Division of Cardiothoracic Surgery
Thoracic Surgery Residency Program
Introduction

Welcome to the Thoracic Surgery Residency Program at the University of Colorado. Our program is a three-year residency which has been in continuous operation since 1977. Our mission is to provide a very well-rounded thoracic surgical education in all facets of our specialty. Our global objective is to prepare the graduates of our program to step into their careers prepared to meet the challenges of the profession, regardless of their ultimate career goals.

During the course of the three-year curriculum, residents rotate through the University of Colorado Hospital, Children’s Hospital Colorado, and the Department of Veterans Affairs Medical Center, Denver. These rotations provide a robust and sophisticated experience in all facets of adult and congenital heart disease and general thoracic surgery. The first two years of the three-year curriculum are designed to provide an in-depth experience in each of these subspecialty areas and prepare the resident for eligibility for the American Board of Thoracic Surgery examination process. The third year of the residency is designed in a manner to permit the resident to focus in an area relevant to their ultimate career goals. For example, some of our residents focus their activities in the arena of general thoracic surgery, and others in the arena of congenital heart surgery. Regardless of a resident’s career goal, the faculty is absolutely committed to helping all residents achieve their goals.

The graduates of our program have established very successful careers across the country. Our graduates are established cardiac and thoracic surgeons in both academic medical centers and private practice.
Regardless of the particular area of clinical focus, the graduates of our programs have consistently provided feedback that they were more than ready to function independently upon completion of the residency program.

Thank you for your interest in our program.

Sincerely,

David A. Fullerton, MD
Professor and John T.M. Wright Endowed Chair in Heart Valve Surgery
Chief, Division of Cardiothoracic Surgery
Residency Program Director
University of Colorado School of Medicine

Karen H. Muth, BA
Thoracic Surgery Residency Program Coordinator
University of Colorado School of Medicine
Educational Goals and Objectives

The global objective of the thoracic surgery residency program is to teach residents the skills necessary to become well-rounded cardiothoracic surgeons. In addition, it is our interest to align our training program with modern career objectives. The rotation schedule for the residency is designed to achieve this global objective, while at the same time permitting enough flexibility within the program to accommodate the desire of the resident to focus on a particular subspecialty, such as general thoracic or adult cardiac surgery. Throughout the residency, the resident is given graded responsibility both in and outside the operating room.

Year 1 - Adult Cardiac Surgery

During the first year a resident’s time will be divided between the adult cardiac service and the general thoracic service. The goals and objectives during the first year are:

- Medical management and indications for surgery of ischemic and valvular heart disease
- Preoperative evaluation of patients
- Risks of the operations and how to counsel patients appropriately
- Perioperative management of patients following complicated cardiac and general thoracic procedures
- ICU care, including ventilator management, nutritional support, inotropic management, and management of intra-aortic balloon pumps
- Acquire graded responsibilities as primary surgeon to perform operations for coronary revascularization, valve repair and replacement, and aortic disease
- Acquire graded responsibilities as primary surgeon for heart and lung procurements for transplantation

Year 1 - General Thoracic Surgery

- Evaluation and management of thoracic malignancies including lung, esophageal and mediastinal tumors
- Evaluation and management of surgical lung infections
- Staging of thoracic malignancies
- Utilize appropriate adjunctive protocols for chemotherapy and radiation therapy
- Intraoperative airway management and planning of major airway resections
- Evaluation, management, and operative treatment of patients undergoing lung transplantation
- Acquire graded intraoperative responsibility as surgeon for operations on the lung, chest wall, mediastinum and esophagus
Year 1 - Related Specialties

Acquire a working knowledge of echocardiography, nuclear cardiology, cardiac stress tests, pulmonary function studies, chest imaging (CT and MRI), and esophageal motility. The resident will become sufficiently familiar with these to be able to independently interpret them.

By the end of the first year, it is the expectation of the Program Director that the resident is fully capable of performing straightforward cardiac surgery with minimal assistance. Virtually all general thoracic cases are performed by the resident with faculty assistance.

Year 2 - Adult Cardiac Surgery

The second year is devoted to the practice of adult cardiac surgery at the University of Colorado Hospital, the VA Medical Center, as well as gaining exposure to pediatric cardiac surgery at Children's Hospital Colorado. It is expected during the second year that residents will develop an increased understanding of the following:

- Medical management of heart failure
- Indications and contraindications for heart transplantation
- Management of heart transplant recipients
- Indications for ventricular assist devices

In addition residents will:
- Continue to assume more responsibilities as primary surgeon for operations for myocardial revascularization and valvular heart disease
- Assume responsibility as primary surgeon on heart procurements
- Assume graded responsibility as primary surgeon in the placement of ventricular assist devices

Year 2 - Pediatric Cardiac Surgery

- Learn the pathophysiology of the common congenital heart anomalies
- Learn the fundamentals of cardiopulmonary bypass in infants and children
- Learn the perioperative hemodynamic management for pediatric cardiac surgical patients
- Acquire graded intraoperative responsibility as surgeon for operations to correct atrial septal defects, ventricular defects, patent ductus arteriosus, and coarctation of the aorta.

Year 3 - Adult Cardiac and/or General Thoracic Surgery

By the beginning of the third year, the resident is expected to have made a decision regarding his/her ultimate career goals and subspecialization. Once this decision has been made and the resident has demonstrated skills to be ABTS eligible, the resident’s experience is focused in this area. This is typically for the final six to nine months of the residency. Such areas might include esophageal surgery, minimally invasive thoracic surgery, valve repair, etc. In addition, all residents will assume responsibility as primary surgeon on heart and lung transplants as well as insertion of ventricular assist devices.
Educational Conferences

It is our ultimate goal to prepare our residents, not only to satisfactorily pass the ABTS certification examination, but to excel beyond that to a level of expertise that will allow the resident to become a future leader in their area of specialty. To accomplish this endeavor we have many educational activities which include:

- Cardiac Catheterization Conferences
- Multidisciplinary general thoracic surgical oncology conference (held weekly with attendance of pulmonologists, oncologists, radiation oncologists, radiologists, as well as thoracic surgeons)
- Surgical Grand Rounds
- Morbidity and Mortality Conferences (monthly)
- Journal Club held with area cardiothoracic surgeons
- Teaching Conferences are held weekly and directed by the thoracic surgical residents
- Research opportunities allowing residents exposure to national meetings
- Case Conferences (monthly)
# Residency Case Volume

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<th>ABTS Requirement</th>
<th>2009 Graduate</th>
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<th>2011 Graduate</th>
<th>2012 Graduate</th>
<th>2013 Graduate</th>
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The Anschutz Medical Campus (AMC) is a 500 acre campus located 15 minutes from Denver International Airport. AMC is home to the newly constructed University of Colorado Hospital, Children’s Hospital Colorado and the University of Colorado School of Medicine and its associated research facilities. It will be the home of the new Denver Veteran’s Affairs Medical Center, currently under construction and schedule for completion in 2015.

The northern 225 acres of the campus are being developed as the Colorado Science & Technology Park at Fitzsimons, a biomedical industrial park. More than 30 biotech companies are currently housed within the more than six million square feet of corporate and bioresearch facility space. The Denver Regional Transportation District (RTD) has approved a future light rail line to run from downtown Denver to Denver International Airport with stops at AMC, further enhancing the connectivity of the Anschutz Medical Campus to the region.

