



2006

annual report

quality revolution



**rev·o·lu·tion** *n.* A fundamental change in the way of thinking about or visualizing something; a change of paradigm.

## Dear Friends:

Thanks to the hard work and dedication of our physicians, nurses and employees, Cleveland Clinic had an outstanding year in 2006. For the first time in our history, we had 3.3 million outpatient visits; total revenues exceeded \$4.4 billion; and total research funding reached \$225 million. The Cleveland Clinic Lerner College of Medicine continues to thrive:

In 2006, 1,067 applications were received for 32 positions. In addition, MCAT scores surpassed the national average, and 100 percent of our second-year students passed their national boards. These great accomplishments reflect our continued commitment to providing best-in-class healthcare through improved patient care, world-class research and outstanding medical training.

The reason Cleveland Clinic exists is for the care of our patients. Everything we do must be measured by the benefit it brings to the patient. In 2006, our patient satisfaction scores continued to improve, and we are committed to doing even better.

To meet this commitment, Cleveland Clinic in 2006 launched a revolution in healthcare, a quality revolution. This revolution will take many forms, but the overall purpose is to deliver a healthcare experience to all patients that is second to none.

Why do we call it a “quality revolution”?

Revolution is a strong word, but it is the right word. What we are undertaking will in many ways transform the world of medicine and make Cleveland Clinic the model of care for our industry. Many of our current efforts are highlighted in this annual report.

We have come to understand that quality is not only what we put into our product, it is what the patient takes out of it. Our profession has been excellent in focusing on the delivery of successful outcomes; it has, however, been less successful at meeting patients’ physical and emotional needs.

Cleveland Clinic is committed to changing that. Patients want good outcomes, but they also want more. They want a warm, empathetic experience in comfortable, convenient surroundings. They want to be welcomed, respected and given the information they need to make the best decisions for their health.

This is the very essence of the quality revolution.

In 2006, Cleveland Clinic celebrated its 85th anniversary. It was founded as one of the nation’s first not-for-profit group practices, a truly revolutionary idea in medical care. The foresight of our founders laid the foundation for the clinical success we would achieve in the following decades. We are proud of the fact that in 2006, *U.S. News & World Report* ranked Cleveland Clinic one of the top three hospitals in America.

Our staff model remains revolutionary. All staff physicians work on one-year contracts and must submit to an annual performance review (APR). The APR assesses the physician’s clinical performance, research and educational activities, along with patient satisfaction. The APR assures the quality of our staff, which means patients can find the confidence here to face any medical condition.

“The reason Cleveland Clinic exists is for the care of our patients. Everything we do must be measured by the benefit it brings to the patient.”

Today, we are executing a master plan that will make our campus more convenient, unified and user-friendly to patients and visitors. First, we are transforming our model of care into institutes. These institutes break down traditional medical divisions that are more physician-focused than patient-focused by bringing multiple specialties together based on organ and disease systems. Services will be combined, when possible, in a common location and share common leadership. Patients, therefore, can remain in one location for all of their care, including consults, tests and imaging. From access to communication to billing to point-of-care service, institutes will greatly improve the experience patients have at Cleveland Clinic.

Anyone traveling to our main campus also will witness the remarkable transformation taking place in our physical space. We are currently in the midst of building two world-class medical facilities: the \$495 million Sydel and Arnold Miller Family Pavilion – which will house our Heart and Vascular Institute – and the \$107 million Glickman Tower, which will be the new home of our Urological and Kidney Institute. Both buildings will offer unsurpassed comfort and service amenities to patients and their guests. These buildings are scheduled to open in 2008, along with a new parking facility with enough space for 4,000 cars.

Revolutionizing the emotional experience of being a patient is a high priority. Patients want dignity, respect and to be valued as individuals. They want to be listened to. They want acknowledgement of their needs. These needs aren't secondary to medical care. They are an essential part of it.

Our efforts in this area are many. We have created a new executive position to strengthen empathy throughout the institution and appointed a physician to the post. We are boosting the cultural competence of employees through diversity training, and coaching everyone from phone operators to front desk personnel in friendliness, courtesy and responsiveness. We are responding faster to nurse call buttons, offering more information desks and healthier dining options. Uniformed greeters welcome patients and guests at every entrance. Ambient music and art from our new Art in Medicine program are creating a more pleasing aesthetic campus-wide.

Finally, the quality revolution doesn't stop at our doorstep. We also are focused on improving the health of our communities. In 2006, we helped usher in a revolution at the ballot box by officially supporting the Smoke-FreeOhio campaign. We are proud of our work with this successful initiative, and of our follow-up efforts joining with the City of Cleveland and Cuyahoga County to provide free smoking cessation services to the public, especially the uninsured.

The quality revolution is an ongoing process. We must never get complacent; never miss a chance to innovate or improve a system or technique; and never forget that quality – like everything else at Cleveland Clinic – begins and ends with the patient.

Sincerely,



Delos M. Cosgrove, M.D.  
CEO and President

## Statistical and Financial Highlights

### Cleveland Clinic

<b>Patient Care</b>	<b>2005</b>	<b>2006</b>
Total Clinic Visits	2,891,146	3,062,772
Emergency Visits	62,841	61,916
Total Admissions (excluding newborns)	53,316	53,443
Acute	50,821	51,301
Non-Acute	2,495	2,142
Surgical Cases	69,421	71,643
Inpatient	24,302	24,561
Outpatient	45,119	47,082
<b>Education</b>	<b>2005</b>	<b>2006</b>
Residents and Fellows in Training	850	914
Continuing Medical Education		
Programs	303	316
Participants	92,654	99,328
Accredited Residency Training Programs	59	59
Allied Health Students	332	363
Programs for Allied Health Specialists	31	29
<b>Research</b>	<b>2005</b>	<b>2006</b>
Total Grant and Contract Revenue	\$140.4M	\$144.3M
Total Federal Revenue	\$90.1M	\$91.1M
Total Laboratory Investigators	176	194

### Cleveland Clinic Health System

<b>Patient Care</b>	<b>2005</b>	<b>2006</b>
Emergency Visits	390,420	392,042
Total Admissions (excluding newborns)	155,194	158,615
Acute	139,040	141,937
Non-Acute	16,154	16,678
Surgical Cases	159,454	160,160
Inpatient	52,819	53,125
Outpatient	106,635	107,035
<b>Financial Highlights (in \$thousands)</b>	<b>2005</b>	<b>2006</b>
Total Operating Revenues	4,051,731	4,399,049
Operating Income	289,078	372,201
Charity Care (at cost)	106,100	110,454

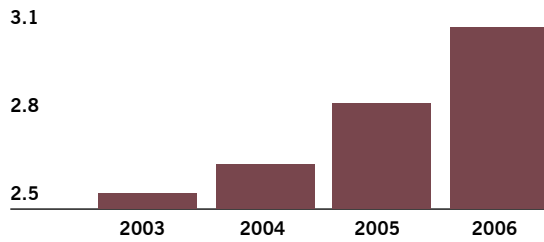
Notes:

Chart includes revised figures since 2005 annual report.

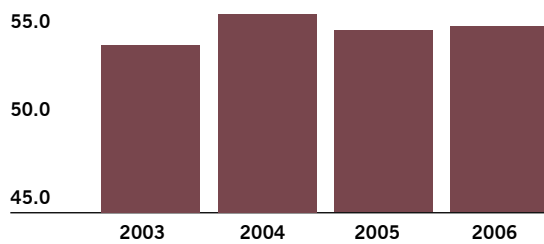
Health system statistics include Weston Hospital beginning October 2006

## Patient Care

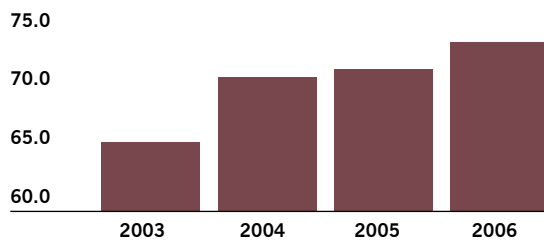
Total Visits (in millions)



Admissions (in thousands)

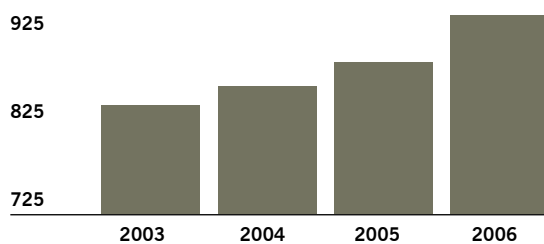


Surgical Cases (in thousands)



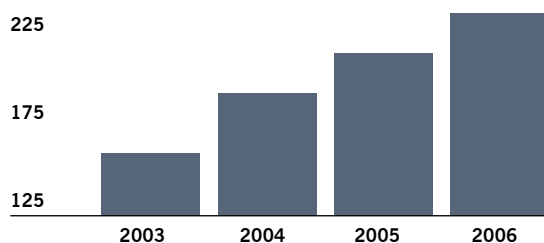
## Education

Residents and Fellows in Training



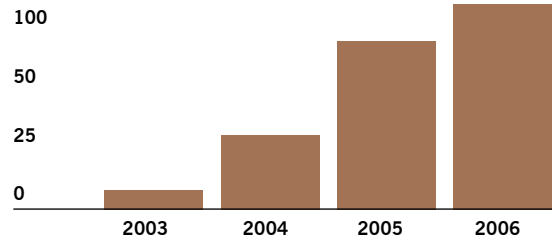
## Research

Total Research Funding (in \$millions)



## Nursing

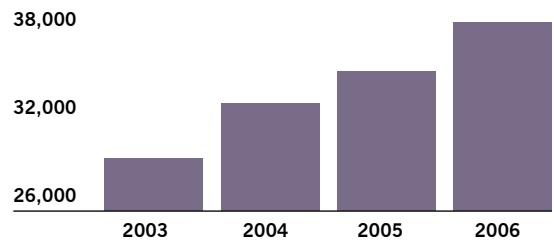
Research Projects



Leadership in evidence-based practice through research is a top priority for Cleveland Clinic's Division of Nursing. In 2006, nurses participated in 114 research projects.

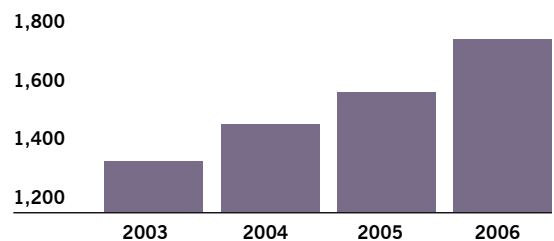
## Work Force

Total Employees (Cleveland Clinic Health System)



With more than 35,000 employees in Ohio (36,600 overall), Cleveland Clinic is the largest employer in Northeast Ohio and the second largest employer in the state.

