surgical intervention after NICU discharge</td>
<td>12 (29)</td>
</tr>
<tr>
<td>Abnormal eye exam</td>
<td></td>
</tr>
<tr>
<td>Blindness</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Prescription glasses</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Hearing impairment</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Muscle tone issues</td>
<td></td>
</tr>
<tr>
<td>Hypotonia</td>
<td>2 (5)</td>
</tr>
<tr>
<td>Hypertonia</td>
<td>5 (12)</td>
</tr>
<tr>
<td>Hypotonia and hypertonia</td>
<td>2 (5)</td>
</tr>
<tr>
<td>Formally diagnosed with cerebral palsy</td>
<td>6 (15)</td>
</tr>
<tr>
<td>Required or continued therapy services (physical, occupational, and/or speech)</td>
<td>29 (71)</td>
</tr>
</tbody>
</table>

Many NICU graduates are evaluated prenatally in Cleveland Clinic Children's Fetal Care Center and diagnosed with conditions that place them at an increased risk for neurodevelopmental impairments. Many of these infants require frequent rehospitalizations, which is typical for this high-risk population. Some require ongoing surgical repairs of cardiac, gastrointestinal, and/or neurologic anomalies. To help these infants achieve their greatest neurodevelopmental potential, a high number are referred to therapy services. Although some infants have muscle tone issues by 2 years of age, the majority of NICU graduates are thriving and have essentially normal neurodevelopment.
In 2012, the Fetal Care Center provided services for 265 families. Sixty-eight families were referred for maternal conditions and the remainder for fetal anomalies. The Fetal Care Center arranged for 411 prenatal consultations with a variety of subspecialists and coordinated 51 fetal magnetic resonance imaging scans and one fetal computed tomography scan.

Eighty-six babies were born in Cleveland Clinic’s Special Delivery Unit, which opened in January 2012. Twenty-six mothers chose to deliver there for their own health issues (mostly maternal cardiac conditions) and the remainder for fetal issues. Thirty-three of the 86 babies were delivered by planned cesarean section, and an additional eight cesarean deliveries were not anticipated.
Neonatal Central Line-Associated Bloodstream Infections

The Ohio Perinatal Quality Collaborative (OPQC) is a consortium of neonatal units dedicated to reducing infections in infants 22 to 29 weeks gestational age. In 2008, Cleveland Clinic Children's three NICUs implemented several initiatives for the prevention of late-onset infections.

NICU Central Line-Associated Bloodstream Infection Rate per 1,000 Central Line Days for All Gestational Ages (N = 7)

2012

The Cleveland Clinic Children's three NICUs’ combined mean central line-associated bloodstream infection rate for 2012 was 1.3%. There were a total of seven central line-associated bloodstream infections per 1,000 central line days for all gestational ages.

The National Healthcare Safety Network’s (NHSN) central line-associated bloodstream infection rate is calculated by combining birth weight and infection data from Level III NICUs. NHSN data include infections associated with all types of central lines, including umbilical lines. The NHSN rate of 1.6% is the mean for all patients from reporting NICU facilities.
Pediatric Nephrology

Center for Comprehensive Pediatric Renal Care

The Judith M. Power Dialysis Center at Children’s Hospital for Rehabilitation provides hemodialysis and peritoneal dialysis services to infants, children, adolescents, and young adults through age 21. It is the only pediatric dialysis center in northern Ohio affiliated with a pediatric transplant program.

The National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative™ guidelines and national benchmarks are used for quality improvement initiatives to enhance the outcomes of patients who develop end-stage kidney disease. The dialysis center has consistently exceeded these national dialysis quality measure benchmarks since opening in 2003.

In the outcomes below, the sample size of 11 represents the dialysis center’s patient volume. While the overall patient population remains basically stable, the center’s peritoneal dialysis population increased during 2012.

Hemoglobin is monitored monthly per quality initiative guidelines to assess the proper dose administration of erythropoiesis-stimulating agents (darbepoetin alfa [Aranesp®] and epoetin alfa [Epogen®]) to patients.

Hematocrit Monthly Averages

2008 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
<th>Benchmark*: 33% to 36%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

*Benchmark: Range established by National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative, found at kidney.org/professionals/kdoqi

The monthly hematocrit averages of patients treated in the Power Dialysis Center from 2008 to 2012 were better than the national benchmark of 33% to 36%, with the exception of a slight drop in 2011. This was attributed to a necessary transition from epoetin alfa to darbepoetin alfa due to a manufacturing issue.
**Urea Reduction Ratio**

The urea reduction ratio is used to measure the reduction in a patient’s urea levels as a result of dialysis. It indicates how effectively dialysis treatment removes waste products from the body. The ratio is expressed as a percentage and is usually measured monthly.

**Urea Reduction**

2008 – 2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
<th>Benchmark*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>80</td>
<td>&gt; 70%</td>
</tr>
<tr>
<td>2009</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

*N = 10, 8, 11, 11, 11

*Benchmark: National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative, found at kidney.org/professionals/kdoqi

Urea reduction ratios at the Power Dialysis Center have consistently been higher than national benchmarks, demonstrating that the center has a highly effective process for dialysis treatments.
Fistula Rate

In patients with end-stage renal disease who are on dialysis, arteriovenous fistulas provide optimal access due to decreased opportunities for infection and thrombosis, when compared with grafts and tunneled or nontunneled catheters.

Arteriovenous Fistula Rates

2008 – 2012

Infection Rate

Rates of infection are followed for every patient who received an arteriovenous fistula, arteriovenous graft, or catheter. If a patient has symptoms that are related to infection, blood cultures and/or exit site cultures are obtained. Infectious complications are the number one reason for increased morbidity and mortality in dialysis patients.

Infection Rates in Patients Receiving Arteriovenous Fistula, Graft, or Catheter

2011 – 2012

From 2008 to 2012, the Power Dialysis Center’s arteriovenous fistula rates were steadily above the national benchmark of > 60%.

The Power Dialysis Center’s infection rates for patients receiving a fistula, graft, or catheter were 0% in 2011 and 0.7% in 2012, exceeding the national benchmark of < 1%.
**Kt/V**

Kt/V is another way to measure dialysis adequacy. In this measurement:

- K stands for the dialyzer clearance — the rate at which filtrate passes through the dialyzer — expressed in milliliters per minute (mL/min).

- t stands for time.

- K x t (the top part of the fraction) is clearance multiplied by time, representing the volume of fluid completely cleared of urea during a single treatment.

- V represents the volume of water a patient’s body contains.

The Kt/V is more accurate than the urea reduction ratio in measuring how much urea is removed during dialysis because it takes into account both urea generated by the body during dialysis and the extra urea removed along with fluid during dialysis.

**Kt/V Adequacy**

**2008 – 2012**

<table>
<thead>
<tr>
<th>Year</th>
<th>Kt/V</th>
<th>Benchmark*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1.0</td>
<td>&gt; 1.4</td>
</tr>
<tr>
<td>2009</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

*Benchmark: National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative, found at kidney.org/professionals/kdoqi

A higher Kt/V number is better than a lower number.
Pediatric Epilepsy: Effect of Treatment on Seizures

Seizure Severity in Medically Treated Pediatric Epilepsy Patients (N = 436)
2007 – 2012

In the pediatric age group, seizure severity, as measured by the LSSS, improved significantly from the initial visit to the last follow-up in patients treated with medications alone, with mean LSSS score of 31.4 at initial visit compared to 13.9 at follow-up visit (P < 0.0001). The standard box plots reflect the median and the 25th and 75th quartiles. N = number of patients with greater than six months of follow-up. Mean duration of follow-up was 21.7 months.

Seizure Frequency in Medically Treated Pediatric Epilepsy Patients (N = 334)
2007 – 2012

<table>
<thead>
<tr>
<th>Cleveland Clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responder rate (≥ 50% reduction in seizure frequency)</td>
</tr>
<tr>
<td>Percent seizure-free (&gt; 6 months follow-up)</td>
</tr>
</tbody>
</table>

Pediatric patients also saw a reduction in seizure frequency: 73% of patients seen between 2007 and 2012 had a 50% or greater reduction in seizure frequency, and 60% became completely seizure-free beyond six months of follow-up after their initial visit. Mean duration of follow-up was 21.7 months. The average seizure frequency at baseline in this patient cohort was 26 seizures per month.
Long-Term Seizure-Freedom in Adult and Pediatric Patients Following Epilepsy Surgery (N = 1,898)

Surgical Dates: 1996 – 2012

Forty-four percent of patients with previously medically intractable epilepsy remained seizure-free 12 years after surgical treatment at Cleveland Clinic’s Epilepsy Center. Individual curves of seizure outcome show similar long-term chances of seizure-freedom in adult and pediatric patients who underwent epilepsy surgery at the center between 1996 and 2012.