The Anschutz Medical Campus

As the only academic medical center in the Rocky Mountain region, the University of Colorado Hospital (UCH) and our top medical professionals, superior medicine, and progressive change make it one of the leading hospitals in the nation. Consistently ranked among the top hospitals in the country by U.S. News & World Report’s annual survey of “America’s Best Hospitals,” the University of Colorado Hospital is internationally respected for its exceptional teams of medical specialists. UCH was named Top-Performing Academic Hospital in Quality – Two Years in a Row by the University HealthSystems Consortium.

Located on the Anschutz Medical Campus, the University of Colorado Hospital's 700 bed hospital contains state of the art facilities including a hybrid operating room in which TAVR, aortic endovascular and structural heart cases are performed. The 17 bed CT Surgical ICU is located adjacent to the OR, with outpatients seen in the Cardiovascular Center and in the Cancer Center.

The CT Surgical service at the University of Colorado Hospital encompasses the surgical treatment of all forms of cardiac, aortic, pulmonary, esophageal and other thoracic diseases. The service includes a mature ventricular assist device component, as well as a full-fledged heart and lung transplant program. All patient rooms are private and provide facilities for rooming of family members.
Teaching Hospitals Continued

**Children's Hospital Colorado**

_Pediatric Cardiothoracic Surgery_

Children's Hospital Colorado (CHC) has been ranked for more than a decade as one of the best children’s hospitals nationally in U.S. News & World Report and is located one block from the University of Colorado Hospital on the Anschutz Medical Campus. Its state-of-the-art facilities include a hybrid operating room and cardiac ICU. The pediatric cardiac surgical program at CHC encompasses all forms of complex congenital cardiac diseases including arterial switch procedures, Norwood procedures and pediatric cardiac transplantation.

**The Department of Veterans Affairs Medical Center**

The Department of Veterans Affairs Medical Center, Denver serves as the tertiary care center for veterans in Colorado, Wyoming, and Montana. All aspects of adult cardiac and thoracic diseases are managed by the Denver VA for this veteran population. There are two half day clinics devoted to cardiac and thoracic surgery respectively. The thoracic surgery resident rotating at the VA provides coverage at these clinics with our faculty. There are five operative days per week. The cardiac caseload is weighted towards coronary revascularization and valvular heart disease, although all aspects of cardiovascular surgery are performed by the cardiothoracic service, including thoracic aortic aneurysm surgery. The thoracic experience leans towards surgical management of lung and esophageal carcinomas, as well as surgical management of pleural infections. The VA experience is a unique and an integral part of the University of Colorado School of Medicine Thoracic Surgery Residency Program.

Currently under construction on the Anschutz Medical Campus, the new state-of-the-art Denver VA Medical Center (VAMC) includes a new 120-bed inpatient bed-tower with a 30-bed spinal cord injury unit, plus a separate 30-bed nursing home community living center. The $800 million construction is scheduled for completion in 2015.
Teaching Hospitals Continued

National Jewish Health

National Jewish Health (NJH) is an accredited teaching affiliate of the University of Colorado School of Medicine. All of the physicians and scientists on staff at National Jewish Health have faculty appointments at the University of Colorado School of Medicine.

NJH has been recognized as the best respiratory hospital in the nation since 1998, according to *U.S. News & World Report*. NJH has achieved this notable ranking by: 1) providing patient care that is thorough, multidisciplinary, and tailored to the individual needs of each patient, 2) “translating” the lessons of world-class basic science into improvements in patient care, and 3) actively promoting the continuing education of scientists, physicians, healthcare professionals, and the public. Patients treated medically at NJH are referred to the University of Colorado Hospital for thoracic surgical procedures.

Denver Health Medical Center

Denver Health Medical Center is Colorado's primary “safety net” institution. In the last 10 years, this compassionate organization provided more than $2.1 billion in care for the uninsured. Despite this large financial responsibility, Denver Health remains financially solvent through an efficient, integrated system.

25 percent of all Denver residents receive their health care at Denver Health. One of every three children in Denver is cared for by Denver Health physicians.

Denver Health is a comprehensive, integrated organization with multiple components including: 477-bed main hospital at Eighth Avenue and Bannock Street that houses the Rocky Mountain Regional Level 1 Trauma Center, the only academic level 1 trauma center in the area; 911 medical response system for the City and County of Denver; Denver Public Health Department; 8-clinic network of Family Health Centers throughout the city; 12-clinic network of school-based health centers in Denver public schools; Rocky Mountain Poison and Drug Center NurseLine, a telephone advice line that offers assistance to patients 24 hours a day, seven days a week; Denver CARES, a safe setting offering community detoxification services; Correctional Care; and Denver Health Medical Plan, Inc.
Denver Health Medical Center Continued

Denver Health also houses the Denver Health Paramedic School; the Rocky Mountain Center for Medical Response to Terrorism, Mass Casualties and Epidemics; the Rita Bass Trauma & EMS Education Institute; the Colorado Biological, Nuclear, Incendiary, Chemical and Explosive (BNICE) Training Center, a statewide initiative to educate Colorado's health care and public safety workforce on the principles of preparing for, and responding to a weapons of mass destruction event; and clinical training programs for medical residents and allied health professionals in many different specialties.

Patients treated medically at Denver Health are referred to the University of Colorado Hospital for cardiac and thoracic surgical procedures.
Our Faculty

David A. Fullerton, MD
Professor and John T.M. Wright Endowed Chair in Heart Valve Surgery
Chief, Division of Cardiothoracic Surgery
Residency Program Director
Director, Cardiothoracic Surgical Research
Co-Medical Director, CT Surgical ICU
University of Colorado School of Medicine

Clinical Interests: Myocardial revascularization, valve repair, valve replacement and TAVR.

Medical School: University of Missouri-Columbia, Magna Cum Laude

Surgery Residency: University of Washington, Seattle

Thoracic Surgery Residency: University of Colorado

Board Certification: American Board of Surgery, American Board of Surgery—Critical Care, American Board of Thoracic Surgery

David Fullerton, MD was born in Texas and received his undergraduate degree from Southern Methodist University. He then graduated Magna Cum Laude from the University of Missouri School of Medicine where he was a member of Alpha Omega Alpha. He completed a residency in general surgery at the University of Washington including one year of research in coronary physiology. He then moved to the University of Colorado for a residency in thoracic surgery which he completed in 1990. He remained on the faculty at the University of Colorado for the next six years during which time he helped establish adult and pediatric heart and lung transplant programs. He continued his interest in research and became an NIH-funded investigator in the area of pulmonary hypertension. During this time he was Chief of Cardiothoracic Surgery at the Department of Veterans Affairs Medical Center, Denver. In 1996, he was recruited to Northwestern University in Chicago as Chief of Cardiothoracic Surgery and Program Director for the thoracic surgery residency program. After seven very successful years in Chicago, he was recruited back to the University of Colorado as Head of the Division of Cardiothoracic Surgery.