Professional Staff



The professional medical staff, which includes staff physicians, associate staff physicians and assistant staff physicians, increased 9% in 2006 to 1,727 positions.

Note:  
All graphs Cleveland Clinic unless otherwise noted.



## institutes

Cleveland Clinic is putting patients first in a bold, new way. We are breaking down traditional divisions and departments and replacing them with patient-focused, integrated practice units called institutes. Institutes combine multiple specialties based on organ and disease systems. By bundling expertise under a single roof, institutes provide true multidisciplinary care to each and every patient.

## clinical achievements

Cleveland Clinic makes medical history every year. 2006 was no exception. Among our many “firsts” this year was the first U.S. implantation of a new device to replace a worn ankle. The 58-year-old patient, who suffered from debilitating arthritis, was implanted with the Salto Talaris™ total ankle replacement. The device mimics the movements of the natural ankle joint and preserves more of the patient’s original bone than alternatives.





## innovation

Cleveland Clinic innovations advanced patient care on many fronts in 2006. Specialists in the Center for Neurological Restoration pioneered the use of deep brain stimulation to successfully treat profound depression, Tourette syndrome and obsessive-compulsive disorder. The technique uses mild electric impulses to **stimulate** delicate targets in the brain, offering new hope to patients with hard-to-treat psychiatric disorders.

## information technology

As communication has evolved, so has our ability to redefine the patient-doctor visit. Today, sophisticated technology allows a traditional face-to-face visit, but with a virtual twist. Using securely connected digital cameras and special teleconsultation technology, a Cleveland Clinic physician at our main campus can examine a patient anywhere in the world – right down to looking into a patient's ears, nose and throat. No matter the distance between physician and patient, the encounter is personal, and communication is simple and direct.





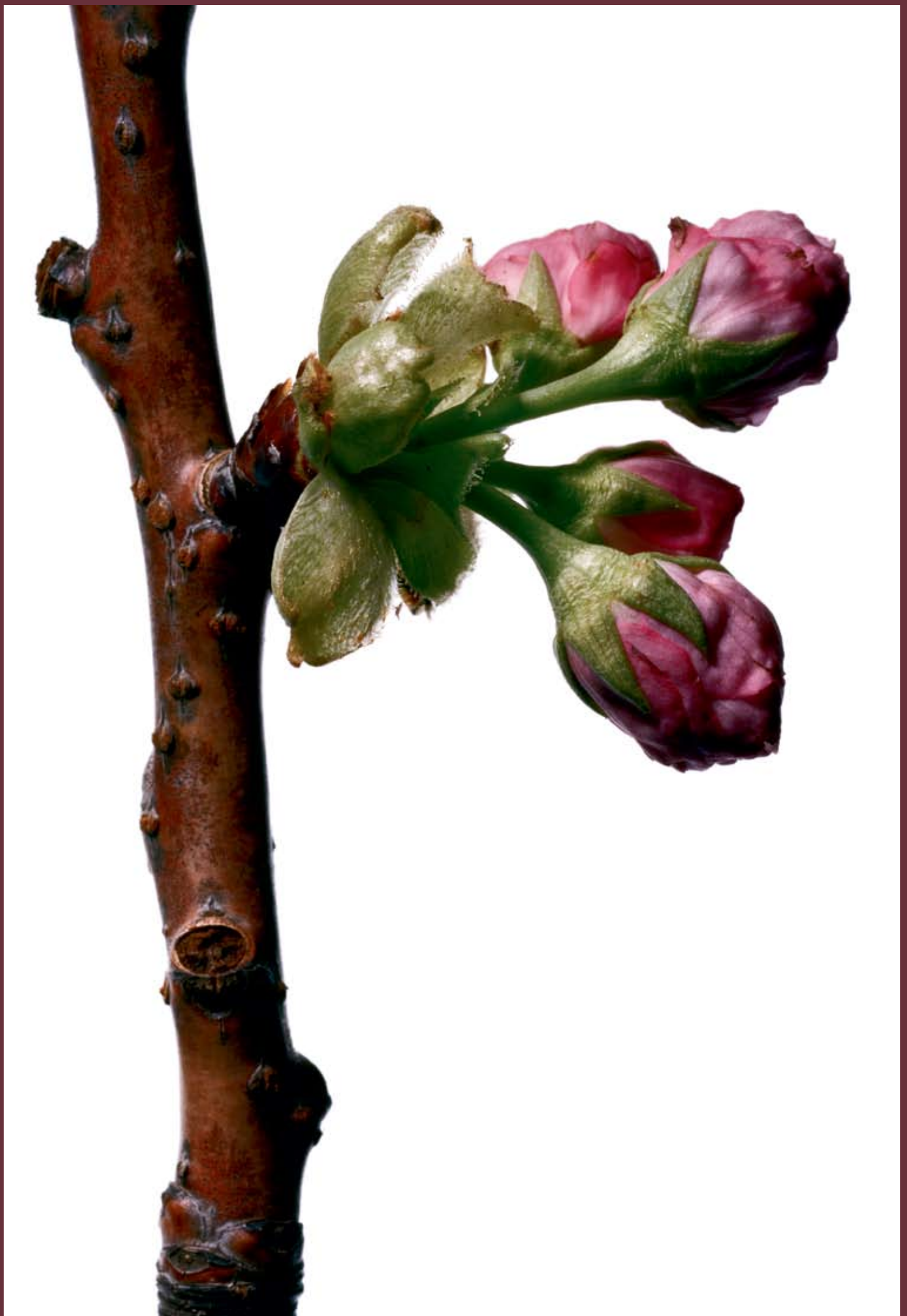
## research

Cleveland Clinic Cancer Center researchers developed a new cancer drug that **disguises** itself as vitamin B-12 to trick cancer cells into accepting nitric oxide, a powerful cancer killer. The drug, called nitrosylcobalamin, is so promising that the National Cancer Institute is fast-tracking its development through its Rapid Application to Development program – the only new drug from anywhere so honored in 2006.

## nursing

Despite a national nursing shortage, Cleveland Clinic is successfully **attracting** young people to the profession through the area's first high school summer nursing internship program. Led by the Office of Civic Education Initiatives and the Division of Nursing, the program brings motivated high schoolers into Cleveland Clinic to work alongside nurses. The first class emerged in 2006, energized about a future in nursing and healthcare.





## expansion

Cleveland Clinic care is in high demand around the world. We are answering that demand with new partnerships, branching out to areas as far west as Seattle to as far east as the United Arab Emirates. In 2006, Cleveland Clinic signed an historic partnership with the government and people of Abu Dhabi that will bring high quality, academic medicine to the Middle Eastern region. Cleveland Clinic Abu Dhabi is scheduled to open in 2010.

## wellness

What if you could vote for better health? Ohio voters had that opportunity on Nov. 7, 2006, when they passed SmokeFreeOhio (“No” on 4, “Yes” on 5). This initiative, which bans smoking in public places, had Cleveland Clinic’s full support. Going a step further, Cleveland Clinic partnered with the city of Cleveland and Cuyahoga County to offer uninsured residents free nicotine patches and nicotine avoidance counseling – helping hundreds to **extinguish** their habit.



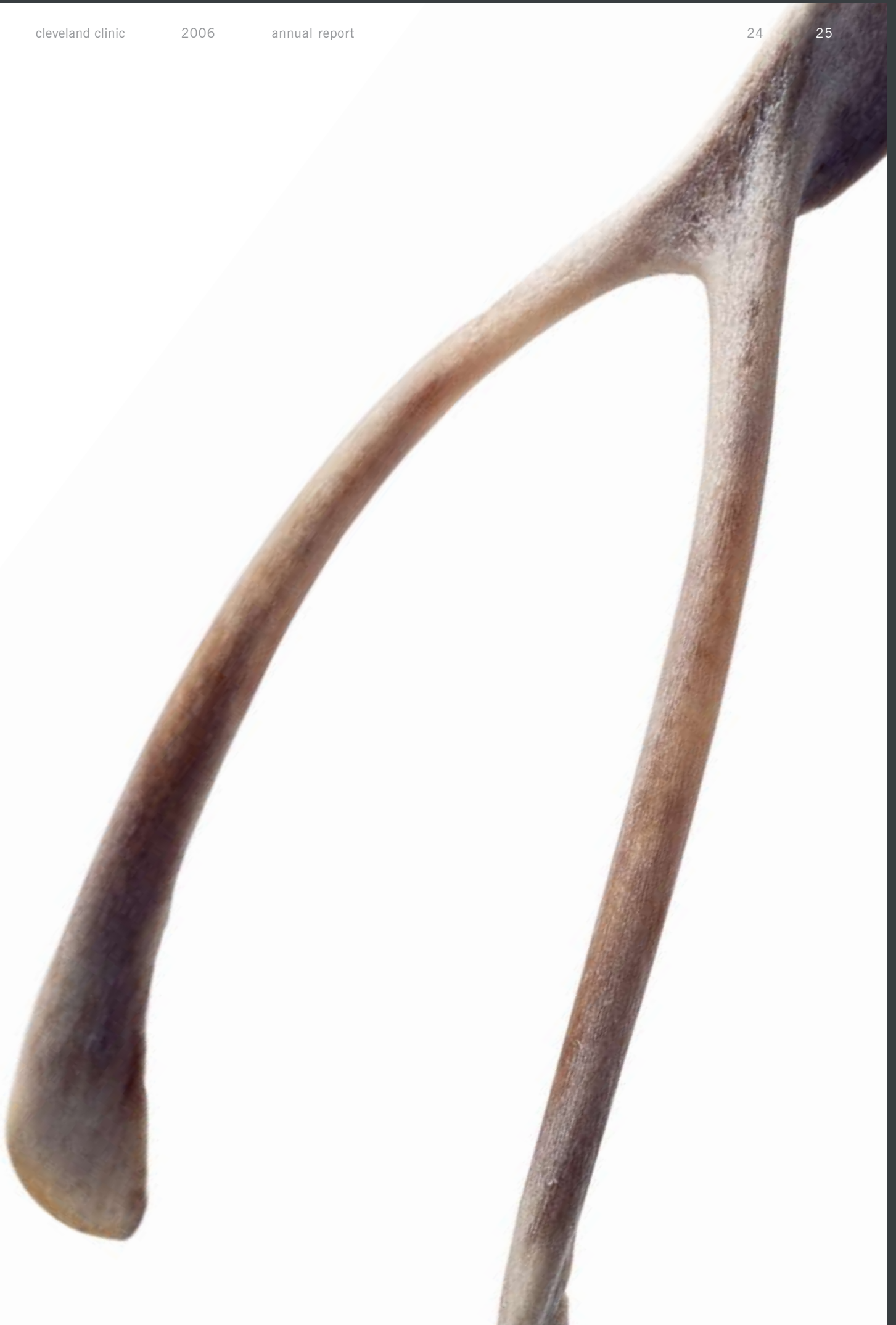


## patient experience

Comfort and compassion are as important as clinical outcomes. Consider the traditional hospital gown, which makes patients feel vulnerable and exposed. Cleveland Clinic has fashioned a new gown that permits functionality from the caregivers' point of view, yet wraps and ties in a way that preserves patient dignity and modesty. The result: patients who feel respected as individuals.