<table>
<thead>
<tr>
<th>Years From Surgery</th>
<th>1 Year</th>
<th>2 Years</th>
<th>5 Years</th>
<th>10 Years</th>
<th>12 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Seizure-free (combined cohort)</td>
<td>76%</td>
<td>71%</td>
<td>62%</td>
<td>50%</td>
<td>44%</td>
</tr>
<tr>
<td>% Seizure-free (adult epilepsy)</td>
<td>72%</td>
<td>66%</td>
<td>56%</td>
<td>48%</td>
<td>43%</td>
</tr>
<tr>
<td>% Seizure-free (pediatric epilepsy)</td>
<td>80%</td>
<td>76%</td>
<td>67%</td>
<td>50%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Patients, usually infants and young children, with life-threatening, catastrophic epilepsy may be candidates for hemispherectomy, one of the most complex types of epilepsy surgery. The graph reflects the percentage of patients who continue to be completely seizure-free up to eight years following a hemispherectomy.

Beyond improvements in seizure frequency, several other benefits were observed after hemispherectomy:

- **Seizure medication reduction:** 57% of patients discontinued all seizure medications by last follow-up, and 17% were taking only one seizure medication.
- **Functional improvement:** 83% of patients were walking independently at last follow-up, with an additional 9% requiring minimal assistance for ambulation.
- **Cognitive and language development:** With early surgery, seizure-freedom, and aggressive postoperative therapy, 36% had age-appropriate language and 34% had modestly delayed language at last follow-up. Forty-two percent of patients were reading at age-appropriate levels at last follow-up. These rates were actually a few percentage points better than the language performance of patients before surgery (cognition and language typically worsen with chronic epilepsy and persistent seizures; by stopping seizures, epilepsy surgery can prevent further decline but is not typically expected to improve cognition and language).
Pediatric Epilepsy: Effect of Treatment on Healthcare Utilization

Treatment benefits for patients in the pediatric age group extended beyond the improvements seen in seizure frequency and severity.

Hospitalization Rates in Surgically Treated Pediatric Epilepsy Patients (N = 365)

2009 – 2012

Mean Hospitalization Rate (per 3 Months)

Healthcare utilization improved significantly from the initial visit to the last follow-up. The number of hospitalizations in the three months preceding each visit decreased from a mean of 0.18 over three months at initial visit to a mean of 0.05 at last follow-up visit ($P < 0.0001$), a nearly 72% reduction in frequency of hospitalizations. N = pediatric patients with greater than six months of follow-up. Mean duration of follow-up was 20.4 months.

Emergency Room Visits in Surgically Treated Pediatric Epilepsy Patients (N = 365)

2009 – 2012

Mean ER Visit Rate (per 3 Months)

There was a significant reduction in the frequency of emergency room (ER) visits, from a mean of 0.41 ER visits in the three months preceding the initial visit to 0.14 at the last follow-up visit ($P < 0.0001$), a more than 60% reduction in frequency of ER visits. N = pediatric patients with greater than six months of follow-up. Mean duration of follow-up was 16.5 months.
Pediatric Neurometabolic Clinic

The term “idiopathic developmental delay” is used to define some 3% of the population that has unexplained neurologic and developmental symptoms, including epilepsy. Until recently, this population of children and adults, some with progression of their symptoms for unexplained reasons, remained largely without a diagnosis. With advances in technology and improving diagnostic skills, the ability to reach a conclusive diagnosis in this population has steadily improved. While there is no national standard, tertiary care centers such as Cleveland Clinic have the potential to reach a diagnosis 30% to 50% of the time.\textsuperscript{1}

Reference


Neurometabolic Clinic Diagnostic Yield

2009 – 2012

In 2012 the Neurometabolic Clinic evaluated 212 patients presenting with unexplained neurologic and/or developmental symptoms, and diagnosis was established in 52 patients, or 24.5%. Among those 52 patients, 52% had genetic conditions, 37% had mitochondrial disorders, and 11% had other metabolic diseases. Patients with idiopathic autism are excluded. \(N = \) number of patients seen with unexplained neurological and/or developmental symptoms.
Rating of Outpatient Care and Services: Neurometabolic Clinic (N = 18)

2011 – 2012

Mean Patient Satisfaction Score

Providing a diagnosis in a compassionate, comprehensive way greatly affects patient and family satisfaction. Mean patient satisfaction scores (outpatient medical practice survey results) for a sample of new patients seen in the Neurometabolic Clinic at Cleveland Clinic main campus are higher than benchmarks. Higher scores indicate greater patient satisfaction.

Source: Press-Ganey, a national hospital survey vendor.

Pediatric Headache

Improvement in Headache Disability

2012

On average, pediatric patients treated for headache in 2012 showed an improvement in PedMIDAS (Migraine Disability Assessment Score), as well as in the number of school days missed in the preceding three months. Mean duration of follow-up was 320 days.
Pediatric Sleep Disorders

Pediatric Sleep Studies by Age (N = 545)

2012

Pediatric patients (ages 0 to 18 years) can have sleep studies at Cleveland Clinic facilities in both outpatient and inpatient settings.

The Sleep Disorders Center has child-friendly technologists who are adept at working with infants, children, and teens, including those with developmental and behavioral challenges. The center’s large and comfortable bedrooms are able to accommodate special equipment that may accompany the child and are furnished with a separate bed for a parent.
Prevalence of Sleep Disorders in the General Pediatric Population (N = 300)

September 2012

Patients (%)

<table>
<thead>
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<th>BEARS Category</th>
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Sleep disorders adversely affect mood, behavior, learning, metabolism, immunity, and cardiovascular health. A recent National Sleep Foundation poll showed about 10% of parents of toddlers and older children felt their child had a sleep problem. To assess this at a local level, the Sleep Disorders Center offered the BEARS survey to all parents at time of check-in to general pediatric offices over a one-month period in September 2012. The BEARS survey is a widely used screening tool that asks about Bedtime problems, Excessive daytime sleepiness, nocturnal Awakenings, Regular or irregular sleep habits, and Snoring. Of 300 parents who responded, a large number reported sleep issues present in their child, and many felt that the reported problems were significant enough to adversely affect the child and/or family.

Daytime Sleepiness in Adolescents (N = 33)

February 2010 – February 2013

The Cleveland Adolescent Sleepiness Questionnaire (CASQ) is a 16-item self-completed instrument validated for 11- to 17-year-olds as a measure of daytime sleepiness. The scores range from 16 to 80, with greater values reflecting increasing sleepiness. Although 35 (SD = 11) has been established as the mean normative score, a cutoff for a normal score in clinical populations has not been reported. While mean group CASQ scores did decrease in Pediatric Sleep Clinic patients, the decrease did not reach statistical significance. The median duration of follow-up was 167 days.
# Pediatric Orthopaedic Surgery

## Pediatric Surgery (<18 years of age), 2006 – 2012

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Key: **LOS** = length of stay, **ACL** = anterior cruciate ligament, - = insufficient data
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<th>Procedure</th>
<th>30-Day Readmission Rate, %</th>
<th>30-Day Reoperation Rate, %</th>
<th>Limb-Related Physical Limitations</th>
<th>1-Year Infection Rate, %</th>
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Key: Baseline = preoperative score, 90-Day Follow-Up = 90-day postoperative score, ACL = anterior cruciate ligament, - = insufficient data

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*No admission for dehydration or postoperative hemorrhage

PFAPA syndrome includes recurrent episodes of fever with aphthous stomatitis and pharyngitis as well as cervical lymphadenopathy. Acute episodes of fever last three to seven days and routinely occur every few weeks. Other less common symptoms are joint pain, abdominal pain, rash, headache, vomiting, and diarrhea.
Departments of General and Community Pediatrics

Cleveland Clinic Children’s General Pediatrics and Community Pediatrics departments provide general pediatric care to children and adolescents in the community. Together, more than 70 providers serve as primary care physicians to some 100,000 patients in Northeast Ohio. The departments collaborate to develop and maintain quality initiatives, aiming to provide timely, comprehensive, safe, and appropriate care while promoting the health and well-being of patients.

Immunization

According to the Centers for Disease Control and Prevention, adhering to the childhood immunization schedule could prevent approximately 42,000 deaths. It also has the potential to save almost $69 billion in U.S. healthcare costs. The schedule includes the following vaccines for children from birth to 2 years of age: four diphtheria, tetanus, and acellular pertussis; three polio; one measles, mumps, and rubella; three Haemophilus influenzae type B; three hepatitis B; one varicella; four pneumococcal conjugate; two hepatitis A; two or three rotavirus; and two influenza.