Dr. Fullerton has received funding from the NIH and has served as a member of the Surgery, Anesthesia, and Trauma Study Section of NIH. He has published over 200 papers in peer-reviewed journals. He has served on the Editorial Board of The Annals of Thoracic Surgery, The Journal of Surgical Research and the Journal of Cardiac Surgery. He is a member of major surgical societies including the Society of University Surgeons, the American Surgical Association, the Society of Thoracic Surgeons, the American Association for Thoracic Surgery, the Western Thoracic Surgical Association, and the Society of Clinical Surgery. He is a past member of the Board of Governors of the American College of Surgeons. He has been a member of the Residency Review Committee for Thoracic Surgery and served as the Chair of that committee. He has served as a Director of the American Board of Thoracic Surgery. His clinical expertise is recognized by his being listed on numerous “Best Doctors Lists” over the past decade. He currently serves on the Boards of Directors for the Joint Council on Thoracic Surgery Education and CTSNet. He is currently the immediate past president of the STS. He is the Executive Director-elect of the American Board of Thoracic Surgery.
Ashok N. Babu, MD
Assistant Professor of Surgery, University of Colorado School of Medicine

Clinical Interests: Surgical treatment of heart failure with an emphasis on ventricular assist devices. Dr. Babu's research interest lies in optimizing the surgical treatment of heart failure.

Medical School: Northwestern University Medical School, Chicago

Surgery Residency: University of Colorado
Thoracic Surgery Residency: University of Colorado

Board Certification: American Board of Thoracic Surgery

Ashok Babu, MD is a member of our cardiac surgery faculty in the Division of Cardiothoracic Surgery. A native of Peoria, Illinois, Dr. Babu attended Northwestern University where he received his undergraduate degree in biomedical engineering, graduating summa cum laude with honors. He continued in the medical program at Northwestern and upon graduation in 2002, moved to the University of Colorado for general surgery training. During his general surgery training, he spent two years in basic science research studying lung transplant immunology, esophageal carcinogenesis in reflux disease, and aortic valve calcification. He received the Ben Eiseman Award for Basic Science Research in 2007. He also received the J. Cuthbert Owens Award for Excellence in Teaching and Patient Care and the Golden Apple Teaching Award during his residency. Upon completion of general surgery training in 2009, Dr. Babu entered the Thoracic Surgery Residency Program here at the University of Colorado.

Dr. Babu joined our faculty in July 2012. His clinical interests are wide and include the surgical treatment of heart failure with short and long term mechanical circulatory support, extracorporeal membrane oxygenation (ECMO) for acute respiratory and cardiac failure, minimally invasive valve surgery, arterial grafting for coronary disease, and quality improvement / cost reduction in cardiac surgery. His research interests lie in device development aimed at improving the function and outcomes of ventricular assist devices and ECMO support.
David N. Campbell, MD
Professor of Surgery, University of Colorado School of Medicine
Director, Pediatric Cardiac Transplantation Program and Congenital Cardiac Fellowship Program, Children’s Hospital Colorado

Medical School: Rush Medical College, Chicago
Surgery Residency: University of Colorado
Thoracic Surgery Residency: University of Colorado

Dr. Campbell holds the academic rank of Professor of Surgery at the University of Colorado. He received his medical degree from Rush Medical College. He then completed residencies in general surgery and thoracic surgery at the University of Colorado. Dr. Campbell undertook formal fellowship training in pediatric cardiac surgery at Children’s Hospital Boston. Subsequently, he joined the faculty in the Department of Surgery at the University of Colorado in 1981.

Dr. Campbell’s major interests include congenital heart surgery, both pediatric and adult, repair of congenital tracheal diseases, thoracic transplantation in infants, children and adults, and mechanical circulatory assistance.

Dr. Campbell founded the Heart Transplantation Programs at the University of Colorado Hospital and at Children’s Hospital Colorado. He continues his leadership in these fields as the Surgical Director of the Children’s program. Under his leadership more than 450 heart transplants have been performed in these programs. He is co-founder of the Pediatric Lung Transplant Program at Children’s Hospital Colorado. He also founded the Mechanical Circulatory Support Program at the University of Colorado Hospital.

Dr. Campbell is certified by the American Board of Thoracic Surgery, and holds a Specialty Certificate in Congenital Heart Surgery. He is a member of 18 professional societies including the American Association of Thoracic Surgery, the Society of Thoracic Surgeons, the Western Thoracic Surgical Association, the International Society for Heart and Lung Transplantation, American College of Surgeons, and the Congenital Heart Surgeons Society. Dr. Campbell is active in the leadership of several local medical organizations, as well as regional and national organizations.

Dr. Campbell has authored more than 25 book chapters and has authored or co-authored more than 125 scientific papers published in peer-reviewed journals. Dr. Campbell is widely regarded as an influential surgical educator and is the Director of the ACGME-approved Congenital Cardiac Surgery Residency Program.
Joseph C. Cleveland, Jr, MD
Professor of Surgery, University of Colorado School of Medicine

Clinical Interests: Adult cardiac surgery, off-pump coronary artery surgery, adult heart and lung transplantation, mechanical assist devices, heart valve reconstruction/replacement.

Medical School: University of Washington, Seattle

Surgery Residency: University of Colorado
Thoracic Surgery Residency: University of Colorado
Board Certification: American Board of Surgery, American Board of Thoracic Surgery

Dr. Cleveland joined the Cardiothoracic Surgery faculty July 2001. He is a Professor of Surgery. He attended medical school at the University of Washington where he was elected to Alpha Omega Alpha graduating with High Honors in 1991. He completed an internship, surgery residency and thoracic surgery residency at the University of Colorado from 1991–2001.

Dr. Cleveland’s clinical interests include adult cardiac surgery, adult heart and lung transplantation, mechanical assist devices, and heart valve reconstruction/replacement. He is the Surgical Director for Adult Cardiac Transplantation/Mechanical Assist Devices at the University of Colorado Hospital. Dr. Cleveland is a nationally recognized expert of ventricular assist devices (VAD) and is a member of the end-stage cardiopulmonary disease workforce of the STS. He also is a member of the Adverse Effects Committee for Intermacs, a NIH sponsored VAD database.

Dr. Cleveland’s research interests concern myocardial responses to cardiopulmonary bypass and obligatory ischemia associated with heart surgery. He completed a two-year trauma surgical research fellowship under the mentorship of Alden H. Harken, M.D. from 1994 to 1996. During that time he worked on cellular signaling during myocardial preconditioning. Dr. Cleveland was a recipient of the Jahnigen Career Development Award from the American Geriatric Society in 2004. He is the Principal Investigator/Co-Principal Investigator on numerous clinical research studies and has authored or co-authored over 100 publications and 15 book chapters.

Dr. Cleveland is the Assistant Program Director of the Thoracic Surgery Residency Program and is a Preceptor in the Foundations of Doctoring Program. He received the Outstanding Clinical Teacher award for 2002-2003, the first annual School of Medicine Professionalism Award in 2007, in 2009 was a co-recipient of the 5th Annual Dwight McGoon National Teaching Award presented at the AATS, and in 2010, 2012, 2013 & 2014 was recognized in 5280: Denver’s Mile High Magazine as one of Denver’s Top Doctors.

Dr. Cleveland is a member of The Society of Thoracic Surgeons, the American Association for Thoracic Surgery, the American College of Surgeons and numerous other societies. He is on workforces for the STS, is treasurer of the WTSA, and serves on numerous other society and local committees. He is the program chair for the 51st Annual STS Meeting in January 2015.
Frederick L. Grover, MD

Professor of Surgery, Division of Cardiothoracic Surgery and Past Chair, Department of Surgery, University of Colorado School of Medicine

Clinical Interests: Adult cardiac surgery, lung transplantation, adult heart transplantation.