## inspiration

Letter writing is back in style at Cleveland Clinic. A new communications campaign called “Letters to Tomorrow” has motivated patients nationwide to share their **wishes** for life and health. It invites patients to express their confidence by addressing their hopes and dreams for the future. The letters are published quarterly and read by current patients to inspire their own recovery.



2006 year in review



## 2006 U.S. News & World Report America's Best Hospitals Rankings

### Overall Ranking

Cleveland Clinic 3rd

### Alone in its Field

Heart & Vascular Institute #1 for 12 years in a row

### In America's Top Two

Digestive Disease Center 6 years  
Glickman Urological Institute 7 years in a row

### In America's Top 10

Kidney Disease 3rd  
Rheumatology 4th  
Neurology and Neurosurgery 5th  
Orthopaedics 5th  
Ear, Nose and Throat 7th  
Endocrinology 7th  
Respiratory Diseases 7th  
Gynecology 8th

### Highly Ranked

Cancer 13th  
Ophthalmology 14th  
Pediatrics 20th  
Psychiatry 20th  
Rehabilitation 22nd

## clinical achievements

### **First Heart-Liver Transplant in Ohio**

Charles Miller, M.D., General Surgery, and Nicholas Smedira, M.D., Thoracic and Cardiovascular Surgery, led a team that performed a heart/liver transplant on a 50-year-old woman from Michigan – the first heart/liver transplant at Cleveland Clinic and the first in Ohio. Multiple organ transplants are complicated logistically and technically. “The heart/liver teams must make sure the patient and organs have a high probability of survival to justify taking two organs, which, in the case of a heart and a liver, technically could save two patients’ lives. Multi-organ transplants should only be considered when the surgeons have tremendous experience with all solid organ transplants,” says Dr. Smedira. Since Cleveland Clinic’s heart transplant program began in 1984, more than 1,000 hearts have been transplanted. Cleveland Clinic’s liver transplant program recently recorded its 1,000th liver transplant.

### **Deep Brain Stimulation for Depression, OCD and Minimally Conscious State**

Eighteen million patients in the U.S. suffer from major depression. Medication and psychotherapy often are effective treatments, as well as electroconvulsive therapy for more severe cases. Despite these approaches, at least 3 million patients suffer from severe, disabling depression that is intractable to all therapies. Since 2004, a Cleveland Clinic team has been pioneering the use of deep brain stimulation for depression. Six patients with intractable depression underwent DBS surgery at Cleveland Clinic. At one-year follow up, two-thirds of the patients had more than 50 percent improvement in their depression scores, as well as significant improvements in their quality of life measures, anxiety and energy levels. This group of patients also had improvements in memory scores following DBS surgery.

The Cleveland Clinic team is treating patients with intractable obsessive-compulsive disorder successfully with DBS and currently is conducting a clinical trial investigating the use of DBS for treatment of severe traumatic brain injury. The preliminary results show significant improvements in arousal, communication, attention, movement and feeding for these patients.

### **Implant of New Total Ankle Replacement**

A 58-year-old Cleveland Clinic patient with debilitating arthritis was the first person in the U.S. to receive a new total ankle replacement. The operation was performed by Brian Donley, M.D., Orthopaedic Surgery. The new device mimics the anatomy and flexion/extension movements of the natural ankle joint, and preserves more of the patient’s original bone than alternatives. Now patients have a more compact option to existing replacement systems – and one that can be implanted using a smaller incision. Every year in the U.S., 1,200 ankle replacements are performed.

### **Vocal Dysfunction: Managing Young Athletes**

When young athletes get overly involved in their game, their breathing may go on the injury list. Gerard A. Banez, Ph.D., has developed and evaluated an innovative biobehavioral treatment of vocal cord dysfunction in young athletes. Dr. Banez’s approach integrates diaphragmatic breathing with other self-regulation strategies. “Our protocol goes beyond traditional approaches to teach young athletes how to control their breathing while exercising. We train them in handling the stress and worry related to their symptoms,” he says. Preliminary findings reveal a 74 percent improvement in the respiratory symptom rated worst prior to treatment and a 56 percent improvement in overall respiratory symptoms.

### **Stem Cell-Based Therapies for Heart Failure**

For several years, members of the departments of Cardiovascular Medicine and Cell Biology have been national leaders in the development of stem cell-based therapy for patients with significantly reduced ventricular function after an acute myocardial infarction and for those with chronic heart failure. Marc S. Penn, M.D., Cardiovascular Medicine, has developed a stem cell-related treatment that has improved heart function in biological models. He has licensed proprietary technology to an industry partner to begin clinical trials in human patients with chronic heart failure in 2007. At the same time, researchers are working with another corporate partner on developing clinical trials of a therapy based on unique progenitor cells derived from bone marrow, to be administered immediately after myocardial infarction.

### Using 3-D CT to Plan Valve Surgery

A new collaboration is making it possible for cardiac surgeons to study a patient's heart inside and out before surgery. Srikanth Sola, M.D., Paul Schoenhagen, M.D., and Sandra Halliburton, Ph.D., are using a state-of-the-art multi-detector CT scanner to develop 3- and 4-D images of the aortic valve and aortic root in patients who are being evaluated for valve replacement or repair. "These images," says Dr. Schoenhagen, "significantly increase the amount of information the surgeon has available before opening the chest. Interactive reconstruction of the CT data on advanced computer systems allows our team to study the aortic valve morphology, leaflet calcification and mobility before surgery and plan accordingly." Cleveland Clinic is among the first institutions in the nation to use CT images in this way. The collaboration involves physicians from Thoracic and Cardiovascular Surgery, Interventional Cardiology, Cardiovascular Imaging, Cardiothoracic Anesthesia, Cardiovascular Medicine, Radiology, and Vascular Surgery. Research to define the specific uses and limitations of this advanced technology compared with other imaging modalities, including echocardiography, is currently under way.

### Minimally Invasive Heart Combo

Cleveland Clinic surgeons including Marc Gillinov, M.D., and Lars Svensson, M.D., Ph.D., Thoracic and Cardiovascular Surgery, have developed a new minimally invasive technique that enables combined mitral valve surgery and ablation of atrial fibrillation through a small chest wall incision.

### Intrasurgical Cell Harvest Refines Spinal Fusion

Robert F. McLain, M.D., Orthopaedic Surgery, has developed a way of harvesting and enriching bone marrow from a patient's own spine during spinal fusion surgery for use as grafting material. The technique builds upon a previous Cleveland Clinic discovery by Orthopaedic Surgery's George Muschler, M.D., of a method of concentrating and enriching progenitor cells to enhance bone healing. Spinal fusion is an effective treatment for many cases of severe back pain. Ordinarily, the spinal bones are fused using a graft of bone tissue or cells removed from the patient's pelvis. This new technique makes it possible to collect the cells that are needed to enhance spinal fusions through the same incision.

### Clip Device for Atrial Fibrillation

Developed at Cleveland Clinic, the Cosgrove-Gillinov Clip is designed to prevent strokes in patients with atrial fibrillation, the most common type of arrhythmia. Atrial fibrillation can be deadly because the arrhythmic heart can generate blood clots that may travel to the brain and cause strokes. In the final pre-clinical testing phase, this novel medical device addresses the portion of the heart in which the clots are most likely to form, and blocks it off. The relative simplicity of this device makes it an attractive alternative to more complex treatments, ranging from ablation procedures to Maze surgery. The clip can be applied percutaneously or surgically as part of another heart procedure.

### Unsurpassed Bone Marrow Transplant Results

The Bone Marrow Transplant Program in the Taussig Cancer Center treated more patients than ever before in 2006. Bone marrow transplants are mainly used to treat non-Hodgkin's lymphoma, Hodgkin's disease, all types of leukemia and multiple myeloma. The Cancer Center's 30-day survival rate for all autologous transplants is 100 percent. The 30-day survival rates for related allogeneic transplants are 100 percent, and the 100-day survival rates exceed 90 percent. These results are unsurpassed by any center in the world.

### Fighting Anesthesia Awareness

Under the leadership of Michael Roizen, M.D., Chairman of Anesthesiology, Critical Care Medicine and Comprehensive Pain Management, Cleveland Clinic is launching a patient safety program to reduce incidences of patient awareness during anesthesia and to encourage physicians to monitor the brain function of patients at risk when appropriate. The program supports Cleveland Clinic's commitment to patient safety during anesthesia and surgery and incorporates physician guidelines recently issued by the American Society of Anesthesiologists and The Joint Commission. In addition to advocating the expanded use of brain-function monitoring, the program includes new policies and training initiatives related to Cleveland Clinic's anesthesia practices.

### New Device for Collapsing Heart Valves

A new flexible wire device has been developed by José Navia, M.D., Thoracic and Cardiovascular Surgery, to strengthen collapsing heart valves. The device is designed to be implanted nonsurgically, delivered to the heart via catheter and deployed in the valve by inflating a small balloon. The prosthetic ring restores the normal shape and function of the diseased valve.



## Cleveland Clinic in Florida

Nearly two decades ago, Cleveland Clinic opened its first facility in Florida, giving residents quality care and offering international patients from the Caribbean and Central and South America a more accessible location. Operations in Florida have expanded and evolved over the years, and 2006 was no different. Three big announcements were made that have driven significant changes in Florida: the sale of the Naples facility; the appointment of new CEO Bernardo Fernandez, M.D.; and the completion of the purchase of the 150-bed hospital in Weston.