Compliance With Childhood Immunization Schedule

2011 – 2012

Mean Percent

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</table>

Benchmark*: 90th percentile

*Benchmark: Healthcare Effectiveness Data and Information Set’s Effectiveness of Care Measure commercial HMO 90th percentile rate (published in the National Committee for Quality Assurance’s The State of Health Care Quality 2012 report, found at ncqa.org)

The national 90th percentile rate for all early childhood vaccines administered by the child’s second birthday was only 34.6% during 2012. Cleveland Clinic Children’s immunization rate of 58% in 2012 far surpassed the national 90th percentile.
Compliance With Adolescent Immunization Schedule

2011 – 2012

Mean Percent

N = 3,694

N = 3,837

Cleveland Clinic Children's Benchmark*: 90th percentile

*CBenchmark: Healthcare Effectiveness Data and Information Set's Effectiveness of Care Measure commercial HMO 90th percentile rate (published in the National Committee for Quality Assurance’s The State of Health Care Quality 2012 report, found at ncqa.org)

Cleveland Clinic Children’s adolescent vaccine completion rate (tetanus/pertussis booster and meningococcal conjugate vaccine) was 82% in 2012, whereas the national 90th percentile was 79.9%. Despite having vaccination rates in the top 10% of the country, the hospital’s goal is to drive compliance rates even higher. It has launched numerous vaccination quality improvement measures.
Asthma Care

In September 2009, four Cleveland Clinic pediatric primary care offices enrolled in the American Academy of Pediatrics Chapter Quality Network Asthma Project (Ohio Chapter) in collaboration with other practices throughout the state. In October 2011, an additional seven Cleveland Clinic practice sites enrolled.

These practices strive to assess the level of asthma control for patients at all visits, regardless of the reason for the visit. Level of control is determined by a standardized questionnaire completed by the patient on an electronic tablet or verbally with a member of the nursing staff. Providers are then able to prioritize the visit, determining whether further assessment of a child’s asthma is needed to prevent exacerbations, missed school days, missed parent workdays, emergency room visits, and hospitalizations.

Asthma Quality-of-Care Measures Achieved

2009 – 2012

The graph not only highlights the improvement in asthma care since 2009 but also verifies the sustainability of the improvements over a four-year period. The asthma care measures employed were 1) using a validated tool to assess asthma control, 2) following the National Heart, Lung, and Blood Institute’s recommended stepwise approach to adjusting controller medication therapy, and 3) updating the asthma action plan at each asthma patient encounter.
Obesity

The literature suggests that providers may subjectively rely on visual cues to drive their obesity counseling practices rather than actually calculate a patient’s body mass index (BMI) percentile. As a result, many cases of childhood overweight (BMI 85th to 94.9th percentile) and obesity (BMI ≥ 95th percentile) are not accurately diagnosed, and appropriate counseling and interventions are not offered to many pediatric patients unless they are extremely obese. To assist Cleveland Clinic Children’s primary care providers in more accurately diagnosing overweight and obese patients, an automatic BMI calculation was added to the well-child care visit template in the electronic medical record. Providers are now prompted to classify the patient as underweight, normal weight, overweight, or obese.

Changes in Rates of BMI Assessments and Counseling Efforts (N = 1,483)

A chart review was conducted for all patients seen in the Department of General Pediatrics for well-child care visits six months before and six months after the BMI calculation was added to the electronic health record. Appropriate and specific BMI classification rose from 18% to 90%. Improvements were also seen in dietary and exercise counseling ($P < 0.001$), but room for improvement still exists. The department’s next Plan-Do-Study-Act obesity quality improvement cycle is being conducted to assist providers with electronic decision support at the time of the well-child care visit.
**Asthma Control Testing**

The Asthma Control Test™ (ACT) is a validated instrument used by the Center for Pediatric Pulmonary Medicine to assess symptom control in patients referred for initial or follow-up visits. The ACT measures daytime and nighttime symptom severity, use of rescue beta-agonists, functional assessment, and self-assessment of control. A composite score of test responses from the child and a parent is used for children aged 4 to 11 years, but children 12 years and older provide a self-assessment.

The ACT provides a longitudinal measure of asthma control and categorizes patients into three asthma score categories:

- Well-controlled (score > 19). A primary management objective is to achieve scores greater than 19.
- Not well-controlled (score 16–19). Scores in this range reflect the need for further clinical improvement.
- Poorly controlled (score < 16). Scores less than 16 indicate more severe functional impairment, elevated risk of exacerbation, and likelihood of increased health resource utilization.

**ACT Score* Category of Patients ≥ 4 Years of Age (N = 234)**

<table>
<thead>
<tr>
<th></th>
<th>Initial Visit</th>
<th>Follow-Up Visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-controlled</td>
<td>63%</td>
<td>76%</td>
</tr>
<tr>
<td>Not well-controlled</td>
<td>17%</td>
<td>19%</td>
</tr>
<tr>
<td>Poorly controlled</td>
<td>2%</td>
<td>5%</td>
</tr>
</tbody>
</table>

*ACT = Asthma Control Test

Of the 17% of patients presenting with poorly controlled asthma in 2012, two-thirds demonstrated sufficient improvement in ACT scores to be placed into a better category at the follow-up visit. At follow-up, only 5% of patients were classified as poorly controlled.
Seventy-seven percent of children who presented with poorly controlled or not-well-controlled asthma demonstrated an increase in ACT scores (≥ 3 points) at their last follow-up visit. Scores increased despite the fact that most children referred to the Center for Pediatric Pulmonary Medicine have more severe asthma phenotypes, multiple comorbidities, and prior histories of significant health resource utilization. This level of improvement has been associated with value-based measures such as improved quality of life and decreased overall costs of asthma care.
**Disease Activity Assessment for Juvenile Idiopathic Arthritis**

Juvenile idiopathic arthritis (JIA) affects up to 300,000 children in the United States and can be associated with significant functional impairment if not properly recognized and treated. Cleveland Clinic Children’s Center for Pediatric Rheumatology strives to provide evidence-based, patient-centered, outcome-directed care to children with JIA. The center follows national guidelines for JIA therapy and utilizes a multidisciplinary care team to ensure that patients have the best chance to achieve remission and to live life with minimal effects from JIA.

In an effort to improve outcomes, the rheumatology team has implemented the calculation and tracking of the Juvenile Arthritis Disease Activity Score (JADAS) in all JIA patients. This scoring system is a validated, innovative arthritis activity assessment tool that allows providers to make a real-time assessment of arthritis disease activity. Further, the rheumatology staff assesses functional status and damage of patients with JIA during visits to Cleveland Clinic main campus. Going forward, these outcomes will help the center’s staff focus on and improve the quality of care they provide to children and their families.

**Juvenile Idiopathic Arthritis Outcome Measures**

**2012**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Health Status Measure</th>
<th>Mean Score</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional status</td>
<td>Childhood Health Assessment Questionnaire</td>
<td>0.5</td>
<td>0–3</td>
</tr>
<tr>
<td>Disease activity</td>
<td>Juvenile Arthritis Disease Activity Score</td>
<td>7.1</td>
<td>0–57</td>
</tr>
<tr>
<td>Disease damage</td>
<td>Juvenile Arthritis Damage Index–Articular</td>
<td>0.1</td>
<td>0–72</td>
</tr>
<tr>
<td></td>
<td>Juvenile Arthritis Damage Index–Extra-Articular</td>
<td>0.4</td>
<td>0–13</td>
</tr>
</tbody>
</table>

In 2012, Cleveland Clinic Children’s rheumatologists saw more than 160 unique patients with JIA at the main campus facility. More than 70% of patients had a subtype of JIA affecting more than five joints. Seventy percent of patients were on methotrexate, and almost 60% were being treated with biologic response modifiers. Patient JADAS scores in this population were low. The mean score was 7.1, and 56% of patients had a score lower than 5.2, consistent with minimally active or inactive disease. Even with a mean disease duration of more than four years, this population had minimal evidence of articular and extra-articular damage due to arthritis (JADI-A* = 0.1; JADI-E* = 0.4). Patients also had excellent functional status, as evidenced by mean Childhood Health Assessment Questionnaire (CHAQ) scores.

*JADI-A = Juvenile Arthritis Damage Index–Articular, JADI-E = Juvenile Arthritis Damage Index–Extra-Articular*
Cleveland Clinic Children’s Center for Autism

Social Thinking Program

In response to the need for an empirically supported approach to teaching social thinking to children with high-functioning autism or Asperger’s disorder, Cleveland Clinic Children's Center for Autism developed the SPIES program (Social Thinking Practice and Instruction Enhances Socialization). The 20-week program includes child intervention, parent instruction, and skill generalization, and culminates in a six-week inclusive summer camp. Children who have participated in the program often return in subsequent years for booster sessions (two to three per year) and for the summer camp.

Improvement in Social Behavior of SPIES Program Participants (N = 32)

2008 – 2012

Number of Social Difficulties

![Bar chart showing improvement in social behavior over three years.]

A total of 32 children with high-functioning autism or Asperger’s disorder, aged 6 to 11 years, have participated for at least one year in the SPIES program. By the end of their first year, many SPIES participants showed a substantial improvement in social behavior as a result of intervention. Individuals who have continued to receive booster sessions and participate in the summer camp have maintained these improvements over three years.
Lerner School for Autism — Educational Goal Achievement

The Center for Autism’s Lerner School provides each of its students with an Individualized Education Plan each school year. This plan typically consists of between 30 and 120 educational objectives. Over the past seven years, the school has realized increasingly greater success in helping students achieve their educational goals.