Medical School: Duke University

Surgery Residency: Duke University Medical Center, University of Colorado

Thoracic Surgery Residency: University of Colorado

Board Certification: American Board of Surgery, American Board Thoracic Surgery

From 1991 to 2003, Dr. Grover was Head of the Division of Cardiothoracic Surgery at the University of Colorado School of Medicine and Chief of Surgical Services at the Department of Veterans Affairs Medical Center, Denver. From August 2002 until May 2012, Dr. Grover was Chair of the Department of Surgery at the University of Colorado School of Medicine. He is a graduate of Duke University School of Medicine. He obtained his residency training at Duke University and the University of Colorado. Following two years of military service in the U.S. Navy in San Diego, Dr. Grover spent 19 years of his career in San Antonio at the University of Texas Health Science Center in the Division of Cardiothoracic Surgery.

Dr. Grover has a major interest in general and cardiothoracic residency training. He has actively participated in the training and mentoring of over 44 thoracic surgery residents over his career. In addition to clinical interests in the areas of acquired adult cardiac surgery and lung and heart transplantation, Dr. Grover has a major interest in risk-adjusted outcomes analyses and quality improvement in the field of cardiothoracic surgery. He chaired the Society of Thoracic Surgeons Work Force on National Databases from 1995 to 2004. In addition, he was the Medical Director of the Continuous Improvement in Cardiac Surgery Program for the Department of Veterans Affairs and in that capacity helped organize the VA Cardiac Surgery Database. He chaired the United Network for Organ Sharing Thoracic Committee, and has served on the UNOS Board of Directors. He was the Co-Principal Investigator of a large VA multi-center clinical trial comparing off-pump to on-pump coronary artery bypass, which was published in the New England Journal of Medicine.

Dr. Grover belongs to numerous professional organizations including the American Medical Association, American College of Surgeons, Society of Thoracic Surgeons, American Association for Thoracic Surgery, the Southern Thoracic Surgical Association, American Surgical Association, the Western Thoracic Surgical Association, the European Association for Cardiothoracic Surgery, the Society of University Surgeons, the International Society for Heart and Lung Transplantation, and is a past-president of the Southern Thoracic Surgical Association. Dr. Grover served as President of the Society of Thoracic Surgeons for 2006 – 2007. He has served on the National Quality Forum Board of Directors, and currently serves on the American College of Cardiology National Cardiovascular Data Registry Board, and was Chair of the STS Council on Quality, Research, and Patient Safety. Dr. Grover has been very involved in healthcare policy at a national level and is an advocate for physician involvement and leadership in this effort. He has authored or co-authored over 312 scientific papers, many of which are in the area of utilizing surgical databases for quality improvement. He was honored in 2005 by receiving the Duke University Distinguished Medical Alumnus Award, by being the 2010 ACS Gibbon Lecturer, by receiving the American College of Cardiology Distinguished Fellowship Award, the University of Colorado Faculty Professionalism and Jefferson Awards, the Association of VA Surgeons Distinguished Service Award and the Southern Thoracic Surgical Association Inspiration Award and is an American Heart Association Fellow. Dr. Grover serves on a national not-for-profit board and has an interest in international medicine and medical missions in developing countries.

Dr. Grover and his wife of 54 years Carol have two sons and four grandchildren and two exceptional daughter-in-laws, all of whom live in Denver. For relaxation he enjoys the outdoors and especially fly fishing and skiing.
James Jaggers, MD
Professor of Surgery, University of Colorado School of Medicine
Barton-Elliman Chair and Chief of Pediatric Cardiac Surgery
Children’s Hospital Colorado

Clinical Interests: Complex congenital heart defects in newborns and infants, adult congenital cardiac surgery, pediatric cardiac transplantation, surgery for Marfan Syndrome.

Medical School: University of Nebraska

Surgery Residency: Oregon Health Sciences University
Thoracic Surgery Residency: University of Colorado
Board Certification: American Board of Surgery, American Board of Thoracic Surgery, Congenital Cardiac Surgery

A native of Nebraska, Dr. Jaggers is a graduate of the University of Nebraska School of Medicine. Following a residency in surgery at the University of Oregon, he completed a residency in cardiothoracic surgery at the University of Colorado in 1996 and a post-graduate fellowship at Children’s Hospital Colorado in 1993 and 1996.

In early 2010, Dr. Jaggers was recruited from Duke University Medical School, where he served as a faculty member in the Department of Surgery since 1996 and Chief of Pediatric Cardiothoracic Surgery since 2001.

Dr. Jaggers is the Barton-Elliman Chair in Pediatric Cardiothoracic Surgery and Co-Medical Director of the Heart Institute at Children’s Hospital Colorado. Dr. Jaggers specializes in repairing complex congenital heart defects in babies and newborns and is also among the first to receive a new subspecialty certification in congenital cardiac surgery designated by the American Board of Thoracic Surgery. He is also a leading authority in neonatal heart surgery. In addition to his skill as a clinical surgeon, Dr. Jaggers is a highly respected researcher whose work has appeared in nearly 100 scientific publications and books. Dr. Jaggers’ interests include clinical research in the performance and quality of Congenital Heart Surgery, as well as basic science research in mechanisms of development for Left Heart Obstruction Defects.

Dr. Jaggers is a member of 12 professional organizations including the American Association for Thoracic Surgery, the American College of Surgeons, the Congenital Heart Surgeons Society, the International Society for Heart & Lung Transplantation, the Society of Thoracic Surgeons, the European Association of Cardiothoracic Surgery, and the World Society of Pediatric Cardiac Surgeons.
Robert A. Meguid, MD, MPH  
Assistant Professor of Surgery  

Medical Degree: Brown University, Providence, RI  

Surgery Residency: Johns Hopkins University, Baltimore  

Thoracic Surgery Residency: University of Washington, Seattle  

Board Certification: American Board of Surgery, American Board of Thoracic Surgery  

Dr. Meguid received his undergraduate degree in biochemistry from Brown University in Providence, Rhode Island and graduated with honors in 1997. He received his medical degree in 2002 from Brown University School of Medicine. He performed his internship and residency in general surgery at the Johns Hopkins Hospital, Baltimore, Maryland between 2002 and 2010. Following completion of his general surgery residency, he undertook his cardiothoracic surgery residency at the University of Washington, Seattle, Washington, between 2010 and 2012.  

He obtained a Master of Public Health with a focus in epidemiologic and biostatistics at the Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland in 2008, during which time he completed a thoracic surgery research fellowship. Throughout his formal education, he has engaged in research training as a research fellow in the Surgical Nutrition and Metabolism Laboratory at the SUNY Health Science Center in Syracuse, New York, the Center for Surgical Research at the Brown University School of Medicine in Providence, Rhode Island, and in the Surgical Oncology Research Laboratory at Massachusetts General Hospital, Harvard Medical School, in Boston, Massachusetts.  

Dr. Meguid joined our faculty in July 2012. His clinical interests include benign and malignant diseases of the lung, esophagus and mediastinum; chest wall tumors, deformities and reconstruction; surgery for end-stage lung disease and lung transplantation; benign and malignant airway disease; and minimally invasive thoracic procedures such as VATS lobectomy.  