Today Cleveland Clinic in Florida has more than 120 physicians and 1,500 employees, and is now united as one team. With a reinvestment in operations and the strong support of the community, Cleveland Clinic plans to increase its Florida medical practice to 150 physicians in the coming years, in addition to expanding and adding new services. Already Cleveland Clinic in Florida has expanded its Sleep Disorders Center and broadened its service offerings in thoracic surgery and pulmonary medicine. In collaboration with the Taussig Cancer Center in Cleveland, there is tremendous opportunity to grow the cancer program in Florida.

The future is bright in Florida for Cleveland Clinic and the patients it serves.

### Tissue-Lined Stent for Peripheral Vascular Disease

A man in Chile has become the first patient to be successfully fitted with a new tissue-lined stent developed by Timur Sarac, M.D., Vascular Surgery. The stent is lined with biological tissue that is identical to the interior lining of the blood vessels. The self-expanding stent is designed to treat peripheral vascular disease in the femoral artery, in what is a complex, delicate process. Stents that are currently available, such as bare metal and drug-eluting, have not shown long-term success in treating these blockages. The one currently available stent for this purpose has a significant drop off in patency at one year. The new stents are lined with peritoneal tissue (the cells that line the inside of the abdomen), which it is believed will achieve longer patency. A randomized clinical trial will soon begin in the U.S.

### First Use of DynaCT for Abdominal Tumors

Radiofrequency ablation and cryotherapy are effective minimally invasive treatment for some kinds of lung, liver and renal tumors. However, accuracy depends on adequate visualization on CT, ultrasound or fluoroscopy. Tumors located in inaccessible or hard-to-visualize areas are difficult to treat. Using DynaCT, a new angiographic imaging modality, physicians can visualize tumors in 3D, potentially improving accuracy and outcomes. While DynaCT has been used for other interventional procedures, Abraham Levitin, M.D., Interventional Radiology, is first to use it for lung and abdominal tumors.

### Augmented Reality to Assist Removal of Urological Tumors

The 3-D visualization technique known as augmented reality is being developed and evaluated by Inderbir Gill, M.D., and Osamu Ukimura, M.D., Urology, for laparoscopic and robotic urologic tumor removal. Augmented reality translates data into a virtual image and superimposes it onto the real intraoperative image to create a composite view. Data from the patient's own ultrasound, CT or MRI scan are converted into a real-time 3-D image. The image is registered and superimposed onto the laparoscopic or robotic view of the patient's anatomy on the screen. Augmented reality allows the surgeon to see into a kidney, prostate gland or bladder and know the extent of tumor penetration, the precise location of nerve bundles and blood vessels, and exact depth and angle of the blade in relation to the tumor. Augmented reality was first applied to brain surgery (because the brain doesn't move), but is now being applied elsewhere, as new software is developed to accommodate more mobile physical structures.

### **Percutaneous Valve Replacement: Two Approaches**

Cleveland Clinic is one of only three FDA-approved centers to perform minimally invasive valve replacement using Cribier-Edwards replacement valves. The valve had previously been delivered to the site via catheter using a specific (retrograde arterial) route through the blood vessels. Cleveland Clinic has now developed a second approach to the valve site – through the left ventricle. A multidisciplinary team including E. Murat Tuzcu, M.D., and Samir Kapadia, M.D., Cardiovascular Medicine, and Lars Svensson, M.D., Ph.D., Thoracic and Cardiovascular Surgery, leads the effort. Surgical valve replacement is still the preferred treatment for badly diseased valves, but severely compromised patients who are ineligible for surgery now have a minimally invasive option. The development of this new approach means that an even greater number of these patients can now benefit from this treatment.

### **High Heart Transplant Survival Rate in the U.S.**

Survival rates for Cleveland Clinic heart transplant patients are higher than both the national averages and the rates of expected survival. Cleveland Clinic's one-year survival rate is 93.8 percent compared to the expected survival rate of 88.6 percent.

### **New Device for Treating Mitral Regurgitation in Ischemic Cardiomyopathy**

Tomislav Mihaljevic, M.D., Thoracic and Cardiovascular Surgery, is testing the safety and efficiency of the Coapsys® Annuloplasty System, a device placed on the outside of the heart to correct mitral regurgitation and restrain left ventricular enlargement. The trial compares the safety and efficacy of the closed-heart Coapsys® device with open surgical repair of the mitral valve using an annuloplasty ring or band.

### **Miniature Sensor Monitors Bone Healing**

Aaron Fleischman, Ph.D., and Shuvo Roy, Ph.D., Biomedical Engineering, collaborated with Edward Benzel, M.D., Spine Center, to develop a microelectromechanical (MEMS) device, which is implanted between adjacent bones to monitor healing and the success of orthopaedic implants. The device has no wires or batteries and works using a sensor that generates an output signal in response to the load being applied to the body by adjacent bones. This technology can be used to determine indications for surgery and other therapies where current reliance on MRI and CT scans can be misleading.

### **Hip Resurfacing for Young Patients**

Why replace a whole joint when only part of a hip may be damaged by wear or osteoarthritis? That's the question answered by a new technique called hip resurfacing. "Hip resurfacing replaces only the part that's damaged – the surface of the bone," says Peter Brooks, M.D., Orthopaedic Surgery, who traveled to England to learn the technique. "Hip resurfacing is mainly restricted to younger patients. For them, the technique allows more range of motion, fewer dislocations and a more normal 'feel' than a total hip replacement," says Dr. Brooks, the first surgeon in Northeast Ohio to perform hip resurfacing. In the half year since introducing the technique in September 2006, he has performed 45.

### **Radiation: Shielding the Patient**

Medical physicist Matthew Vossler, M.S., of the Wooster Family Health Center, developed a method of calculating the amount of radiation that goes through a shield custom-designed for patients undergoing radiation treatment. The method has been successfully implemented to improve the accuracy and efficiency of patient treatment-time calculations.

### **New Treatment for Rare Bone Disease**

Frequent bone fractures and tooth loss are among the consequences of hypophosphatasia, a rare congenital metabolic deficit. Up until now, no medical treatment has been available. But Chad Deal, M.D., Rheumatic and Immunologic Diseases, has helped successfully treat one patient with the adult form of the disease using a substance called teriparatide. Among the beneficial effects of the treatment was reversal of the bone demineralization that is characteristic of hypophosphatasia. The case will be published in the *Journal of Clinical Endocrinology & Metabolism*.

### **Groundbreaking Spinal Radiosurgery Program**

In 2006, Cleveland Clinic launched a groundbreaking noninvasive option for spinal tumors, known as stereotactic spinal radiosurgery, which is revolutionizing spinal metastases treatment. Metastases on the spine can result in acute, persistent pain and, if left untreated, can cause destruction of the vertebral body and potentially result in paralysis. Traditional treatment options to provide relief include surgery, conventional radiation therapy, chemotherapy and pain management. Under the leadership of Lilyana Angelov, M.D., Head of Spinal Radiosurgery, the Brain Tumor and Neuro-Oncology Center's Stereotactic Spine Radiosurgery program provides patients with local tumor control and pain relief in more than 90 percent of cases, often within a few days to weeks.

## research achievements

### Racial Gap Continues

Young black people with leukemia have in the past had a significantly lower five-year survival rate than young whites. A study of this gap reveals that this disparity no longer holds among children. However, research led by Aaron Viny, B.S., Lerner College of Medicine (class of 2009), found that the gap persists and, in fact, has worsened in adolescents and young adults. More work needs to be done to narrow the remaining gap. "The data for children are encouraging and suggest similar steps to reduce disparities among older adolescents and young adults," says Mr. Viny.

### New Epilepsy Gene Link

Cleveland Clinic researchers are the first to identify a gene in patients who have epilepsy associated with a movement disorder called paroxysmal dyskinesia (PD). The gene, discovered by Jocelyn Bautista, M.D., and Qing Wang, Ph.D., Molecular Cardiology, Lerner Research Institute, may provide a possible target for new treatments and cures. "Epilepsy and movement disorders like paroxysmal dyskinesia are distinct diseases, but they are increasingly found to affect the same patient or the same family," says Dr. Wang. "This study raises awareness of coexistent epilepsy and PD as a distinct clinical entity."

### Mortality Linked to Poverty

Lower income status is linked to poor physical fitness and higher mortality from all causes, including cardiovascular disease. Possible reasons may include limited access to exercise opportunities, poor diet, and greater exposure to tobacco smoke among poor people. These findings come from a study led by Michael S. Lauer, M.D., Cardiovascular Medicine, and published in the *Journal of the American Medical Association*. "Combining individual patient data with socioeconomic data could help physicians more readily identify patients at risk for developing fatal heart disease," says Dr. Lauer. "These findings also reinforce the importance of public health initiatives that seek to address social and economic factors that have an impact on health."

### New Knowledge Will Lead to Better Treatment for Atrial Fibrillation

The use of self-administered blood thinners (low molecular weight heparins) guided by transesophageal echocardiography in patients undergoing cardioversion (a brief electric shock) treatment for atrial fibrillation is as safe as intravenous administration (unfractionated heparin), may result in better outcomes and is more cost-effective. Allan L. Klein, M.D., Cardiovascular Medicine and Professor of Medicine, led the randomized multicenter clinical study responsible for these findings, which appeared as a late-breaking trial in the *European Heart Journal*. This knowledge will lead to better treatment for atrial fibrillation, a common heart rhythm disorder, and it clinically enhances breakthrough findings by Dr. Klein that appeared in the *New England Journal of Medicine* in 2001. Results of that study showed that transesophageal echocardiography-guided cardioversion is an effective strategy against atrial fibrillation. This new strategy has changed the clinical practice for cardiologists.

### Drug-Eluting Stents Pose a Risk in Certain Patients

Drug-eluting stents present as much as a four- to fivefold increase in relative risk for causing late thrombosis as bare metal stents. This finding came from a study led by Deepak L. Bhatt, M.D., Cardiovascular Medicine, and was published in the *American Journal of Medicine*. "Drug-eluting stents should continue to be used," says Dr. Bhatt, "but only in patients who are carefully selected to be least likely to experience these thrombotic events."

### New Anticancer Agent Gets NCI Boost

To meet the public demand for faster development and approval of novel anticancer therapies, the National Cancer Institute created a Rapid Application to Development Program (RAID). This program offers important resources and access to expertise and core services that are essential to the early development of a drug, biologic or vaccine. In 2006, an application to the RAID program was accepted from Joseph Bauer, Ph.D., and Daniel Lindner, M.D., Ph.D., Cancer Biology, for nitrosylcobalamin, a novel chemotherapeutic agent developed by Dr. Bauer. This is the first successful application to RAID from Cleveland Clinic and the only application approved from any institution in 2006.