### Percentage of Educational Goals Achieved by Lerner School for Autism Students (N = 115)

2005 – 2012

<table>
<thead>
<tr>
<th>School Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005–2006</td>
<td>40</td>
</tr>
<tr>
<td>2006–2007</td>
<td>60</td>
</tr>
<tr>
<td>2007–2008</td>
<td>60</td>
</tr>
<tr>
<td>2008–2009</td>
<td>60</td>
</tr>
<tr>
<td>2009–2010</td>
<td>80</td>
</tr>
<tr>
<td>2010–2011</td>
<td>80</td>
</tr>
<tr>
<td>2011–2012</td>
<td>100</td>
</tr>
</tbody>
</table>

From 2005 to 2012, the Lerner School showed a substantial increase in the average percentage of educational goals achieved by its students. In the 2011–2012 school year, students with autism achieved an average of 75% of their Individualized Education Plan goals. Comparatively, children in many special education settings commonly achieve less than 50% of their educational goals. This high level of achievement occurred despite the fact that many of these children had significant challenging behaviors that impeded learning. Additionally, even when educational goals were not achieved, all students showed significant progress toward their goals and often completed them at the beginning of the following school year.
The Preschool Program provides year-round, early, intensive behavior intervention for young children who are diagnosed with autism spectrum disorder. Children as young as 18 months through 6 years receive 30 hours per week of intervention through collaboration of the education team and the child’s parents. Utilizing the science of applied behavior analysis and child development principles, program faculty design an individualized curriculum to teach communication, social interaction, play, and a range of functional and adaptive skills.

A total of 101 students have graduated from the Preschool Program since it opened in 2002. The majority of children who exited the program over the past decade were placed in either 1) mainstream settings with minimal or no educational support (39%) or 2) less intensive special education settings (26%) than Lerner School. The remaining students (35%) were placed in settings that provided intensive behavioral intervention. Comparatively, studies of intensive behavioral intervention programs for preschoolers have shown an approximately 30% placement rate in mainstream settings with minimal or no educational support. These outcomes indicate that young children with autism who attend the Preschool Program have substantially improved in their ability to function independently in their future educational settings, resulting in decreased resource utilization and cost to the public education system.
Change in Percentage of Exiting Preschool Students Who Were Placed in Less Intensive Support Settings* (N = 354)  
2008 – 2012

*Settings that do not require intensive behavioral intervention or 1:1 aide services

Over the past five years, an increasing percentage of preschoolers with autism have gone on to less intensive settings after exiting the Preschool Program. In these settings, intensive behavioral intervention is no longer required for student success.
Center for Autism — Baby Day Clinic for Early Identification of Autism Spectrum Disorders

Cleveland Clinic Children’s Center for Autism has an active early evaluation and diagnosis clinic — the Baby Day Clinic — designed to identify children with autism as early as possible. This clinic receives many referrals from community pediatrician practices, where children are routinely screened for autism symptoms at ages 18 and 24 months. As a result of community screening and the availability of the Baby Day Clinic, the average age at first diagnosis of an autism spectrum disorder has decreased dramatically.

Age of Identification of Autism Spectrum Disorders at Cleveland Clinic Children’s Center for Autism (N = 136)  
2010 – 2011

The national average age of diagnosis of autism spectrum disorders is 5.7 years. For the 136 children with autism spectrum disorders seen in the Baby Day Clinic from 2010 to 2011, the average age of diagnosis was 3.3 years. Early identification significantly improves the ability to initiate early behavioral intervention, as recommended by the American Academy of Pediatrics.
Pediatric Behavioral Health

Summer Treatment Program for Children With ADHD

Children’s Hospital for Rehabilitation offers a Summer Treatment Program (STP) that is designed for children aged 6 to 11 years with attention-deficit/hyperactivity disorder (ADHD). The seven-week program divides participants into groups of 10 to 12 children, based on age, and five clinical staff members supervise each group. In 2012, 31 children participated in the program, and all completed the program.

Benefits of the program include:

• Daily social skills training from counselors
• Four-hour recreational period (swimming, soccer, baseball, and basketball)
  – Learn sports skills that help them be successful with peers
  – Participate in group problem-solving discussions
• Two hours in a classroom setting to learn how to behave in a school setting
• Parent training
  – Enhance behavior management at home and school
  – Follow-up “booster sessions” throughout the school year
• Medication assessments
• Continued research on ADHD

Average Number of Daily Negative Verbalizations of Summer ADHD Program Participants by Age Group (N = 31)

<table>
<thead>
<tr>
<th>Treatment Week</th>
<th>Ages 6–7 (N = 11)</th>
<th>Ages 8–9 (N = 11)</th>
<th>Ages 10–11 (N = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>4</td>
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<tr>
<td>5</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of Daily Verbalizations

Average Number of Daily Negative Verbalizations of Summer ADHD Program Participants by Age Group (N = 31)

2012
Average Number of Daily Positive Peer Interactions of Summer ADHD Program Participants by Age Group (N = 31)

Number of Daily Interactions

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 6–7 (N = 11)</td>
<td>50</td>
</tr>
<tr>
<td>Ages 8–9 (N = 11)</td>
<td>40</td>
</tr>
<tr>
<td>Ages 10–11 (N = 9)</td>
<td>30</td>
</tr>
</tbody>
</table>

Summer Treatment Program for Adolescents With ADHD

The Summer Treatment Program for Adolescents (STPA) is a seven-week program designed for children aged 11 to 14 years with ADHD. The program divides participants into groups of eight to 10 children, based on age, and five clinical staff members supervise each group. In 2012, one of the 20 students who participated in the program was removed due to severe psychopathology, giving the STPA a completion rate of 95%.

Benefits of the program include:

- Development of problem-solving skills, social skills, and social awareness to improve interaction with peers
- Ability for participants to earn money (contingent on behavior)
- Two hours in a classroom setting
  - One hour of history — to learn note-taking and test-taking techniques
  - One hour of strategies — to learn how to efficiently manage their time during a long-term project
- Implementation of a parent-teen negotiation strategy to enable more effective behavior management at home
- Parent training
  - Enhance behavior management at home and school
  - Follow-up “booster sessions” throughout the school year
- Medication assessments
- Continued research on ADHD
**Average Number of Daily Negative Behaviors in 11- to 14-Year Age Group in Summer ADHD Program (N = 19)**

2012

**Number of Daily Behaviors**

![Graph showing the average number of daily negative behaviors from week 1 to week 7.](image)

**Average Amount of Money Earned by 11- to 14-Year-Olds in Summer ADHD Program (N = 19)**

2012

**Number of Dollars**

![Graph showing the average amount of money earned from week 1 to week 7.](image)
Parent Satisfaction Questionnaire Results for Summer ADHD Programs for Children and Adolescents

Forty-nine parents of 49 STP and STPA participants completed a questionnaire designed to assess parent satisfaction and their children's behavioral improvements.

The graphs below depict the results of the questionnaire. Noteworthy results include:

- Some 96% of parents identified the STP or STPA as more effective than other treatments.
- All parents (100%) stated they benefited from the programs.

Extent That Child and Parent Benefited From Summer ADHD Program (N = 49)

2012

How Parents Rated STP* or STPA* Program’s Effectiveness and Their Level of Satisfaction Compared With Other Treatments (N = 49)

2012

*STP = Summer Treatment Program, STPA = Summer Treatment Program for Adolescents
Extent That Child Enjoyed Summer ADHD Program (N = 49)

Parents' Responses to: Would You Recommend or Re-Send Your Child to the Summer Treatment Program? (N = 49)
Social Skills Training for Children With ADHD

Children's Hospital for Rehabilitation offers age-appropriate social skills training for children and adolescents with attention-deficit/hyperactivity disorder (ADHD).

- Children aged 6 to 14 years meet in age-appropriate groups of six to eight children per group.
- Groups meet for 90 minutes per week for seven weeks, and sessions are facilitated by the ADHD Center for Evaluation and Treatment staff.
- Caregiver/parent coaching groups are offered simultaneously.
- Parents learn behavioral techniques and interventions.
- The following list illustrates examples of targeted skills:
  - Initiating cooperative ventures
  - Initiating conversation
  - Participating in a group
  - Interrupting appropriately
  - Giving/accepting negative feedback
  - Making/keeping friends
  - Listening during conversation
  - Following instructions/rules
  - Solving problems/negotiating
Sixteen parents of 20 social skills program participants completed a questionnaire designed to assess parent satisfaction and their children’s behavioral improvements. The following graphs depict the results of the questionnaire. Noteworthy results include:

- A total of 93% of parents indicated the social skills training was above average.
- All parents (100%) made improvements toward their goals.