Dr. Meguid is the surgical director of the Surgical Outcomes and Applied Research (SOAR) program, a research collaborative between the Department of Surgery and the University of Colorado Adult and Child Center for Health Outcomes Research and Delivery Science. His research is in identifying structures and processes of care which lead to improved outcomes for surgical patients, in order to improve patient care and shape health care policy. Dr. Meguid is a member of The Society of Thoracic Surgeons, the American College of Surgeons, the Society of Surgical Oncology, the Association for Academic Surgery, the Surgical Outcomes Club and other professional organizations. He is engaged in medical student and resident training and mentorship. He is an editor-in-chief of The Johns Hopkins ABSITE Review, author of several chapters and numerous research articles in the field of thoracic surgery, for which he has received national recognition.
John D. Mitchell, MD
Professor of Surgery
Courtney C. and Lucy Patten Davis Endowed Chair in Thoracic Surgery
Chief, Section of General Thoracic Surgery
University of Colorado School of Medicine

Medical Degree: University of Michigan, Ann Arbor

Surgery Residency: Massachusetts General Hospital, Boston
Thoracic Surgery Residency: Massachusetts General Hospital, Boston
Board Certification: American Board of Surgery, American Board of Thoracic Surgery

A native of Colorado, Dr. Mitchell received his undergraduate degree in molecular biology at the University of Colorado Boulder, graduating *Magna Cum Laude* in 1983. He subsequently attended the University of Michigan Medical School on an Armed Forces Scholarship, graduating in 1987 with honors and as a member of Alpha Omega Alpha. He then moved to Boston, where over the following decade he completed residencies in both General and Cardiothoracic Surgery at Massachusetts General Hospital. During his residency, Dr. Mitchell also served as a Registrar in Cardiothoracic Surgery in Liverpool, England, and was a research fellow at Harvard Medical School from 1990 to 1992. Following a four year period on active duty in the United States Navy, Dr. Mitchell joined the faculty at the Stanford University School of Medicine. In 2002, he was recruited to the University of Colorado to become the Chief of General Thoracic Surgery. Since his arrival in Colorado, he has been recognized repeatedly by his peers as one of the best thoracic surgeons in the Rocky Mountain region. In 2006, Dr. Mitchell was awarded the Courtenay C. and Lucy Patten Davis Endowed Chair in the Department of Surgery, and in 2008 was presented the Donald B. Doty Educational Award at the 34th Annual Western Thoracic Surgical Association.

Dr. Mitchell is the Chief of General Thoracic Surgery within the Division of Cardiothoracic Surgery. His primary clinical responsibilities are at the University of Colorado Hospital and National Jewish Health, Denver. As a consultant for National Jewish, Dr. Mitchell has extensive experience in the surgical treatment of lung infection. His research interests focus on lung cancer, surgical treatment of lung infection, and lung transplantation. His clinical interests include all thoracic oncology, surgery of the airway, surgery for infectious lung disease, esophageal surgery, adult lung transplantation, and minimally invasive approaches to thoracic surgical procedures.

Dr. Mitchell is a member of the Society of Thoracic Surgeons, the American College of Surgeons, the American Association for Thoracic Surgery, the Western Thoracic Surgical Association, the General Thoracic Surgical Club and numerous other professional groups. He currently serves on the ACS Board of Governors and the ACS Advisory Council for Cardiothoracic Surgery, as well as several STS Committees including the Council on Quality, Research and Patient Safety, the Committee on Ethics and Standards, and is the Chair of the STS Workforce on Evidence Based Surgery. He is President Elect of the WTSA, the past Treasurer and Program Chair of the WTSA, and serves on the Executive Committee of the
Max B. Mitchell, MD
Professor of Surgery, University of Colorado School of Medicine

Clinical Interests: Congenital heart disease, pediatric heart transplantation, adult congenital heart disease.

Medical School: George Washington University

Surgery Residency: University of Colorado

Thoracic Surgery Residency: University of Colorado

Pediatric Cardiac Surgery Fellowship: Royal Children’s Hospital, Melbourne, Australia

Board Certification: American Board of Surgery, American Board of Thoracic Surgery, American Board of Thoracic Surgery- Subspecialty certification in Pediatric Cardiac Surgery

Dr. Mitchell holds the academic rank of Professor of Surgery at the University of Colorado. Dr. Mitchell received his Doctorate in Medicine from the George Washington University School of Medicine. He then completed residencies in General Surgery and Thoracic Surgery at the University of Colorado. Dr. Mitchell conducted basic science research during a full-time two-year National Institutes of Health Postdoctoral Research Fellowship in the surgical laboratory at the University of Colorado. Dr. Mitchell undertook fellowship training in pediatric cardiothoracic surgery for one year at the Children’s Hospital Colorado, and subsequently served as the senior fellow in pediatric cardiothoracic surgery at the Royal Children’s Hospital in Melbourne, Australia. He has been a faculty member in the Department of Surgery at the University of Colorado since 1998. He is the Director of the Mechanical Circulatory Support Program at the Children’s Hospital Colorado.

Dr. Mitchell’s clinical interests include neonatal and congenital cardiac surgery, congenital and acquired diseases of the mitral valve, atrioventricular valve repair in children and adults, and pediatric cardiac transplantation. His basic research interests include myocardial preservation and endothelial cell function. He is currently conducting clinical projects studying outcomes following a variety of congenital cardiac surgical conditions. In addition, Dr. Mitchell has ongoing studies examining biologic differences between normal and pathologic heart valves in pediatric patients. He has authored or co-authored 62 peer reviewed articles and 21 invited papers or book chapters. Dr. Mitchell has made scientific presentations at more than 16 national and international meetings, and he has given invited lectures in Japan, China and Spain. Dr. Mitchell has an interest in third world medicine and has participated on volunteer medical missions in Kazakhstan and China. Dr. Mitchell has served in Iraq as a military surgeon.

Dr. Mitchell is a member of 11 professional organizations including the Congenital Heart Surgeons Society, the American Association for Thoracic Surgery, the Society of Thoracic Surgeons, the Western Thoracic Surgical Association, and the European Association for Cardio-Thoracic Surgery.
T. Brett Reece, MD
Associate Professor of Surgery, University of Colorado School of Medicine

Clinical Interests: Adult cardiac surgery, thoracic aortic surgery, aortic endografting, aortic dissections, aortic valve preservation, interstitial aortic diseases including the Marfan's and bicuspid aortic valve syndromes, mechanical circulatory support, and thoracic transplantation.

Medical School: University of Virginia

Surgery Residency: University of Virginia

Thoracic Surgery Residency: University of Colorado

Aortic Surgery Fellowship: University of Pennsylvania

Board Certification: American Board of Surgery, American Board of Thoracic Surgery

T. Brett Reece, MD serves as cardiac surgery faculty in the Division of Cardiothoracic Surgery. He grew up in Oklahoma playing football and ranching. After earning his BA in economics from Dartmouth College, he received his medical degree at the University of Virginia, where he completed his surgical research fellowship and general surgery training in 2006. His next step was completion of his thoracic surgery training at the University of Colorado in 2009 in addition to a fellowship in aortic surgery at the University of Pennsylvania in the spring of 2008.

Dr. Reece has wide interests in cardiac surgery, including mechanical circulatory support and thoracic transplantation. However, his main interest lies in the Thoracic Aortic Program at the University of Colorado. This multidisciplinary program encompasses all approaches to thoracic aortic disease including open procedures, endovascular procedures, hybrid procedures, and hypothermic circulatory arrest. Moreover, the program has an aggressive approach toward the treatment of aortic dissections, both short and long term. The newly structured Thoracic Aortic Clinic serves all thoracic aortic pathology including genetic pathologies such as Marfan's and other interstitial arterial diseases.