### Combination Therapy May Destroy Deep Tumor Cells

Photodynamic therapy (a treatment in which a relatively harmless drug becomes activated and targets cancer cells following exposure to visible light) is currently only partially effective against skin cancers and internal malignancies. The key to making this treatment even more effective, according to a new study, is to pre-treat the cells with an anticancer agent known as methotrexate. The agent sensitizes the cancer cells so they can be more easily destroyed by the light therapy. Edward Maytin, M.D., Ph.D., Dermatology, led the study, which was published in the *British Journal of Cancer*. As a result, photodynamic therapy may become useful against more types of cancer than was previously thought possible. "We have achieved good results in the laboratory," says Dr. Maytin. "The next step is to see if methotrexate can be effectively combined with photodynamic therapy in the clinical setting."

### Statins Stop Atherosclerosis, Raise HDL

A nationwide, multicenter clinical trial has shown that intensive use of a specific statin (Crestor<sup>®</sup>) was able to reverse atherosclerosis. In addition, the statin treatment raised the level of beneficial HDL by 14 percent. Results were measured by intravascular ultrasound. Steven Nissen, M.D., Chairman of Cardiovascular Medicine, led the study, which was published in the *Journal of the American Medical Association*.

Statins are a potent therapy against cardiovascular disease, able to both lower LDL and raise HDL. "This is the lowest level of LDL cholesterol that to our knowledge has been achieved in a statin outcome trial of any kind," says Dr. Nissen. "It's a really low level and hard to achieve with any regimen I'm aware of."

### Bat Saliva May Extend Stroke Window

A blood-thinning substance (desmoteplase) derived from vampire bats is a safe and effective treatment for stroke, according to a new study. Anthony Furlan, M.D., Neurological Institute, was North American principal investigator of the study, which was recognized as one of the American Heart Association's Top Ten Research Projects of the Year.

The purpose of the study was to establish doses and evaluate the safety and efficacy of the treatment. If further studies lead to the drug's approval, it could extend the anti-clotting treatment window for stroke patients from three to nine hours.



## Building for the Future

More than 1,000 construction workers are involved in the largest project in Cleveland Clinic history: the building of the new Sydell and Arnold Miller Family Pavilion and Glickman Tower. Destined to be two of the most significant structures in American medicine, these buildings are the centerpiece of a new master plan that will transform Cleveland Clinic's main campus and environs.

### Sydell and Arnold Miller Family Pavilion

Ninety thousand cubic yards of dirt were removed to create its 150,000 square foot footprint. Scheduled for completion in 2008, this 10-story building will include the most advanced diagnostic, imaging and treatment technologies available, while being totally patient and visitor friendly. A rooftop garden will feature an outdoor veranda and stunning views of Cleveland and Lake Erie.

### Glickman Tower

Also slated for opening in 2008, Glickman Tower will combine Cleveland Clinic's renowned Urological & Kidney Institute and its related functions into a single facility. With 10 stories, the tower will feature a grand hallway, meeting and conference facilities, and the most advanced clinical capabilities.

### Landscaping

Landscape architect Peter Walker has been engaged to enhance Cleveland Clinic's main campus. Plans include a broad tree-lined mall, or allée, with a reflecting pool running down the center. The allée will run north to south from Chester Avenue to the front door of the Miller Family Pavilion.



## Global Cardiovascular Innovation Center

Cleveland Clinic's Fairfax community will soon welcome a new neighbor. A Global Cardiovascular Innovation Center (GCIC) will be constructed on Cedar Avenue between East 100th and 101st streets within the next two years.

The GCIC is a collaboration with the Fairfax Renaissance Development Corporation and more than 20 Northeast Ohio biomedical and academic institutions. Established with a \$60 million grant from the state of Ohio, the GCIC will develop and acquire new technologies for the treatment of cardiovascular disease. The grant is the largest ever made under Ohio's Third Frontier Project, the state's billion dollar effort to expand Ohio's high-tech research capabilities, promote innovation and create high-paying jobs.

The GCIC will recruit experienced leaders and emerging companies to establish an international cluster of expertise. Chairman of Cardiovascular Medicine Steven Nissen, M.D., will lead the new center. The building is expected to be the centerpiece of new retail and housing development in the area.

### Myelin Evolved with Land Invertebrates

A protein component of nerve-sheathing myelin known as PLP has changed over the eons as invertebrates evolved from fish to land animals – becoming more protective of the nerve as it did so. The study that made this finding was led by Bruce Trapp, Ph.D., Neurological Institute, and published in the *Journal of Cell Biology*. It shows that the abnormal expression of PLP plays a critical role in multiple sclerosis and other neurodegenerative diseases. Future therapies may target PLP or attempt to mimic its protective influence when it ceases to function.

### Fiber Failure Invokes Pelvic Prolapse

The elastic fibers that in part compose the female reproductive organs can weaken and fail in response to the massive remodeling they undergo during pregnancy and birth. The molecular mechanism behind this failure, which can cause pelvic organ prolapse and urinary incontinence, is a certain protein, the production of which may weaken with age or be low in certain women at risk for those conditions. Margot Damaser, Ph.D., Biomedical Engineering, participated in the study, the findings of which were published in the *American Journal of Pathology*. The study showed that elastic fibers are critical to pelvic floor integrity. Research is being conducted to prevent these common conditions by counteracting the genetic or age-related disposition of these fibers to fail.

### How Saturated Fat Harms the Body

A single meal high in saturated fat impairs the body's ability to protect against plaque, a prime contributor to heart disease and stroke. It has also been found that such a meal limits the ability of arteries to expand and transport blood and the protective action of good cholesterol. The study was led by Stephen Nicholls, M.B.B.S., Ph.D., Cardiovascular Medicine, and published in the *Journal of the American College of Cardiology*. "These findings further illustrate the importance of maintaining a diet that is low in saturated fat," says Dr. Nicholls. "The results strongly suggest that a diet's fat composition affects the ability of HDL to serve as an anti-inflammatory agent for the arteries. This is significant, given that the accumulation of plaque in the arteries is the main risk factor leading to heart attacks and strokes."

### Stroma Implicated in Breast Cancer

Inherited breast cancer susceptibility is caused by germline (in every single cell of the body) alterations. While hereditary breast cancer has always been thought to develop in the breast glands, genomic alterations in the innocent tissues surrounding the breast glands known as stroma are also involved. This finding comes from a study led by Charis Eng, M.D., Ph.D., Chair of the Genomic Medicine Institute, and published in the *American Journal of Human Genetics*. In the short term, Dr. Eng's study suggests that screening for breast cancer may need to include stromal tissues. In the long term, it sets the stage for new therapies that seek to normalize the impaired stroma and reverse the growth of cancerous or precancerous lesions.

### Circadian Clock Affects Aging

The lack of a certain protein that helps regulate the body's internal clock results in the premature aging and death in biological models. Marina Antoch, Ph.D., Cancer Biology, led the study making this conclusion, which was published in *Genes and Development*. Dr. Antoch's findings supply a molecular explanation for why people with disrupted sleep cycles have increased risk for many diseases, including cancer. It further suggests that this particular protein could be a potential target for beneficial drugs.

### New Virus Associated with Prostate Cancer

A previously unknown virus has been discovered in association with prostate cancer. The discovery came about through the isolation of a specific gene that kills viruses and the observation that mutation of this gene often went along with prostate cancer. The virus was then identified using a DNA-detecting chip. Eric Klein, M.D., Urology, and Robert Silverman, Ph.D., Cancer Biology, together with collaborators at the University of California, San Francisco, reported the findings in *PLoS Pathogens*. Identification of this virus could lead to the development of new prostate screening tools or a vaccine. It also suggests that sexually transmitted infections could contribute to prostate cancer, as with cervical cancer.

### Integrin+VEGF=Angiogenesis

Proteins called integrins, which are essential to the growth of new blood vessels, can only do their work in tandem with a substance known as vascular endothelial growth factor (VEGF). These findings were led by Tatiana Byzova, Ph.D., Molecular Cardiology, and appeared in the *Journal of Experimental Medicine*. Disrupting the integrin-VEGF link may prevent the growth of blood vessels that sustain cancerous tumors and could be a promising goal for new cancer drug therapies.

### Protein Affects Virus Replication

A cellular protein called PACT, previously associated with abnormalities of the face and ears, also activates the immune response to viral infections – like influenza – by linking with a protein kinase called PKR. Ganes Sen, Ph.D., led the study making these findings, which were published in the *Proceedings of the National Academy of Sciences*, and *Virology*. In addition to providing a target for screening for particular facial abnormalities, these findings expand knowledge about potentially pandemic diseases like influenza and may be applied to mysteries of cell differentiation, the growth of cancerous cells and regulated cell death.

### How Pancreatic Cancer Grows and Spreads

Mutation in a gene called palladin alters the structure of pancreatic cells, resulting in a form of familial pancreatic cancer. It may also play a significant role in nonfamilial or sporadic pancreatic cancer. Research has concluded that the structurally altered pancreatic ductal cells gain mobility and are able to detach from the tumor and migrate to other parts of the body. This may represent a fundamentally new mechanism for cancer progression. Since palladin causes a form of familial pancreatic cancer, these observations suggest that its effect on cell structure and mobility may be behind the development of pancreatic cancer and its characteristic rapid spread. Mary P. Bronner, M.D., Anatomic Pathology, led the pathologic components of the study, the finding of which were published in *PLoS Medicine*.

### **Culture Affects Weight Loss Attitudes**

In a recent survey of obese women, black women were more likely to cite their background and culture as contributors to their weight gain than their white counterparts. Black women considered 50 to 100 pounds overweight to be “obese,” in contrast to white women, who set the bar at 25 pounds. Additionally, black women expressed a higher need for one-on-one counseling with their physicians and more culturally sensitive weight loss programs. These findings come from a study led by Carol Blixen, Ph.D., Department of Quantitative Health Sciences, published in the *Journal of the National Medical Association*. “Primary care physicians should recognize that people use the categories and rules of their specific cultures and ethnic groups to frame what they consider to be acceptable and preferable foods and use this information to develop culturally appropriate weight loss menus,” says Dr. Blixen.

### **Inflammation and Kidney Disease**

Recent years have seen inflammation implicated in cardiovascular disease and a host of other ailments. In a review published in the *American Journal of Cardiology*, Donald G. Vidt, M.D., Hypertension and Nephrology, found that inflammation also is a component of major modifiable factors in kidney disease. The marker for inflammation is a substance in the blood called C-reactive protein. Dr. Vidt observed that elevated levels of C-reactive protein in the blood predict all-cause cardiovascular mortality for patients on dialysis, worsening renal function in patients with no overt renal disease, as well as hypertension. Many of the therapies that currently treat renal disease are effective, he believes, because they suppress inflammation. Dr. Vidt observed that statin drugs have been shown to have a renoprotective effect, based upon their anti-inflammatory abilities.