Parents’ Rating of Social Skills Training for Children With ADHD Aged 6 to 14 Years (N = 16)

2012

<table>
<thead>
<tr>
<th>Subject matter was clearly presented.</th>
<th>How would you rate the group?</th>
<th>Improvement was made toward goals.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>93%</td>
<td>73%</td>
</tr>
<tr>
<td>7%</td>
<td>7%</td>
<td>27%</td>
</tr>
</tbody>
</table>

- Subject matter was clearly presented.
- How would you rate the group?
- Improvement was made toward goals.
Skill Improvement Ratings for Children With ADHD Aged 6 to 14 Years (N = 16)

2012

- Making/Keeping Friends: 38% Needs to be improved, 13% Never a problem, 50% Improved
- Listening During Conversations: 100% Never a problem
- Interrupting Appropriately: 6% Needs to be improved, 94% Improved
- Accepting Limits: 25% Needs to be improved, 6% Never a problem, 69% Improved
- Following Instructions: 19% Needs to be improved, 81% Improved
- Participating in a Group: 6% Needs to be improved, 13% Never a problem, 81% Improved
- Asking/Answering Questions: 19% Needs to be improved, 6% Never a problem, 75% Improved
- Initiating Conversation: 44% Needs to be improved, 56% Improved
- Maintaining Eye Contact: 19% Needs to be improved, 6% Never a problem, 75% Improved
- Solving Problems/Negotiating: 19% Needs to be improved, 13% Never a problem, 69% Improved
- Overall Improvement: 100% Never a problem

Legend: Needs to be improved, Never a problem, Improved
Pediatric Feeding Program

Data were collected on all patients treated in the Pediatric Feeding Disorders Program from 2010 through 2012. To be included in the treatment group, patients had to complete either nine consecutive months of treatment or 15 sessions (whichever came first), with a break of no more than six weeks between sessions. Data were collected at the following points: 1) after nine months or 15 sessions, 2) after 18 months or 30 sessions, and 3) at discharge if discharge occurred more than 18 months after initiation of treatment.

Patients were categorized into three treatment groups, and outcomes were compared within each group, as outlined below. All patients received treatment from an interdisciplinary team that included practitioners from Psychology, Occupational Therapy, and Nutrition. All data were measured at the initiation of treatment and at the established treatment intervals of nine months, 18 months, and at discharge if past 18 months.

General Outpatient Treatment Group (N = 160). Patients in the general outpatient treatment group were treated solely in the outpatient clinic. Patients in this group did not require nasogastric or gastrostomy tube feedings.

Nasogastric/Gastrostomy Tube (NG/GT) Supplementation Treatment Group (N = 23). Patients receiving supplemental NG/GT feedings were treated solely in the outpatient clinic by an interdisciplinary team from Psychology, Occupational Therapy, and Nutrition.

Intensive Treatment Group (N = 16). Patients in the intensive treatment program received treatment five days per week, approximately six to seven hours per day for a period of eight to 10 weeks. Treatment included four to six feeding sessions per day. These patients also typically received outpatient treatment before and/or after the intensive treatment program.
The percentage of patients with weight for age below the third percentile on the Centers for Disease Control and Prevention (CDC) growth curve decreased in all treatment groups from initial treatment to discharge. At discharge, only one patient in the general outpatient treatment group, two patients in the NG/GT supplementation group, and no patients in the intensive treatment program were considered below the third percentile.
The percentage of patients with weight for length or body mass index below the third percentile on the CDC growth curve steadily decreased in all treatment groups from initial treatment to discharge. No patients discharged after greater than 18 months from the outpatient treatment were below the third percentile. One patient from the tube feed supplementation group and two patients in the intensive treatment group remained below the third percentile at discharge. During follow-up outpatient treatment nine months after program completion, only one patient in the intensive treatment group did not have adequate body mass index or weight for length.
Decreased Resistant Behaviors

Percentage of Patients With Resistant Feeding Behaviors

2010 – 2012

Resistant feeding behaviors included aggression, intentional gagging and vomiting, tantrums, and spoon batting. Patients in all treatment groups demonstrated a steady average reduction in resistant feeding behavior.
**Decreased Dependence on NG/GT Supplementation**

To evaluate oral feeding/intake, patients’ percentage of total calorie intake provided from supplemental feeds was measured at initiation of treatment and at established treatment intervals.

**Average Reduction of Nasogastric or Gastrostomy Tube Supplementation (N = 23)**

2010 – 2012

At the initiation of NG/GT treatment, children were receiving an average of 86% of calories from supplemental tube feedings. By nine months of treatment, tube feeding had been reduced by an average of 20%. By 18 months of treatment, there was a 27% reduction on average. Seven children continued to require supplemental feeds at the time of discharge; however, all these children had significant medical and/or developmental complexities that may have precluded complete NG/GT wean.
Pediatric Pain Rehabilitation Program

The Pediatric Pain Rehabilitation Program at Children's Hospital for Rehabilitation is a unique and innovative program designed for children and adolescents with chronic pain that interferes with their normal activities. These children do not attend school, interact with peers, or participate in normal activities. The program focuses on helping children manage their pain and on restoring daily activity. It consists of inpatient and day hospital components and blends pediatric subspecialty care, behavioral health, and rehabilitation therapies in an individualized but coordinated manner.

Pain Program Patient Volumes

2011 – 2012

Number of Patients

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td>91</td>
</tr>
<tr>
<td>2012</td>
<td>101</td>
<td></td>
<td>101</td>
</tr>
</tbody>
</table>

Pain program patient volume increased 11% from 2011 to 2012. In 2012, 64% of patients came from out of state.

Pain Program Primary Diagnoses by Year

2011 – 2012

Number of Patients

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>2011 (N = 91)</th>
<th>2012 (N = 101)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex Regional Pain Syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Abdominal Pain</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
Patients were asked to rate the pain they experienced during the previous 24 hours on a scale of 0 (no pain) to 10 (maximum pain). Pain severity ratings were obtained at the beginning of the three-week pain rehabilitation program and at one-month follow-up.

**Pain Program’s Impact on Pain Severity (Adolescent Self-Report)**

*2011 – 2012*

**Score: 0 (no pain) to 10 (maximum pain)**

One-month follow-up assessment for 2012 revealed an average 33% decrease in pain severity, compared with a 19% decrease in 2011.

The Bath Adolescent Pain Questionnaire (BAPQ), also self-reported by the adolescent, is a 61-item tool designed specifically to assess the multidimensional impact of chronic pain on adolescents. This assessment tool is administered at the beginning of the program and at one month following program completion. The Physical Functioning, Pain-Specific Anxiety, and Social Functioning subscales are used in outcomes analyses.

**Pain Program’s Impact on Physical Functioning**

*2011 – 2012*

**Score: 0 (best) to 32 (worst)**

In 2012, patients in the pain rehabilitation program had an average 57% improvement in Physical Functioning, based on the BAPQ data. An average 52% improvement was reported in 2011.
Pain rehabilitation program patients reported an average 49% decrease in Pain-Specific Anxiety in 2012, based on the BAPQ data. In 2011, an average 36% decrease was seen.

In 2012, patients reported an average 37% improvement in Social Functioning, based on the BAPQ data. The 2011 data revealed an average 28% improvement.
Pediatric Inpatient Rehabilitation Program — WeeFIM Outcomes

The WeeFIM II® System, a pediatric version of the Functional Independence Measure™ (FIM) System, measures and tracks the development of functional independence. The system is used to document functional performance in children and adolescents with acquired or congenital disabilities by measuring a child's need for assistance and the severity of disability. It also provides a method of evaluating outcomes for pediatric rehabilitation and habilitation programs.

The WeeFIM national database provides reports comparing individual programs against national benchmarks. The outcomes of children treated at Children's Hospital for Rehabilitation compare favorably with the national benchmarks.

The WeeFIM length-of-stay and therapy unit efficiency scores are the most important measures of effectiveness of a rehabilitation program because they indicate how quickly a program is able to improve a child's functional abilities. Children's Hospital for Rehabilitation has been consistently at or above the national average in these measures for the past seven years.

Children's Hospital for Rehabilitation Median Length-of-Stay Efficiency Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
</tr>
</tbody>
</table>

*The national benchmark is calculated from a database of WeeFIM performance measures of like facilities, housed by Uniform Data System for Medical Rehabilitation (udsmr.org).

This measure is the change in functional status per day spent in the rehabilitation program. The length-of-stay efficiency rate is calculated by dividing the change in WeeFIM score from admission to discharge (gain) by the number of days the child spent in the rehabilitation program. A higher rate is better than a lower one.
Children treated in the rehabilitation program at Children’s Hospital for Rehabilitation gained more function per therapy unit than children in rehabilitation programs in similar facilities. Therapy unit efficiency rate is calculated by dividing the functional quotient score change by the total number of therapy units provided. A higher rate is better than a lower one.

The WeeFIM score at discharge is calculated by adding the discharge scores for the 18 WeeFIM items. WeeFIM scores range from 18 to 126. A higher score is better than a lower score.

*The national benchmark is calculated from a database of WeeFIM performance measures of like facilities, housed by Uniform Data System for Medical Rehabilitation (udsmr.org).
Children’s Hospital for Rehabilitation Median WeeFIM Score Change (Gain) 2010 – 2012

Gain in Points: 0 (no gain) to 126 (best gain)

The WeeFIM score change is calculated by subtracting the admission WeeFIM score from the discharge WeeFIM score. A higher score indicates more gain in function.

Children’s Hospital for Rehabilitation Median Rehabilitation Length of Stay 2010 – 2012

Days

The rehabilitation length of stay is calculated by subtracting the admission date from the discharge date. If any program interruptions are recorded, these off-service days are subtracted from the total length of stay. A lower number of days is better than a higher number.