During his training, Dr. Reece learned the value of medical student and resident education. His interest in surgical education is evident by multiple education and leadership awards from both UVA and the University of Colorado. He serves as the Associate Director for Medical Student Education in the Department of Surgery. He also serves on the Thoracic Surgery Directors Association's Cardiac Curriculum Committee and as Topic Editor for thoracic aortic surgery for the American Board of Thoracic Surgery Curriculum.

On the research side, Dr. Reece has developed murine models of paraplegia related to thoracoabdominal operations. This line of research includes both the in vivo and in vitro models of spinal cord injury pursuing novel clinical techniques for preventing spinal cord injury resulting from aortic surgery. Clinically, thoracic aortic research has explored less invasive ways and safer techniques for caring for complex aortic pathologies.
Michael J. Weyant, MD
Associate Professor of Surgery, University of Colorado
School of Medicine, Surgical Director, Lung Transplantation

Medical School: Mount Sinai School of Medicine, New York

Surgery Residency: New York-Presbyterian Hospital and Weill Medical College of Cornell University

Thoracic Surgery Residency: Memorial Sloan-Kettering Cancer Center and New York-Presbyterian Hospital

Board Certification: American Board of Thoracic Surgery, American Board of Surgery
Fellow: American College of Surgeons

Michael J. Weyant, MD received an undergraduate degree in biology from Syracuse University, and graduated from the Mount Sinai School of Medicine in New York. He completed a residency in general surgery at the New York-Presbyterian Hospital and Weill Medical College of Cornell University. During his residency he completed a two-year research fellowship studying areas of basic science in surgical oncology. In his final year of residency he was selected as the Chief Surgical Resident in the Department of Surgery. Dr. Weyant continued his training in New York, entering a fellowship in thoracic surgery at Memorial Sloan-Kettering Cancer Center and Weill Medical College of Cornell University.

Dr. Weyant joined the faculty of the University of Colorado School of Medicine in July 2005. His practice is dedicated to all areas of general thoracic surgery including thoracic malignancies, benign esophageal disease, minimally invasive thoracic procedures, and lung transplantation.

Since joining the faculty he has developed a busy clinical practice as well as initiating laboratory research in the areas of esophageal malignancy, lung carcinoma, and lung transplantation. His success in the laboratory is evident by multiple publications and meeting presentations regarding his research. His work was recognized by receiving the 2007 Norman E. Shumway Award and mentoring one of his research residents toward the Samson award in the Western Thoracic Surgical Association Annual Meeting. He has since mentored several surgery residents pursuing research fellowships who have demonstrated excellence through many publications and awards.

Dr. Weyant is recognized as an outstanding educator by his medical student and resident colleagues. He is the 2008 recipient of the University of Colorado Medical Student Golden Apple Teacher of the Year Award and the 2010 recipient of the McGoon Award. The latter is a national teaching award given by the American Association of Thoracic Surgery recognizing excellence in the teaching of cardiothoracic surgery residents. In 2007, Dr. Weyant received the Gary L. and Thelissa Zollinger Early Detection of Lung Cancer Endowment. This significant contribution enables Dr. Weyant to pursue areas of research in early detection of lung cancer as well as interact with the local community to raise awareness of the impact of lung cancer.

Dr. Weyant is an active member of The Society of Thoracic Surgeons and is a member of several workforce committees including the General Thoracic Workforce and the Task membership Committee. He was the 2008-2009 WTSA Chair for the Arrangements Committee and currently serves as the Chair of the Membership Committee of the WTSA.
Our Thoracic Surgery Residents

David Mauchley, MD
Chief Resident
General Surgery Residency: University of Colorado
Medical School: University of Washington

Justin Reeves, MD
2nd Year Resident
General Surgery Residency: Dartmouth-Hitchcock Medical Center
Medical School: University of North Carolina

Ryan Shelstad, MD
2nd Year Resident
General Surgery Residency: University of Minnesota
Medical School: University of Nebraska

Edward (Ed) Bergeron, MD
1st Year Resident
General Surgery Residency: Oakland University William Beaumont School of Medicine, Royal Oak, MI
Medical School: Wayne State University School of Medicine

Giorgio Zanotti, MD
1st Year Resident
General Surgery Residency: Duke University
Medical School: Universita di Pavia, Italy
Our Future Thoracic Surgery Residents

Charles Cole, MD  
**Starts Training 7/2015**  
General Surgery Residency: University of Cincinnati  
Medical School: University of Arkansas for Medical Sciences  
College of Medicine

Brendan Dewan, MD  
**Starts Training 7/2015**  
General Surgery Residency: Emory University  
Medical School: The University of Texas School of Medicine at San Antonio

Our Congenital Cardiac Surgery Fellow

Weng Koon Edward Peng, MD,  
**Fellow**, Pediatric Mechanical Support and Pediatric Cardiac Transplantation  
Thoracic Surgery Residency: Royal Hospital for Sick Children (Yorkhill, Glasgow, UK)  
General Surgery Residency: Queen Margaret Hospital (Fife, UK)  
Medical School: University of Malaya (Kuala Lumpur, Malaysia)
Former Residents

From 1977 through 2012, 36 residents completed the three-year training program at the University of Colorado. Nineteen of these residents initially took academic positions. The remaining are practicing from Idaho to Florida. All of our residents who have taken both parts of the American Board of Thoracic Surgery exam have become board certified.

With the teaching system instituted by Dr. David Fullerton, residents are able to spend more of their residency in the area they intend to practice while still obtaining the index case requirements of the American Board of Thoracic Surgery. All areas of cardiothoracic surgery are experienced in our residency program. Adult cardiac, pediatric cardiac, general thoracic, and transplant are well covered in the three-year program.