### **Serum Markers for Brain Disease**

A new noninvasive way of identifying brain pathologies such as tumors has been developed by Damir Janigro, Ph.D., and Luca Cucullo, Ph.D., Neurological Surgery. Current assessment of central nervous system pathologies is performed by CT or MRI imaging, or spinal taps. This new test looks for specific system-bore proteins that appear in the blood as a result of a blood-brain barrier or cerebrospinal fluid-barrier malfunction. Presence of these proteins indicates pathologies in those areas.

### **Stun-Gun Study**

A Cleveland Clinic study published in the *Journal of the American College of Cardiology* showed that the presence of cocaine offsets the effects to the heart of being shocked with a stun gun. “Given the increased use of stun guns by law enforcement officers attempting to restrain violent individuals, many of whom are intoxicated with cocaine and other drugs, we sought to understand the effects of stun guns on the heart when cocaine is present,” says Patrick J. Tchou, M.D., Cardiovascular Medicine. “Our results show that cocaine did not increase the risks of being stunned; rather, it reduced the likelihood that an individual would experience ventricular fibrillation, or an abnormal heart beat.” Researchers also found that stun gun exposure is not likely to cause life-threatening arrhythmias, Dr. Tchou says.

### **New Focus on Neuroinflammation**

A new program has been established in the Lerner Research Institute to study the role of inflammation in multiple sclerosis, muscular dystrophy, Parkinson’s disease, hearing loss and stroke. The Neuroinflammation Research Center will have more than 30 bench researchers in eight different research groups. Clinical practitioners will also be involved. The center will be unique in the world for the range of expertise involved. “The inflammatory component in neurodegeneration is relatively newly appreciated,” says the Neuroinflammation Research Center Director Richard Ransohoff, M.D. “We now suspect that modifying inflammation can impact the outcomes of most neurological disorders, but the devil is in the molecular details. We’re driven to follow this line of research, because the benefits for patients can be enormous.”

### Highly Effective But Controversial MS Drug is OK'd

A drug used to treat multiple sclerosis (MS), Tysabri® (natalizumab) was temporarily withdrawn from the market by its manufacturers a year ago because of safety concerns, then made available for MS patients in June. FDA approval was based on highly beneficial effects observed in two large clinical studies, both published in the *New England Journal of Medicine*. Richard Rudick, M.D., Chairman of the Division of Clinical Research and Director of the Mellen Center for Multiple Sclerosis, led one of the studies and advised on the other. Both studies found that Tysabri® dramatically reduced new brain lesions, strongly suppressed clinical signs of MS disease activity and significantly reduced the proportion of patients with worsening neurological disability. A small risk of a serious brain infection was found in the study combining Tysabri® with interferon beta-1a. The FDA recommended that Tysabri® be used as a single drug treatment for patients with active relapsing MS. "Tysabri is the first new MS drug approved in the past 10 years. Studies demonstrated significantly better effectiveness than we have seen with standard therapy," says Dr. Rudick. "Over time, we will better understand the long-term safety and benefit of this new treatment, but we are cautiously optimistic."

### Micro-RNAs Regulate Thyroid Cancer Target Genes

Charis Eng, M.D., Ph.D., and Rosemary Teresi of the Center for Genomic Medicine have identified a new class of molecules associated with thyroid cancer. These micro-RNAs regulate the genes that are targeted in thyroid cancer diagnosis and treatment. Thyroid cancer is not only the most common cancer of the glands, but the fastest rising cancer in women and second fastest in men. To diagnose the disease, patients with a suspect neck nodule have had to undergo the surgical removal of the thyroid for biopsy. This discovery of a micro-RNA molecule associated with thyroid cancer is the first step toward a more accurate and less invasive diagnostic methodology. It also provides the potential basis for novel molecular therapies for this deadly cancer.



## Reporting Quality Outcomes

The quality revolution is fueled by information, and Cleveland Clinic has taken the lead as an information provider. Since 2004, Cleveland Clinic departments have been asked to release significant data on outcomes, volumes and innovation in their areas, and to make it public in booklet form and on the Internet.

Currently, 30 Outcomes booklets are available in print and on the Internet ([clevelandclinic.org/quality](http://clevelandclinic.org/quality)). Updated annually, they cover specialties ranging from internal medicine to cardiology to urology, and highlight statistics for particular procedures and conditions, along with other key data. More than 1 million copies of the Outcomes booklets have been distributed so far.

"As pay-for-performance arrangements gain national attention for linking healthcare outcomes with financial compensation, measuring performance and healthcare quality will become critical," says Barry J. Smernoff, Ph.D., Assistant to the Chairman for Strategic Initiatives at Cleveland Clinic in 2006. "Without these metrics, there would not be an objective basis for making informed decisions on compensation."

Cleveland Clinic's Outcomes booklets were cited in the recent book "Redefining Healthcare: Creating Value-Based Competition on Results" by Harvard Business School Professor Michael Porter and Professor Elizabeth Teisberg. This book cited Cleveland Clinic as an example of outcomes reporting, and reproduced actual pages from the Department of Thoracic and Cardiovascular Surgery's Outcomes booklet in the appendix.



## New Air and Ground Fleet for Critical Care

Cleveland Clinic has taken to the skies. To strengthen its critical care transport capabilities, Cleveland Clinic developed a Critical Care Transport Team, staffed by Cleveland Clinic nurses and STAT MedEvac paramedics. As part of the contract with STAT MedEvac, a critical care transport service headquartered in Pittsburgh, Cleveland Clinic has access to a dedicated helicopter for short flights and a number of fixed-wing aircraft (from twin-engine propeller to large jets), based at Burke Lakefront Airport, for longer domestic and international flights.

To boost its ground transport capabilities, Cleveland Clinic partnered with Cleveland-based Donald Martens & Sons Ambulance Service to add two new mobile intensive care units for adult patients.

“The goal is to provide transportation between hospitals,” says A. Marc Harrison, M.D., Director of Medical Operations and Associate Chief of Staff, in an interview with *The Plain Dealer*. “A team can be called to move a patient from Lakewood Hospital to the main campus or go to the other side of the world to pick up a patient.”

## around cleveland clinic

### Heart and Vascular Institute

America’s #1 heart program continues to save lives, introduce innovations and pursue new treatments and cures for the nation’s leading cause of death. In 2006, the Heart and Vascular Institute:

- recorded 234,098 patient visits
- performed 10,242 cardiac surgeries – a record number
- recorded the best heart transplant outcomes in the nation
- advanced scientific understanding of the heart and its care by publishing 113 scientific papers
- saw patients from all 50 states and from 26 countries around the world

Chairmen within the Heart and Vascular Institute also lead their national professional organizations:

- Bruce Lytle, M.D., Chairman of Thoracic and Cardiovascular Surgery, was elected president of the American Association for Thoracic Surgery.
- Steven Nissen, M.D., Chairman of Cardiovascular Medicine, served as president of the American College of Cardiology.

### Nursing Partnership

*Q. Where do nurses come from?*

A. Nursing school programs like Cuyahoga Community College, which has entered a new partnership with Cleveland Clinic to train an additional 64 registered nurses every year, plus 15 new radiation technologists every two years. Thanks to the partnership, Cleveland Clinic employees who wish to move into nursing or radiology may be trained on-site. At the same time, the program will identify workers to fill openings left by those who move on to new careers.

### Bariatric Institute Earns Dual Accreditation

Cleveland Clinic’s Bariatric Institute became Florida’s first hospital-based weight loss surgery program to earn level 1A accreditation from the Bariatric Surgery Center Network Accreditation Program of the American College of Surgeons. This industry recognition follows the Bariatric Institute’s accreditation as a Center of Excellence by the Surgical Review Corporation of the American Society for Bariatric Surgery, making it one of just a few centers in the country to earn dual accreditation.

### CCF Innovations Surpasses Goals

In 2006, CCF Innovations (CCFI) surpassed goals in nearly all categories and implemented novel commercialization, innovation and marketing approaches. CCFI achievements include substantially increased licensing revenue, major equity investments, creation of new companies and significant milestones at several spin-off companies. Here is a snapshot of CCFI's 2006 achievements:

- Secured a \$60 million state of Ohio grant, the largest in the history of Cleveland Clinic, to establish the Global Cardiovascular Innovation Center.
- Cleveland BioLabs, a spin-off company with a market capitalization of nearly \$150 million, successfully completed its initial public offering, the first biotech IPO in Ohio in nearly a decade.
- Four Cleveland-based Cleveland Clinic spin-offs secured their next round of financing, and another four will soon conclude their financing. It is anticipated that each company will create jobs for Cleveland.
- New inventions increased more than 20 percent, with more than 200 expected in 2007.
- Three new spin-off companies were established. The 18 spin-off companies established in the last five years remain three times the national average. Of the 18 companies, 13 have received equity investment and 14 are located in Ohio.
- More than \$15 million in equity financing was secured for Cleveland Clinic spin-offs.
- The total equity value of Cleveland Clinic spin-offs increased by more than 74 percent from 2005.
- CCFI hosted an unprecedented conference on managing conflicts of interest, and hosted the 2006 Medical Innovation Summit featuring Jeffrey Immelt of GE and Nobel Laureate Stanley Prusiner, M.D., among others.

### Expanding Access for Fertility Services

In-vitro fertilization often takes more than one round of treatment to be effective. Cleveland Clinic's Partnership for Families program provides an additional cycle to qualifying couples at no cost. The program, now in its third year, has accounted for 31 successful pregnancies so far. It is now being expanded to provide free services to freeze eggs or embryos to qualifying women about to undergo fertility-impairing cancer treatment.

### New Books from Cleveland Clinic Press

Cleveland Clinic Press, led by executive director John Clough, M.D., published nine titles in 2006. The mission of Cleveland Clinic Press is to increase health literacy and dispel myths and misinformation about medicine, health-care and treatment through the publication and distribution of authoritative, understandable books that reflect the expertise of Cleveland Clinic and its worldwide reputation for excellence. Books released in 2006 include:

*Heart Attack*, by Curtis Mark Rimmerman, M.D.

*Overcoming Infertility*, by Tommaso Falcone, M.D., with Davis Young

*Arthritis*, by John D. Clough, M.D.

*Thyroid Disorders*, by Mario Skugor, M.D., with Jesse Bryant Wilder

*Getting a Good Night's Sleep*, by Nancy Foldvary-Schaefer, D.O.