*The national benchmark is calculated from a database of WeeFIM performance measures of like facilities, housed by Uniform Data System for Medical Rehabilitation (udsmr.org).
This measure represents the discharge functional quotient of children who undergo rehabilitation at Children’s Hospital for Rehabilitation compared with children who undergo rehabilitation at similar facilities. Functional quotient is a methodology of age-adjusting the data and comparing an observed rating to an age-expected rating of a child without a disability. A higher functional quotient is better than a lower one.

This measure represents the change in functional quotient (gain) between admission and discharge of children who undergo rehabilitation at Children’s Hospital for Rehabilitation compared with children who undergo rehabilitation in comparable programs elsewhere. A higher change in functional quotient score is better than a lower one.

*The national benchmark is calculated from a database of WeeFIM performance measures of like facilities, housed by Uniform Data System for Medical Rehabilitation (udsmr.org).*
The Pediatric Rehabilitation Case Management Program provides comprehensive, supportive case management services for children who require inpatient rehabilitation services as a result of multiple trauma, head injury, neurologic injury, spinal cord injury, or other acute conditions that entail functional restoration. The program works to ensure that children and their families have health and developmental needs met at home, at school, and in the community. It does this by ensuring continuity of care and facilitation of access to appropriate, cost-effective services.

**Age of Patients Served by Case Management Program (N = 75)**

**2011 – 2012**

**Number of Patients**

<table>
<thead>
<tr>
<th>Age Range (Years)</th>
<th>2011 (N = 40)</th>
<th>2012 (N = 35)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>5–9</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>10–14</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>15–19</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>&gt; 19</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Income Level of Families With Patients in Case Management Program (N = 75)**

**2011 – 2012**

**Number of Families**

<table>
<thead>
<tr>
<th>Income Range (Dollars)</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–9,999</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>10,000–14,999</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15,000–19,999</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20,000–29,999</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30,000 and up</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

The Pediatric Rehabilitation Case Management Program serves families of all income levels. During 2011 and 2012, the largest numbers of families fell into the lowest and highest income categories depicted in the graph.
One of the case management program's goals is to maintain children in their home environment and provide services allowing them to remain in the community. During 2011 and 2012, all patients in the program were assessed and received case management plans. A total of 97% of patients were discharged to the community; one patient was discharged to skilled care. Of the 35 children served by the program during this period, two required rehospitalization following discharge from Cleveland Clinic Children's Hospital for Rehabilitation.

**Percentage of Case Management Appointments Kept**

2011 – 2012

A total of 187 referrals to medical, educational, and social services were made during 2012. Of those, 96% (179) of appointments were kept. This is an increase from 2011, when 93% of appointments were kept.
During 2012, 14 school re-entry meetings were held with school district representatives and the hospital team, including medical staff, nursing, therapy services, psychology, and social work. Five children had Individualized Education Plans in place at discharge, three were placed in the classroom setting, and one received home instruction provided by the school district. Fewer school re-entry meetings were conducted and fewer placements were made during 2012 than in 2011.
Improving Safety

Serious safety events are incidents that cause serious temporary or permanent harm to patients; they can even be associated with death. Lower-level safety events are incidents that may or may not affect the patient and cause no harm or serious permanent harm.

In high-reliability organizations, it has been shown that focusing on lower-level events can prevent serious safety events because lower-level events may identify latent causes of error. In Cleveland Clinic Children’s, the Quality Council actively encourages the reporting of safety events of any level through the Safety Event Reporting System.

Number of Lower-Level and Serious Safety Events Reported to Safety Event Reporting System

2011 – 2012

During the past two years, the number of lower-level events reported through the Safety Event Reporting System has increased. Comparatively, there was a low rate of serious safety events.
Narcotic-Associated Constipation

A review of adverse drug events conducted by the Pediatric Institute quality group in 2010 showed that 43% of all events were narcotic-associated constipation. To lower the incidence of narcotic-associated constipation and reduce adverse drug events, pediatric physicians incorporated age-specific laxative recommendations into all pediatric order sets that include narcotics. Additionally, they actively collaborate with nursing, Pharmacy, and Hospital Medicine.

Incidence of Narcotic-Associated Constipation

2012

Percent

As a result of incorporating the age-specific laxative recommendations into the order sets, the incidence of narcotic-associated constipation dropped substantially in 2012.
Cleveland Clinic is dedicated to delivering excellent clinical outcomes and the best possible experience for our patients and their families. Patient feedback is critical in driving priorities and assessing results. Based on this feedback, Cleveland Clinic's Office of Patient Experience implements training programs to improve service and communication as well as educational initiatives to help patients understand what to expect when they are in our care.

**Outpatient Office Survey**

2011 – 2012

**Percent Best Response***

*Response options: Very Good, Good, Fair, Poor, Very Poor. Each bar represents a composite score based on responses to multiple survey questions.

Source: Press Ganey, a national hospital survey vendor
The guiding principle of Cleveland Clinic is “Patients First,” and improving the patient experience is a major strategic organizational goal. The Office of Patient Experience collaborates with physician and nursing leadership to establish best practices and implement standardized protocols that ensure delivery of patient-centered care.
Cleveland Clinic Children’s

 Novel Real-Time Survey Tool to Improve Patient Satisfaction During Admission

To optimize patient satisfaction during admission, Cleveland Clinic Children’s created a real-time survey for patients and their families. The goal is to obtain feedback from each family during the admission process and to provide a timely response to their needs.

This project entails the use of wireless technology and a proprietary software platform that allows individuals to directly input responses to survey questions into a centralized database. The 12-question survey was designed to collect information regarding specific experiences of the family during hospital admission. The questions focus on communication by the physician and nursing teams and on the family’s involvement in medical decision-making. Additionally, each family is encouraged to provide comments that allow for specific action to be taken quickly to improve the family’s experience during admission. An underlying analytical platform provides the ability to generate patient-, provider-, floor-, and department-specific reports that can be used by front-end clinicians for service recovery and by administration for support of rapid-cycle improvement initiatives.

Overall Patient Assessment of Admissions Process: Percentage Who Gave Highest Rating*

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>62</td>
<td>57</td>
<td>52</td>
<td>36</td>
</tr>
</tbody>
</table>

Patient Satisfaction With Doctor Communication: Percentage Who Gave Highest Rating*

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

*Patients who responded “Very Good”

This real-time survey tool has been key to improving patient satisfaction scores during the last quarter of 2012. For 2013, the tool will be modified to include questions about satisfaction with pain control and accommodations.
**Cardiology**

**First Pediatric Use of New 3 French Catheters**

Cleveland Clinic Children’s was the first center in the United States to use the Mongoose™ 3 French catheter (PediaVascular, Cleveland, Ohio) in pediatric patients. The advantages that they may offer over 4 French catheters include:

- Equipment that is specifically designed and sized for pediatric patients — approximately a 20% reduction in the size of the arterial sheath used in catheterizations
- Will cause less trauma to the artery and further reduce the already small incidence of vascular complications that occur secondary to vascular access in the catheterization laboratory

The Mongoose 3 French catheters are the first group of catheters to be approved by the FDA with a specific pediatric indication.

**Pediatric Endocrinology**

**Glycogen Storage Disease Program**

A multidisciplinary Glycogen Storage Disease Program has been established at Cleveland Clinic Children’s to manage this rare group of disorders. The goals of therapy for these patients are to:

- Maintain normal blood glucose concentrations at all times
- Achieve and sustain normalization of all other laboratory studies

Patients receive care from a team of pediatric specialists in Endocrinology, Genetics, Gastroenterology, Neurology, and Critical Care, as well as from a metabolic dietitian. Children being treated in the program can expect to grow normally and live full, healthy lives without limitations.
Pediatric General Surgery

Multidisciplinary Approach for Complex Colorectal Surgery Cases

Pediatric patients with complex colorectal surgical problems, such as complicated or rare cases or functionally unacceptable surgical outcomes, can be difficult to treat. To improve patient care and outcomes in these children, the departments of Pediatric Surgery and Colorectal Surgery have instituted a collaborative clinic for children older than 10, in conjunction with a full-time pediatric gastroenterologist from the Department of Pediatric Gastroenterology.

This clinic offers:

- Convenience for families with children who would typically need to be shuffled among multiple specialty clinics
- Real-time integration of three subspecialty perspectives during the initial diagnostic and treatment-planning phases of each child's surgical journey
- Seamless transition between medical and surgical management
- A continuum of care, starting in childhood and extending throughout a lifetime

When a child older than 10 with a complex colorectal condition is referred to any of the involved departments, the child’s family will be offered the opportunity to be seen in the collaborative clinic. A patient previously seen in any of the subspecialty departments who is deemed suitable and would benefit from a multidisciplinary approach will also be offered a place in the clinic. As the child grows through adolescence and into young adulthood, the presence of an adult colorectal surgeon who has participated in the surgical decision-making process along the way will facilitate the transition to an adult care environment at the appropriate time.