Our well-rounded program has enabled residents to be independent surgeons either in private practice or academia once the residency has been completed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Location/Position</th>
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<tbody>
<tr>
<td>Stan Carson, MD</td>
<td>1977</td>
<td>Private Practice, Denver, CO</td>
</tr>
<tr>
<td>David Campbell, MD</td>
<td>1979</td>
<td>Professor, Children's Hospital Colorado, Aurora, CO</td>
</tr>
<tr>
<td>Richard Phillips, MD</td>
<td>1980</td>
<td>Volunteer, Washington State University</td>
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<tr>
<td>Frank Manart, MD</td>
<td>1981</td>
<td>Private Practice, Vail, CO</td>
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<tr>
<td>Lawrence Patzelt, MD</td>
<td>1982</td>
<td>Private Practice, Grand Rapids, MI</td>
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<tr>
<td>John C. Heiser, MD</td>
<td>1983</td>
<td>Private Practice, Grand Rapids, MI</td>
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<tr>
<td>Thomas Cain, MD</td>
<td>1984</td>
<td>Private Practice, Green Bay, WI</td>
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<tr>
<td>Douglas Cowgill, MD</td>
<td>1985</td>
<td>Dean, Clinic/St. Mary's Hospital, Madison, WI</td>
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<tr>
<td>Fred Woelfel, MD</td>
<td>1986</td>
<td>Private Practice, Pittsburgh, PA</td>
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<tr>
<td>Mike See, MD</td>
<td>1989</td>
<td>Professor, John Hopkins University</td>
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<td>David Fullerton, MD</td>
<td>1990</td>
<td>Private Practice, Columbia, MO</td>
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<tr>
<td>James Albert, MD</td>
<td>1992</td>
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<tr>
<td>Michael Grosso, MD</td>
<td>1993</td>
<td>University of Pennsylvania, Philadelphia</td>
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<tr>
<td>James Brown, MD</td>
<td>1994</td>
<td>Associate Professor, University of Maryland</td>
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<tr>
<td>Steve Jones, MD</td>
<td>1995</td>
<td>Private Practice, Boise, ID</td>
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<tr>
<td>Jim Jaggers, MD</td>
<td>1996</td>
<td>Professor, Children's Hospital Colorado, Aurora, CO</td>
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<tr>
<td>Mary Wollerming, MD</td>
<td>1997</td>
<td>Skaggs Medical Center, Branson, MO</td>
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<tr>
<td>Max Mitchell, MD</td>
<td>1998</td>
<td>Professor, Children's Hospital Colorado, Aurora, CO</td>
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<tr>
<td>Irving Shen, MD</td>
<td>1999</td>
<td>Professor, University of Oregon</td>
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<tr>
<td>Peter Serafi, MD</td>
<td>2000</td>
<td>Private Practice, Sebastian, FL</td>
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<tr>
<td>Joseph Cleveland, MD</td>
<td>2001</td>
<td>Professor, University of Colorado</td>
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<tr>
<td>Brett Sheridan, MD</td>
<td>2002</td>
<td>Associate Professor, University of North Carolina</td>
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<tr>
<td>Craig Selzman, MD</td>
<td>2003</td>
<td>Associate Professor, University of Utah</td>
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<tr>
<td>Larry Brinnerhoff, MD</td>
<td>2004</td>
<td>Assistant Professor, Tufts University</td>
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<tr>
<td>Tim Sherwood, MD</td>
<td>2005</td>
<td>Private Practice, Frederick, MD</td>
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<tr>
<td>Aditya Kaza, MD</td>
<td>2006</td>
<td>Associate Professor, Boston Children's Hospital</td>
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<tr>
<td>Sunil Malhotra, MD</td>
<td>2007</td>
<td>Assistant Professor, New York University</td>
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<tr>
<td>Gonzalo Carrizo, MD</td>
<td>2008</td>
<td>Instructor, University of Florida</td>
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<tr>
<td>T. Brett Reece, MD</td>
<td>2009</td>
<td>Associate Professor, University of Colorado</td>
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<tr>
<td>John Charles Dugal, Jr., MD</td>
<td>2010</td>
<td>Private Practice, Knoxville, TN</td>
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<tr>
<td>Ramesh Singh, MD</td>
<td>2011</td>
<td>Inova Fairfax Hospital, Falls Church, VA</td>
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<tr>
<td>Ashok Babu, MD</td>
<td>2012</td>
<td>Assistant Professor, University of Colorado</td>
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<tr>
<td>Sagar Damle, MD</td>
<td>2013</td>
<td>Nebraska Heart Hospital, Lincoln, NE</td>
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<tr>
<td>Mathieu A. Julien, MD, PhD</td>
<td>2014</td>
<td>Visiting Assistant Professor, University of California, Davis</td>
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Mechanical Circulatory Support at the University of Colorado Hospital

The Mechanical Circulatory Support (MCS) Program at the University of Colorado Hospital provides access to life-sustaining devices that are used to treat patients with acute and end-stage heart failure. Patients are managed by the Cardiothoracic Surgery Service while they are inpatients and followed on an outpatient basis by the Heart Failure Service. There is a Mechanical Support Coordinator on call 24 hours a day, seven days a week available to patients and staff. We currently have over 60 patients supported on long-term devices.

The MCS Program grew from a longstanding partnership with our surgical program for advanced surgical therapies in conjunction with an active heart failure cardiology service. Dr. Joseph Cleveland serves as the Surgical Director of the MCS Program; Dr. Andreas Briese serves as the Medical Director. Dr. Ashok Babu has recently been recruited to the faculty as a second surgeon with an active role and interest in MCS and is also developing our ECMO program. Dr. Cleveland also serves nationally on the INTERMACs Adverse Event Adjudication Committee.

Devices are placed for three different indications: Recovery, Bridge to Transplant (BTT), and Destination Therapy (DT). Currently at UCH we implant the CentriMag, Impella 5.0, Thoratec IVADs and PVADs, Thoratec HeartMate II, and the Heartware HVAD. UCH has been an active participant in both Heartmate II and the Heartware BTT and DT Clinical Trials.

On July 23, 2008, the University of Colorado Hospital was awarded Joint Commission Disease Specific Certification for DT Ventricular Assist Device Therapy, the 14th hospital in the country to be awarded this certification. We recently received our fourth Joint Commission Re-Certification for DT VAD.

There is a multi-disciplinary team that participates in the evaluation and management of these patients. Our CT Surgery Residents are actively involved in the evaluation, implantation, and post-implantation care of our VAD patients.

The Mechanical Circulatory Support Program at UCH has earned the Joint Commission’s Gold Seal of Approval® for health care quality and disease-specific certification for VADs for Destination Therapy. The Joint Commission is the nation’s oldest and largest standards-setting and accrediting body in health care.
Thoracoscopic (Minimally Invasive) Lung and Esophageal Resection at University of Colorado Hospital

Introduced in the mid to late 1990s, thoracoscopic techniques (video-assisted thoracoscopic surgery, or VATS) have become the standard of care for anatomic lung resection in North America. As such, it is imperative that trainees in cardiothoracic surgery gain significant experience in these techniques. At the University of Colorado, approximately 75% of anatomic lung resections (segmentectomy, lobectomy, bilobectomy) are performed via a minimally invasive approach. Exposure to these skills begins with the resident’s first rotation on the Thoracic Service, and continues to the completion of the training program. The high volume of cases typically leads to proficiency quickly, and it is expected that finishing residents be comfortable performing these cases in an independent fashion.

In addition to resections performed for malignancy, additional experience is gained through our Infectious Lung Disease Program run jointly with clinicians at National Jewish Health. Through this program, patients from across the United States come to Denver for evaluation regarding treatment for bronchiectasis, cavitary lung disease and other related disorders. Patients for whom surgery (anatomic lung resection) may be beneficial are seen at presentation, then scheduled for surgery at the University of Colorado. As a result, residents gain experience in a large volume of VATS resections, often intricate in nature – segmentectomy or removal of multiple segments, with routine use of thoracoscopic muscle flap transposition. Of course, not all of these patients are eligible for minimally invasive surgery, and this same program allows for exposure to the most complex and difficult types of lung resection – often with concomitant thoracoplasty or Eloesser flap creation.

Similar to the VATS program, our residents gain considerable experience in minimally invasive esophagectomy techniques, largely for malignant disease. Over the last 2 to 3 years, the clear majority of esophageal resections at our institution have been performed utilizing this approach, with excellent results. Again, the large number of cases assures residents of sufficient exposure to perform these cases in an independent manner by completion of the training program.
ECMO Program at University of Colorado Hospital

The ECMO program at UCH has been rapidly growing over the past several years both in the area of acute cardiogenic shock as well as in acute respiratory failure and bridge to lung transplantation. We are currently performing about 30 plus cases per year for various indications. Our outcomes have been excellent and have bolstered volumes for durable LVAD, heart transplant, and lung transplant by turning these critically ill patients into candidates for those therapies. We continue to perform outreach to attempt to grow the “hub and spoke” model for ECMO transfer and are developing a program to allow ECMO transport in the region. The residents gain significant experience in cannulation for VA ECMO, VV ECMO, Avalon cannula, and left ventricular venting as well as in the management of these complex patients. Dr. Ashok Babu serves as the medical director of the ECMO program in collaboration with the pulmonary critical care group and the heart failure cardiologists.