*The Granny-Nanny: A Guide for Parents & Grandparents Who Share Child Care*, a trade paperback by Lee Edwards

*One Stroke, Two Survivors: The Incredible Journey of Berenice and Herb Kleiman*, by Berenice Kleiman with comments by Herb Kleiman

*My Grampy Can't Walk*, a children's picture book about multiple sclerosis from a child's point of view by Vanita Oelschlager

*Breastless in the City: A Young Woman's Story of Love, Loss, and Breast Cancer*, by Cathy Bueti

Cleveland Clinic Press books can be purchased at Amazon.com, BN.com and the Cleveland Clinic Gift Shop.

### **Cleveland Clinic Author Makes Publishing History**

Michael Roizen, M.D., Chairman of Anesthesiology, Critical Care Medicine and Comprehensive Pain Management, became one of the best-selling physician-authors in history in 2006 and the first physician, along with co-author Mehmet Oz, M.D., to have three No. 1 *New York Times* best sellers. The 2006 release, *YOU on a Diet: the Owner's Manual for Waist Management*, was a *New York Times* best seller for 20 weeks in a row and was the No. 2 best-selling book in the world after only eight weeks on the market. (Another book, *YOU: The Owner's Manual*, was the No. 2 selling book in the world in 2005.) His books, which include *YOU: The Smart Patient* and *RealAge: Are You As Young As You Can Be?*, have been described by *Publisher's Weekly* as "Biology 101 with signature wit and wisdom."

### **Grant to Stop Blood Clots**

Researchers led by Roy Silverstein, M.D., Chairman of Cell Biology and Vice Chairman of Translational Research at the Lerner Research Institute, received a \$13.25 million grant from the NIH's Heart, Lung, and Blood Institute to study the genetic and cellular causes of blood clots as key contributors to heart attacks and strokes. The Specialized Center for Clinically Oriented Research (SCCOR) grant is to develop a Center for Thrombosis Research, with Dr. Silverstein as principal investigator. The grant will fund five inter-related research projects led by Dr. Silverstein; Edward F. Plow, Ph.D., Chair of Molecular Cardiology; Kandice Marchant, M.D., Ph.D., Laboratory Medicine; Thomas McIntyre, Ph.D., Cell Biology; and Keith McCrae, M.D., Case Western Reserve University School of Medicine, Division of Hematology. The grant, one of only three awarded nationwide, also supports Research Core Services at the Lerner Research Institute and in Cardiovascular Medicine. "What we learn from this grant could benefit patients for years to come," says Dr. Silverstein.

### **Uncovering the Body's Genetic Secrets**

The Genomic Medicine Institute is something new under the sun: a fully realized effort to uncover the genetic secrets of the body and to use them to cure sickness and disease. Opened in September 2005, the institute's personnel base has leapt from nine to 55 in a year. It is quickly filling its new state-of-the-art building near the Lerner Research Institute.

Under the leadership of Charis Eng, M.D., Ph.D. (winner of the Endocrine Society's 2006 Ernst Oppenheimer Memorial Award for outstanding achievements in endocrine research, and recipient of the 2006 American Cancer Society John Peter Minton, M.D., Ph.D., Hero of Hope Research Medal of Honor for outstanding contributions to cancer research), the institute has begun rolling out unique clinical and research programs, such as:

#### **The Center for Personalized Genetic Healthcare**

The clinical arm of the Genomic Medicine Institute, the center combines research and clinical treatment for patients who have been diagnosed with or suspect they may be at risk of developing gene-based diseases. Unique in the world of medicine, the center brings researchers and clinicians together at one site to address the genetic issues of patients and families. The center is developing, for instance, a "frozen library" of genetic samples for future reference.

#### **The Cancer Genomic Medicine Fellowship**

Cleveland Clinic established the first Cancer Genomic Medicine Fellowship in America and matriculated its first fellow July 1, 2006. The program trains clinicians to become clinicians/clinical scientists with the "tools" to research and practice cancer genomics.

#### **Von Hippel-Lindau Disease Multidisciplinary Clinic**

Von Hippel-Lindau disease is an inherited cancer syndrome characterized by a high risk of tumors in the brain, eye, adrenal glands and kidneys. Subspecialists from a range of disciplines come together in this clinic to provide sophisticated and comprehensive care for these patients and their families.

#### **Tuberous Sclerosis Multidisciplinary Clinic**

Tuberous sclerosis is a genetic condition that can snowball into epilepsy, skin growths, and tumors on the brain, heart, kidneys, lungs and eyes. There is no cure, but patients can enjoy a better quality of life with early diagnosis and longitudinal treatment, the kind now offered by this new program. Tuberous sclerosis is complex and involves many organs and body systems. This program integrates care from 12 different specialties to improve patients' lives.

### Nanotechnology: Collaborating for Progress

Cleveland Clinic Lerner Research Institute and Rensselaer Polytechnic Institute of Troy, New York, have signed an agreement to undertake joint research in nanomedicine, nano-bio materials, smart orthopaedic implants, biomolecular imaging, biocomputation and bioinformatics, bio-MEMS and the development of drug-delivering devices. Nanotechnology involves the engineering of structures on the nanoscale (80,000 times smaller than the diameter of a human hair).

Cleveland Clinic Taussig Cancer Center and the Department of Biomedical Engineering have launched a joint program in cancer nanotechnology. Nanoscale devices can detect very small numbers of cancer cells, potentially allowing the early detection, imaging and treatment of cancers. The joint initiative is initially focusing on drug delivery in a translational research program including collaboration with other international nanotechnology centers.

### Cleveland Clinic Gets on Board Cruise Ships

Since 2003, physicians from Cleveland Clinic have presented health and wellness information to guests aboard the Crystal Cruises ships *Symphony* and *Serenity*. The wellness seminars consist of 45-minute presentations and feature leading-edge health information, discussions and Meet the Doctor sessions. Cleveland Clinic presenters receive no pay for their services. Destinations in 2006 included a 10-day Caribbean Wellness Cruise. "Cleveland Clinic is dedicated to advancing and sharing the latest information on health and science with our patients and the public," says A. David Rothner, M.D., Chairman of Patient Education and Health Information. "Our collaboration with Crystal provides a relaxing and open atmosphere for people to learn about their own individual well-being."

### Chest Pain Award of Excellence

The Chest Pain Alert team (Cardiac Cath) at Cleveland Clinic in Florida received an Excellence in Healthcare Award for a Hospital-Based Program from the *South Florida Business Journal*. The team has consistently achieved one of the lowest national door-to-balloon rates, which is the amount of time it takes to restore blood flow to the heart after a heart attack patient arrives in the emergency room.



## Going Plaid

Diversity is inherent at Cleveland Clinic, a global healthcare provider employing 34,000 people at urban, suburban and rural locations throughout Northeast Ohio. But viewing diversity simply as a basic respect for human differences isn't enough. To achieve remarkable results, an inclusive organizational culture must be created.

"Our goal is to become more plaid," says Deborah Plummer, Ph.D., Executive Director of Cleveland Clinic's Office of Diversity, "by integrating diversity into our system, our structure, the way we function."

The office promotes diversity through education, consultation and programs that leverage differences to enhance innovation, quality of care, teamwork and economic impact. In just a year's time, the office has helped build diverse work teams; trained 10 percent of the workforce to become culturally competent; and established diversity councils and employee networks that not only review the ways differences are experienced at Cleveland Clinic hospitals, but also help create conditions by which we can learn from these differences.

Says Dr. Plummer, "Diverse groups are a powerful force. They generate more ideas, make more positive changes and help advance great institutions. By gaining cultural competencies and leveraging our differences, we'll raise the standard of care and outcomes for all patients."



## New Vision for Cleveland Clinic Regional Hospitals

Cleveland Clinic regional hospitals (Euclid, Fairview, Hillcrest, Huron, Lakewood, Lutheran, Marymount and South Pointe) enacted a new vision in 2006: *The best place to receive care. The best place to practice medicine. The best place to work.*

For the first time, all the hospitals were combined under a single administration. Fred M. DeGrandis, previously CEO of the Fairview, Lakewood and Lutheran hospitals, was named President and CEO of the regional hospitals.

Improvements to the regional hospitals include:

- Doubling the size of Euclid Hospital's Emergency Department.
- Opening the Jacobs Women's Pavilion at Fairview Hospital, which includes additions to the Birthing Center, a high-risk pregnancy unit, a new postpartum unit with private rooms, and an expanded and enhanced visiting area.
- Renovating and relocating Fairview's Acute Rehabilitation Unit and Skilled Nursing Unit to overlook the Cleveland MetroParks.
- Opening the new Marymount Hospital Emergency Department, Intensive Care Unit and Imaging Department, plus the Broadview Heights Medical Center Project.
- Opening South Pointe Hospital's new Geriatric Psychiatry Unit and expanded Skilled Nursing Unit.

In addition, nursing schools were expanded at Huron and South Pointe hospitals, as was the nursing school partnership between Marymount and Kent State University. In 2006, the Huron Hospital Nursing School graduated 100 new nurses.

### Taussig Cancer Center: #1 in Ohio

Cleveland Clinic Taussig Cancer Center jumped to #13 in *U.S. News & World Report* rankings in 2006, and continues to be ranked #1 in Ohio. The Cancer Center team introduced new classes of drugs into the treatment of advanced kidney cancer, developed first-in-human cancer compounds, refined techniques of radiotherapy for prostate and other cancers to maintain efficacy with less toxicity, and contributed a number of important laboratory observations. Clinical volumes continued to increase, as did the number of open clinical trials, research projects, publications and research grants. In addition, the nation's largest palliative medicine training program was expanded.

The Taussig Cancer Center provided care for more than 180,000 patient visits in 2006. Twenty new physicians and scientists were recruited, all with a focus on cancer and research. At the same time, the electronic medical record has enabled unprecedented horizontal integration among Cleveland Clinic's regional and community hospital cancer practices. In 2006, oncologists from the Regional Medical Practice joined the Cancer Center, allowing clinical trials to be implemented in all Cleveland Clinic cancer centers and ensuring more unified standards of care.

A new clinical cancer research infrastructure was developed, linking the Cancer Center with the Moll Cancer Pavilion at Fairview Hospital, the Hirsch Pavilion at Hillcrest Hospital and the Regional Oncology Practice at Independence.