The multidisciplinary clinics will initially be held once a month, with plans to add more clinic sessions as demand grows. Referring physicians and parents who are interested in participating in this collaborative clinic may request an appointment through any of the three participating subspecialty departments.
Pediatric Pain Rehabilitation Program

Behavioral Treatments for Pediatric Headache

Recurrent or daily headache pain is a burden for children and their families. Unhealthy behaviors such as lack of sleep, poor nutrition, and exposure to headache triggers can exacerbate this pain. Additionally, factors such as stress, fear, perfectionism, or frustration can interfere with behaviors leading to good health. Yet children sometimes engage in a pattern of behavior that they find difficult to change.

Behavioral specialists at Cleveland Clinic Children’s teach children cognitive and behavioral strategies that can successfully minimize the pain and distress associated with headaches. These strategies complement recommendations provided by the child’s primary care physician or neurologist. Parents also learn ways to effectively support their child’s self-management of headaches.

Behavioral treatment is provided in an individual or group setting. Treatment typically involves restructuring daily health habits, relaxation training, stress management, and harnessing the power of attitude to create a body more resilient to headache. Biofeedback may also be offered as a component of treatment. Treatment generally takes five to eight sessions, with scheduled homework to strengthen the development of headache management skills. A summary of the treatment and the child’s progress will be shared with the parent(s) and the referring physician after treatment completion.

Children who have completed behavioral treatments for headache have experienced a notable reduction in headache frequency and intensity. Future research is planned to strengthen behavioral treatments for migraine and tension-type headache, enhance treatments for chronic daily headache and post-traumatic headache, and further the understanding of the role of psychology and health behaviors in pediatric headache.
Staff Listing

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Isabelita Guadiz, MD
Charmaine Gutjahr, MD
Lisa Hanna, MD
Some physicians may practice in multiple locations. For a detailed list including staff photos, please visit clevelandclinic.org/staff.
General Patient Referral
24/7 hospital transfers/admissions/critical care transport

Cleveland Clinic Children’s Main Campus
216.448.7000 or 800.223.8687

Cleveland Clinic Children’s Hospital for Rehabilitation Shaker Campus
216.448.6400 or 800.635.2417

Outpatient Appointments/Referrals
Medical and Surgical Subspecialties – Main Campus
216.444.DOCS (3627) or 800.553.5056

Special Cleveland Clinic Children’s Programs
ADHD Center for Evaluation and Treatment
216.445.7574

Adoption Program
216.445.3033

Center for Autism
216.448.6440

Dialysis Unit
216.448.6193

Feeding Disorders Program
216.448.6024

Fetal Care Center
866.864.0430

Metabolic Services
216.444.3303

Nephrology Clinic
216.444.6123

Pain Rehabilitation Program
216.448.6035

Palliative Medicine Service
216.445.1404

Therapy Services (OT, PT, S/LT, and Motor Control programs)
New patients:
216.636.5437

Shaker Campus
216.448.6170

East (Beachwood)
216.593.0113

South (Middleburg Heights)
440.826.0102

West (Westlake)
440.835.7400

Transplantation Programs
Bone Marrow/Stem Cell
216.444.0663

Bone and Tissue
216.445.1270

Cornea
Appointments:
216.444.2020

Heart
216.444.3083

Intestine/Small Bowel
216.445.1191

Kidney
216.448.6420

Liver
216.444.8770

Lung
216.445.1869

Cleveland Clinic Children’s Hospital for Rehabilitation Shaker Campus
Inpatient Admissions and Day Hospital
216.448.6035

Outpatient Medical Clinic Appointments/Referrals
216.448.6179

Center for Autism
216.448.6440
Contact Information

Dialysis Appointments  
216.448.6193

Feeding Disorders Program  
216.448.6024

Nephrology Clinic  
216.444.6123

OT/PT/SLT and Motor Control Programs  
New patients:  
216.636.KIDS (5437)

Pain Rehabilitation Program  
216.448.6035

On the Web at  
clevelandclinicchildrens.org

To find a pediatrician at a Cleveland Clinic Family Health Center near you, visit  
clevelandclinicchildrens.org/staffdirectory

Additional Contact Information

General Information  
216.444.2200

Hospital Patient Information  
216.444.2000

General Patient Appointments  
216.444.2273 or 800.223.2273

Referring Physician Center and Hotline  
24/7 hotline to streamline access to our array of medical services and schedule patient appointments  
855.REFER.123 (855.733.3712), email refdr@ccf.org or visit clevelandclinic.org/refer123

Request for Medical Records  
216.444.2640 or 800.223.2273, ext. 42640

Same-Day Appointments  
216.444.CARE (2273)

Global Patient Services/International Center  
Complimentary assistance for international patients and families  
001.216.444.8184 or visit clevelandclinic.org/gps

Medical Concierge  
Complimentary assistance for out-of-state patients and families  
800.223.2273, ext. 55580, or email medicalconcierge@ccf.org

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clevelandclinicabudhabi.ae

Cleveland Clinic Canada  
888.507.6885

Cleveland Clinic Florida  
866.293.7866

Cleveland Clinic Nevada  
702.483.6000

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800.890.2467
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Cleveland, OH 44195
216.444.DOCS (3627)

Hospital for Rehabilitation
2801 Martin Luther King Jr. Drive
Cleveland, OH 44104
216.448.6400

Fairview Hospital
18101 Lorain Ave.,
Cleveland, OH 44111

Inpatient Unit
216.476.7213

Neonatal Intensive Care Unit
216.476.7157

Pediatric Emergency Department
216.476.7081

Pediatric Subspecialty Clinic
216.444.5437

Inpatient Unit
440.312.4222

Neonatal Intensive Care Unit
440.312.5588

Pediatric Emergency Department
440.312.7337

Pediatric Subspecialty Clinic
216.444.5437

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826 Westpoint Parkway, Suite 1200
Westlake, OH 44145
440.835.7400

Therapy Services – South
17800 Jefferson Park Road, Suite 101
Middleburg Heights, OH 44130
440.826.0102

Therapy Services – East
3355 Richmond Road, Suite 101A
Beachwood, OH 44122
216.593.0113

Family Health Centers
Avon Pointe Family Health Center
36901 American Way
Avon, OH 44011
440.930.6250

Beachwood Family Health and Surgery Center
26900 Cedar Road
Beachwood, OH 44122
216.839.3600

Brunswick Family Health Center
3574 Center Road
Brunswick, OH 44212
330.225.8886

Chagrin Falls Family Health Center
551 E. Washington St.
Chagrin Falls, OH 44022
440.893.9393

Elyria Family Health and Surgery Center
303 Chestnut Commons Drive
Elyria, OH 44035
440.366.9444

Independence Family Health Center
Crown Centre II
5001 Rockside Road
Independence, OH 44131
216.986.4000

Lorain Family Health and Surgery Center
5700 Cooper Foster Park Road
Lorain, OH 44053
440.204.7400
Institute Locations

Richard E. Jacobs Health Center
33100 Cleveland Clinic Blvd.
Avon, OH 44011
440.695.4000

Solon Family Health Center
29800 Bainbridge Road
Solon, OH 44139
440.519.6900

Stephanie Tubbs Jones Health Center
13944 Euclid Ave.
East Cleveland, OH 44112
216.767.4242

Strongsville Family Health and Surgery Center
16761 SouthPark Center
Strongsville, OH 44136
440.878.2500

Twinsburg Family Health and Surgery Center
8701 Darrow Road
Twinsburg, OH 44087
330.888.4000

Willoughby Hills Family Health Center
2570 SOM Center Road
Willoughby Hills, OH 44094
440.943.2500

Wooster Family Health and Surgery Center
1740 Cleveland Road
Wooster, OH 44691
330.287.4500

Cleveland Clinic Children’s Community Hospital Locations

Fairview Hospital
18101 Lorain Ave.
Cleveland, OH 44111
216.444.KIDS (5437)

Hillcrest Hospital
6780 Mayfield Road
Mayfield Heights, OH 44124
216.444.KIDS (5437)

Medina Hospital
1000 E. Washington St.
Medina, OH 44256
330.725.1000

Other Locations

Cleveland Clinic Children’s Pediatric Cardiology at Ashtabula County Medical Center
2420 Lake Ave.
Ashtabula, OH 44004
440.997.2262

Cleveland Clinic Children’s Pediatric Cardiology, Canton
4848 Higbee Ave. NW
Canton, OH 44718
330.492.7827

Cleveland Clinic Children’s Pediatric Cardiology, Kaiser Medical Building
10 Severance Circle
Cleveland Heights, OH 44118
216.297.2559

Cleveland Clinic Children’s Pediatric Cardiology, Lake West Medical Building
36100 Euclid Ave., Suite 280
Willoughby, OH 44094
440.918.4640

Cleveland Clinic Children’s Pediatric Cardiology, Pomerene Hospital
981 Wooster Road
Millersburg, OH 44654
330.674.1015

Cleveland Clinic Children’s Pediatric Cardiology, Parma Medical Arts Center
7007 Powers Blvd., Suite 201
Parma, OH 44129
216.445.5015

Cleveland Clinic Fairview Westown Plaza
10654 Lorain Ave.
Cleveland, OH 44111
216.363.5720