Thoracic Aortic Program at University of Colorado Hospital

The Thoracic Aortic Program at the University of Colorado has developed into a nationally recognized entity. Since 2009, the program has grown from isolated dissection cases with a smattering of elective procedures to a true multidisciplinary program offering the full spectrum of open and endovascular interventions from the root through the iliac arteries. The Thoracic Aortic Clinic facilitates the evaluation of patients with Marfans Syndrome, interstitial vascular disease, and familial aneurysmal syndrome. The care of these patients is shared among cardiothoracic surgery, vascular surgery, and cardiology. This collaboration has expanded the aortic root procedures being done and allowed for the volume to push Aortic Valve repair and Valve sparing root or David procedures. The aggressive approach towards ascending aneurysmal disease has led to >50 hypothermic circulatory arrest cases per year. The program participates in the IRAD and represents in the Society of Thoracic Surgeons Advanced TEVAR symposia. The endovascular program has grown from a few stent grafts a year to more than 40 per year. In conjunction with vascular surgery, the thoracoabdominal endovascular program has begun with physician modified endografts. Essentially, there is no aortic procedure that is not done at the University of Colorado. Residents will learn a simple, safe approach to these complex anatomic repairs. Graduating fellows have essentially done an aortic super-fellowship after three years at the University of Colorado.
TAVR Program at the University of Colorado

The TAVR program at the University of Colorado is very active and currently performs approximately 2-3 cases per week. It is a multi-disciplinary program in all regards. The procedures are performed in the hybrid operating room by a team from cardiac surgery and interventional cardiology. Patients referred for consideration of TAVR are evaluated in the Valve Clinic jointly by surgeons and cardiologists. The TAVR program in an active participant in clinical trials pertaining to TAVR, including the Partner II trial.

Treatment of End Stage Lung Disease at the University of Colorado

The University of Colorado Hospital is the only center in the region that performs comprehensive treatment of end stage lung disease. The lung transplant program performs approximately 30-40 lung transplants per year. The cardiothoracic surgery residents participate in all levels of this program including performing implantation of organs and procurement procedures. We are also one of the few centers in the United States performing ex-vivo lung perfusion as a modality to improve and identify additional lung donor organs. The program actively engages in the use of the available mechanical lung assist devices such as venovenous and arteriovenous ECMO. Lastly we are the only designated referral center in the region that performs lung volume reduction surgery.
Due to our geographic location, faculty interest, and collaboration with National Jewish Health, the University of Colorado serves as a major referral center for airway disease in the central United States. Trainees within the Thoracic Surgery program gain considerable experience in both endoscopic and open surgical approaches in the management of these challenging patients. Mastery of the basic surgical techniques used in airway surgery is expected of our finishing residents, and these techniques serve as the foundation for successful completion of any airway procedure as they move into independent practice.

A variety of endoscopic therapies for both benign and malignant disease are emphasized throughout the training program. Residents gain appreciable experience in both flexible and rigid bronchoscopy, and become expert in complex airway management. Additional experience, if desired, may be arranged with rotations with our interventional pulmonology staff. In addition to the standard bronchial sleeve resection techniques utilized with lung malignancies, residents see and operate on a considerable number of patients with benign tracheal and laryngotracheal stenosis. Indeed, over the last decade laryngotracheal resection and reconstruction for subglottic stenosis has become the most common airway procedure performed at our institution. Experience with these airway surgical techniques, although common within our program, remains rare in the majority of thoracic residencies nationwide.

Beyond endoscopic therapies and airway resection, a third component of our airway program involves surgical correction of central airway collapse, or tracheobronchial malacia. Patients who are found to have symptomatic airway malacia by bronchoscopic and dynamic CT imaging are given a trial of airway stenting; if the symptoms are relieved, they are offered surgical tracheobronchoplasty. Our program to address airway malacia, coordinated with colleagues at National Jewish, is one of the largest in the country.
Members of the Division of Cardiothoracic Surgery play an active role in clinical research at the University of Colorado School of Medicine. Surgical Outcomes and Applied Research (SOAR) is a formal commitment by the Department of Surgery in collaboration with the University of Colorado Adult and Child Center for Health Outcomes Research and Delivery Science to establish a leading program in surgical outcomes research. Members engage in weekly research meetings with ongoing projects and grant applications to achieve self-supported research. In addition to formal meetings, SOAR provides drop-in office hours to help with project design and provide statistical guidance.

**Clinical Trials Research**

In addition, the members of the Division of Cardiothoracic Surgery are involved in clinical trials research, ranging from:

- Contribution to the Lung Cancer Tumor Bank SPORE
- The PARTNER Trial of TAVR (vs) Surgical AVR
- The Endurance Trial (Heartware HVAD)
- Sorin Perceval Valve Trial
- VA grant for long term follow up of on and off pump patient groups
- RADIANT Trial: A Multi-center, Randomized, Double-blind, Placebo controlled, Phase 3 Study of Single-agent Tarceva (erlotinib) Following Complete Tumor Resection with or without Adjuvant Chemotherapy in Patients with Stage IB-IIIA Non-small Cell Lung Carcinoma who have EGFR-positive Tumors.
- SWOG-CALGB 140503 A phase III randomized trial of lobectomy versus sublobar resection for small (2 cm or less) peripheral non-small cell lung cancer.
- COAPT Mitral Clip
- Heartware Ventricular Assist Device for Destination Therapy NOVEL trial: Ex-vivo lung perfusion for lung transplantation
- PERIGON Valve Multi-Institutional Trail
Cardiothoracic Surgery Research Laboratory

The Division of Cardiothoracic Surgery Research Laboratory is located in the state-of-the-art Research Complex II adjacent to our physician office building. Dr. Fullerton is the Director of the Cardiothoracic Surgical Research Lab and Dr. Shin Meng oversees the laboratories. Dr. Meng is independently funded investigator from the NIH. Both are invaluable in the conduct of basic scientific research activities of the clinical faculty. Our laboratory is staffed at all times by professional research associates, surgical residents and medical students.

Several lines of basic scientific investigation are currently ongoing in our laboratory. Examples include:

1. The mechanisms of gastroduodenal reflux-induced histological changes in esophageal morphology
2. The pathogenesis of calcific aortic stenosis
3. The role of Toll-like receptors in myocardial ischemia/reperfusion
4. The mechanisms of macrophage differentiation into foam cells and dendritic cells
5. Mechanisms of spinal cord dysfunction following ischemia/reperfusion
6. Age-related changes in myocardial function
7. Genetic markers of aortopathy
8. The role of sPLA2 in lung and esophageal cancer

The Division has numerous research grants, thus offering a unique opportunity for both general and thoracic residents to perform and be exposed to research. An important strength of this laboratory arises from the synergy of combining research training with surgical research. Surgical research trainees not only are recognized as important resources in the design and conduct of the research, but also add fresh viewpoints to the research projects. Thoracic surgery residents are invited to participate in basic and clinical research activities of the Division.


117. Rocco G, Allen MS, Altorki NK, Asamura H, Blum MG, Deterbeck FC, Dresler CM, Gossot D, Grondin SC, Jaklitsch MT, Mitchell JD, Newton JR,


Scott R. Auerbach, Jane Gralla, David N Campbell, Shelley Miyamoto, and Biagio A. Pietra. Steroid Avoidance in Pediatric Heart Transplantation Results in Excellent Graft Survival. Transplantation 2014;97(4):474-80