While Cancer Center staff continues to publish in major professional journals like the *New England Journal of Medicine* and *Blood*, they also are building national and international recognition through major media appearances related to national events and healthcare issues. In 2006, these included: Larry King Live, CNN's Anderson Cooper 360°, Voice of America, Good Morning America, ABC News Now, CNN's American Morning, as well as nightly news broadcasts. In addition, Cancer Center staff members were involved in the successful "vote 'no' on 4, 'yes' on 5" anti-smoking campaign during the November elections.

### Innovation Trips Yield Big Results

*"We have programs that stimulate doctors to go look for new ideas. Thirty percent of our staff take what I call an innovation day. They go someplace – anyplace in the world – and look for new ideas."*

Delos M. Cosgrove, M.D., CEO and President, Cleveland Clinic, as quoted in *The Plain Dealer*, February 11, 2007.

More than 500 Cleveland Clinic physicians and scientists fanned out over the world on "innovation trips" in 2006 (at least one a year is required for all members of the Lerner Research Institute staff). They investigated new technologies and practices at other medical centers, universities, factories and other types of businesses. For instance:

#### **Emad Mossad, M.D., Cardiothoracic**

**Anesthesiology**, visited Children's Hospital of Wisconsin to learn about and evaluate the effectiveness of a new monitoring tool being used in the pediatric cardiac operating rooms and ICU. He came back with detailed recommendations that may lead to the introduction of this monitor at Cleveland Clinic, along with the further study and refinement of its use and effectiveness.

**Martha Cathcart, Ph.D., Cell Biology**, visited the University of California, Davis to learn more about its new Integrating Medicine in Basic Science program. She noted the program's similarity to Cleveland Clinic Lerner College of Medicine's mission of teaching and mentoring a new generation of physician-investigators and of Cleveland Clinic's new Ph.D. program to create translational scientists. As a result of her visit, Cleveland Clinic and UC Davis are going to collaborate to create more appropriate methods to assess the effectiveness of these programs, develop new programs and work with the NIH to promote new directions in graduate and post-graduate education.

**Lilyana Angelov, M.D., Brain Tumor and Neuro-Oncology Center**, went to Henry Ford Medical Center in Detroit to study its spine radiosurgery program, which uses the Novalis shaped-beam radiosurgery device. "The trip was invaluable in allowing me to establish a novel, coordinated and multifaceted spine radiosurgery program here at Cleveland Clinic," says Dr. Angelov.

### New Department Looks for Simple Solutions

Thousands of inexpensive, low-risk interventions that are easy to apply and can improve patient outcomes must exist. Finding them is the mission of the new Department of Outcomes Research in the Division of Anesthesiology. "Our goal is to become the world's leading clinical anesthesia research site in publication, outside funding and research training," says Department Chairman Daniel I. Sessler, M.D. An example of the department's work is showing that keeping patients warm during operations and providing extra oxygen can markedly reduce the risk of complications. With 13 full-time members, four medical students and seven research fellows, the department published 14 papers in 2006 alone.

#### **Managing Cyclic Vomiting Syndrome**

Patients with cyclic vomiting syndrome may vomit up to six times an hour, for 41 hours straight – or longer. Possibly related to migraine headaches, cyclic vomiting syndrome has no known cause and requires individualized management and treatment. Cleveland Clinic has established Ohio's first Cyclic Vomiting Syndrome Clinic in the Department of Pediatric Neurology and Neurosurgery. The center includes Sumit Parikh, M.D., Neurogenetics and Metabolism; Kadakkal Radhakrishnan, M.D., Pediatric Gastroenterology; and A. David Rothner, M.D., Child Neurology Center. "The long-term management involves a responsive, collaborative doctor-patient-family relationship, sensitive to stresses caused by the illness and to triggers that may predispose patients to attacks," says Dr. Parikh.

### Division of Education: Breaking Records

The Division of Education centrally manages a broad range of educational activities including one of the nation's largest graduate medical education programs. The volume and diversity of clinical problems seen by trainees at Cleveland Clinic and the opportunity to participate in a group practice model of medical care provide an ideal teaching and learning environment. In 2006, the division enjoyed a record-breaking year in several areas:

- The division had an all-time high number of residents and fellows, with 774 enrolled in ACGME/ABMS programs and 140 in advanced fellowship programs.
- New fellowships in Urologic Oncology and Vasculitis were added to Cleveland Clinic's 58 accredited and 80 non-accredited graduate medical education programs.
- After earning institutional accreditation for its graduate training programs in 2006, Cleveland Clinic in Florida is now the only medical center in Palm Beach and Broward counties to be accredited for graduate medical education in eight training programs. Also in 2006, it graduated its first Cardiology fellow. Cleveland Clinic is now the largest non-university affiliated provider of graduate medical education in South Florida.
- Almost 100,000 medical personnel participated in 316 live courses; printed, recorded or computer-assisted instruction; and online training through Continuing Medical Education.
- [clevelandclinicmeded.com](http://clevelandclinicmeded.com) recorded 12.5 million page views, an increase of almost 5 million over 2005. The Web site hosts the Cleveland Clinic Disease Management Project, which offers recommendations for treating more than 150 commonly seen diseases, as well as Web casts and interactive case studies.
- [clevelandclinic.org/health](http://clevelandclinic.org/health), Cleveland Clinic's online Health Information Database, recorded 13.3 million page views, up from 7 million in 2005.
- *The Cleveland Clinic Journal of Medicine* shot past the 100,000 mark in circulation in recent years and now is the second most read journal of internal medicine among office-based internists in America.

### Expanding Cleveland Clinic Care

**International** *"We've had inquiries from people in 50 countries wanting some relationship with Cleveland Clinic. What they said is, 'You know how to build a hospital, how to staff it, how to supply it, how to measure quality.' We realized we had a body of intellectual capital with value."* Delos M. Cosgrove, M.D., CEO and President, Cleveland Clinic, as quoted in *The Plain Dealer*, February 11, 2007.

Cleveland Clinic announced that it will establish, develop and operate a world-class specialty hospital and clinic in Abu Dhabi, United Arab Emirates. Cleveland Clinic Abu Dhabi will use Cleveland Clinic systems, procedures, guidelines and standards. The project is a partnership with Mubadala Development. Scheduled to open in 2010, Cleveland Clinic Abu Dhabi will be staffed by local and regional personnel.

**National** *"Establishing an affiliation with the nation's leader in heart care is a tremendous opportunity for the Swedish Heart & Vascular Institute and a tremendous opportunity for this region."* Richard Peterson, President and CEO, Swedish Medical Center, Seattle, Washington.

Swedish Medical Center and Cleveland Clinic entered into a clinical affiliation in cardiac surgery to enhance heart care offered by the Seattle medical center. This is the first affiliation Cleveland Clinic has established with a cardiac surgery program on the West Coast. Cleveland Clinic will be responsible for operational management of the Swedish cardiac surgery practice, including standardization of approaches, management of ancillary services, coordination of patient flow, patient satisfaction monitoring and all related work. Cleveland Clinic has similar affiliations with the heart programs at Rochester General Hospital in New York and Chester County Hospital in Pennsylvania.

### Record Tenure as Division Chair

William R. Hart, M.D., retired in 2006 after a distinguished 25-year career at Cleveland Clinic, including 15 years as Chairman of the Division of Pathology and Laboratory Medicine. He was the longest serving chairman in the history of his division. Before that, he was one of the longest serving chairmen of the Department of Anatomic Pathology. Dr. Hart was a member of the Board of Governors and the Board of Trustees while serving as President of the Professional Staff during 1989-90. He also was Professor and Chairman of the Department of Pathology in the Cleveland Clinic Lerner College of Medicine. Dr. Hart retires with the gratitude of Cleveland Clinic for his years of outstanding service and the best wishes of his many friends and colleagues.

### Children's Hospital: One of America's Best

At Cleveland Clinic Children's Hospital, 150 physicians and scientists treat thousands of seriously ill children every year. Under the leadership of Chairman Robert Wyllie, M.D., the Children's Hospital is ranked one of the best in America (*U.S. News & World Report*).

- In 2006, the Children's Hospital recorded more than 5,500 admissions and transported more than 1,000 children from Northeast Ohio and 13 states for specialized care. More than 130,000 outpatient visits on the main campus and 240,000 pediatric visits in the regional healthcare facilities, including pediatric services at Fairview and Hillcrest hospitals, were recorded.

- Specialists in the new Fetal Care Center manage the full range of disorders in unborn children. In 2006, the team cared for 59 patients, representing 36 different diagnoses. In many cases, the team provides treatment available at only a handful of centers nationwide.

- Babies born with indented breastbones (pectus excavatum) are being treated with an innovative surgical technique, which is one of the reasons Children's Hospital has been named a National Center of Excellence for the Minimally Invasive Treatment of Pectus Excavatum. The hospital also is one of the few centers in the nation performing transplants in children with heart, liver, kidney or lung disease.

- The newly established Lerner School for Autism at Children's Hospital's Shaker Campus enrolled 74 children in 2006. Ground was broken for the new Debra Ann November Autism Wing, which will expand the school's ability to care for more children with this increasingly common disorder.

- The Children's Hospital is a leader in quality improvement. "Best practice" guidelines were instituted in asthma, diabetes, sickle cell anemia and young children with fevers. These guidelines standardize care throughout Cleveland Clinic hospitals and family health centers and provide metrics to measure outcomes.

- An active research center allows Children's Hospital physicians and scientists to better understand diseases and how they affect children and their families. Research highlights include:

- *development of a simple blood test for nonalcoholic fatty liver disease, one of the most common liver problems in children;*

- *identification of a gene mutation associated with vitamin D-dependent rickets and other bone and mineral metabolism disorders;*

- *investigation into the role of nutrition and cellular mechanisms in neonates; and*

- *evaluation of the role of selenium and related compounds in white blood cell function.*

- In 2006, the Children's Hospital collected a record \$8.6 million in philanthropic gifts. The largest single gift of \$4.6 million established the Calabrese Chair in Pediatrics, held by Dr. Robert Wyllie.

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In 2006, Cleveland Clinic celebrated its 85th anniversary. It was founded as one of America's first not-for-profit, multi-specialty group practices – a revolutionary model of medicine that continues today. The four founders of Cleveland Clinic – George W. Crile, M.D.; Frank E. Bunts, M.D.; William E. Lower, M.D.; and John Phillips, M.D. – believed this unique structure would best serve patients because care would be provided through physician teamwork and cooperation. “The result of such an organization,” wrote Dr. Crile in 1921, “will be that the entire staff...will maintain the spirit of collective work, and each of us will accept as our reward for the work done, his respective part in the contribution of the group, however small, to the comfort, and usefulness, and the prolongation of human life.”

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