Cleveland Clinic Sports Health Center
5555 Transportation Blvd.
Garfield Heights, OH 44125
877.440.TEAM (8326)

Community Pediatrics, Chesterland
8254 Mayfield Road,
Suite 1
Chesterland, OH 44026
440.729.0100
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<tr>
<th>Community Pediatrics, Euclid</th>
<th>Community Pediatrics, Mentor</th>
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<tbody>
<tr>
<td>26250 Euclid Ave, Suite 611</td>
<td>7200 Center St., Suite 200</td>
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<tr>
<td>Euclid, OH 44132</td>
<td>Mentor, OH 44060</td>
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<td>216.261.2606</td>
<td>440.255.0706</td>
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<tr>
<th>Community Pediatrics, Fairview Park</th>
<th>Community Pediatrics, North Olmsted</th>
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<tr>
<td>20800 Addington Blvd., Suite 400</td>
<td>24700 Lorain Ave.</td>
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<tr>
<td>Fairview Park, OH 44126</td>
<td>North Olmsted, OH 44070</td>
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<tr>
<td>440.356.2272</td>
<td>440.716.9810</td>
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<tr>
<th>Community Pediatrics, Garrettsville</th>
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<tr>
<td>1 Memory Lane</td>
<td>805 Columbia Road, Suite 102</td>
</tr>
<tr>
<td>Garrettsville, OH 44231</td>
<td>Westlake, OH 44145</td>
</tr>
<tr>
<td>330.527.8111</td>
<td>440.808.1925</td>
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<tr>
<th>Community Pediatrics, Gemini</th>
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<tr>
<td>2001 Crocker Road, Suite 520</td>
<td>11203 Stokes Blvd.</td>
</tr>
<tr>
<td>Westlake, OH 44145</td>
<td>Cleveland, OH 44104</td>
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<tr>
<td>440.835.1731</td>
<td>216.444.2165</td>
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Pediatric Institute & Cleveland Clinic Children's
Overview

Cleveland Clinic is an academic medical center offering patient care services supported by research and education in a nonprofit group practice setting. More than 3,000 Cleveland Clinic staff physicians and scientists in 120 medical specialties care for more than 5 million patients across the system, performing more than 200,000 surgeries and conducting 450,000 Emergency Department visits. Patients come to Cleveland Clinic from all 50 states and more than 132 nations around the world.

Cleveland Clinic is an integrated healthcare delivery system with local, national, and international reach. The main campus in midtown Cleveland, Ohio, has a 1,450-bed hospital, outpatient clinic, specialty institutes, labs, classrooms, and research facilities in 46 buildings on 167 acres. Cleveland Clinic patients represent the highest CMS case-mix index in the nation. Cleveland Clinic encompasses 75 northern Ohio outpatient locations, including 16 full-service family health centers, eight community hospitals, an affiliate hospital, and a rehabilitation hospital for children. Cleveland Clinic also includes Cleveland Clinic Florida, Cleveland Clinic Lou Ruvo Center for Brain Health in Las Vegas, Cleveland Clinic Canada, and Sheikh Khalifa Medical City (management contract). Cleveland Clinic Abu Dhabi is a full-service hospital and outpatient center in the United Arab Emirates scheduled to begin offering services in 2014. Cleveland Clinic is the second-largest employer in Ohio with nearly 44,000 employees. It generates $10.5 billion of economic activity a year.

The Cleveland Clinic Model

Cleveland Clinic was founded in 1921 by four physicians who had served in World War I and hoped to replicate the organizational efficiency of military medicine. The organization has grown through the years by adhering to the model set forth by the founders. All Cleveland Clinic staff physicians receive a straight salary with no bonuses or other financial incentives. The hospital and physicians share a financial interest in controlling costs, and profits are reinvested in research and education.

The Cleveland Clinic system began to grow in 1987 with the founding of Cleveland Clinic Florida and expanded in the 1990s with the development of 16 family health centers across Northeast Ohio. Fairview Hospital, Hillcrest Hospital, and six other community hospitals joined Cleveland Clinic over the past decade and a half, offering Cleveland Clinic institute services in heart and neurological care, physical rehabilitation, and more. Clinical and support services were reorganized into 27 patient-centered institutes beginning in 2007. Institutes combine medical and surgical specialists around specific diseases or body systems under single leadership and in a shared location to provide optimal team care for every patient. Institutes work with the Office of Patient Experience to give every patient the best outcome and experience.
Cleveland Clinic Lerner Research Institute

At the Lerner Research Institute, hundreds of principal investigators, project scientists, research associates, and postdoctoral fellows are involved in laboratory-based translational and clinical research. Total research expenditures from external and internal sources exceeded $265 million in 2012. Research programs include cardiovascular, oncology, neurology, musculoskeletal, allergy and immunology, ophthalmology, metabolism, and infectious diseases.

Cleveland Clinic Lerner College of Medicine

Lerner College of Medicine of Case Western Reserve University, which celebrated its 10th anniversary in 2012, is known for its small class size, unique curriculum, and full-tuition scholarships for all students. The program is open to 32 students who are preparing to be physician investigators.

Graduate Medical Education

In 2012, nearly 1,800 residents and fellows trained at Cleveland Clinic and Cleveland Clinic Florida, which is part of a continuing upward trend.

U.S. News & World Report Ranking

Cleveland Clinic is consistently ranked among the top hospitals in America by U.S. News & World Report, and our heart and heart surgery program has been ranked No. 1 in the nation since 1995. In 2012, Cleveland Clinic’s urology and nephrology programs were both ranked No. 1 in the nation.

For more information about Cleveland Clinic, please visit clevelandclinic.org.
**Referring Physician Center and Hotline**
24/7 hotline to streamline access to our array of medical services and schedule patient appointments, call 855.REFER.123 (855.733.3712), email refdr@ccf.org, or visit clevelandclinic.org/refer123

**Remote Consults**
Online medical second opinions from Cleveland Clinic's MyConsult® are particularly valuable for patients who wish to avoid the time and expense of travel. Cleveland Clinic offers online medical second opinions for more than 1,200 life-threatening and life-altering diagnoses. For more information, visit clevelandclinic.org/myconsult, email eclevelandclinic@ccf.org, or call 800.223.2273, ext. 43223.

**Request Medical Records**
216.444.2640 or 800.223.2273, ext. 42640

**Track Your Patients' Care Online**
DrConnect® offers referring physicians secure access to their patients’ treatment progress while at Cleveland Clinic. To establish a DrConnect account, visit clevelandclinic.org/drconnect or email drconnect@ccf.org.

**Medical Records Online**
Cleveland Clinic continues to expand and improve electronic medical records (EMRs) to provide faster, more efficient, and more accurate care by sharing patient data through a highly secure network. Patients using MyChart® can renew prescriptions and review test results and medications from their personal computers. MyChart provides a link to Microsoft HealthVault, a free online service that helps patients securely gather and store health information. It connects to Cleveland Clinic's social media and Internet site, currently the most visited hospital website in America. For more information, visit clevelandclinic.org/mychart.

**Critical Care Transport Worldwide**
Cleveland Clinic’s critical care transport team and fleet of mobile ICU vehicles, helicopters, and fixed-wing aircraft serve critically ill and highly complex patients across the globe.
To arrange a transfer for STEMI (ST elevated myocardial infarction), acute stroke, ICH (intracerebral hemorrhage), SAH (subarachnoid hemorrhage), or aortic syndrome, call 877.379.CODE (2633).
For all other critical care transfers, call 216.444.8302 or 800.553.5056.

**CME Opportunities: Live and Online**
Cleveland Clinic’s Center for Continuing Education operates one of the largest and most successful CME programs in the country. The center’s website (ccfcme.org) is an educational resource for healthcare providers and the public. Available 24/7, it houses programs that cover topics in 30 areas. Among other resources, the website contains a virtual textbook of medicine (Disease Management Project) and myCME, a system for physicians to manage their CME portfolios. Live courses, however, remain the backbone of the center’s CME operation. Most live courses are held in Cleveland, but outreach plans are underway.
Clinical Trials

Since its establishment in 1921, Cleveland Clinic has been an innovator in medical breakthroughs, with a mission of unlocking basic science and pursuing clinical research. Today, Cleveland Clinic is running more than 2,000 clinical trials of various types. Our researchers are focusing on an array of conditions, including breast and liver cancer, coronary artery disease, heart failure, epilepsy, Parkinson disease, chronic obstructive pulmonary disease, asthma, high blood pressure, diabetes, depression, and eating disorders. To learn more, go to clevelandclinic.org/research.

Healthcare Executive Education

Cleveland Clinic’s dynamic executive education program provides real-world insights into the highly competitive business of healthcare. The Executive Visitors’ Program is an intensive three-day program that provides a behind-the-scenes view of our organization for the busy executive. The Samson Global Leadership Academy is a two-week immersion into the challenges of leadership, management, and innovation. The curriculum includes coaching and a personalized three-year leadership development plan. Learn more at clevelandclinic.org/execed.
This project would not have been possible without the commitment and expertise of a team led by Vera Hupertz, MD, and Bryant M. Bond.

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