Modern treatments in orthopaedic surgery are experiencing tremendous advances in recent years. The Department of Orthopaedic Surgery and Rehabilitation at the University of Nebraska Medical Center is proud to be at the forefront of advances in both research and clinical care that allows us to participate in offering superior education to the residents who will make up the next generation of orthopaedic surgeons, as well as continuing to provide state-of-the-art treatment to our patients.

Every two years we bring you news of the department through this comprehensive Departmental Report to keep you abreast of what is happening in areas such as research, resident education, and patient care. Inside you will find the latest news regarding our faculty and residents, changes in our programs, and accomplishments throughout the department during the calendar years of 2004 and 2005, with a few highlights from 2006.

Four new faculty members have joined our full-time staff. We welcome to the department, Drs. Lori Reed (Foot & Ankle and General Orthopaedic Surgery), Brian Hasley (Pediatric Orthopaedic and Spine Surgery), Sean McGarry (Musculoskeletal Oncology), and Anthony Lauder (Hand and Upper Extremity). You can learn more about them in the "Meet Our Faculty" section of this report.

Long-time faculty member and friend, Dr. Walter Huurman retired to Professor Emeritus status this year and was honored in the spring with a celebration of his career and accomplishments. Maybe you attended the celebration or wrote in with a note of well-wishes; we thank you all for sharing your memories and helping us to honor Walt.

In our research labs at the Scott Technology Center, we are forging ahead with many exciting projects. Our state of the art Biomechanics Laboratory continues to make new strides in research regarding methodologies of in-vitro testing of implants, freehand navigation technology for minimally invasive surgery and several other innovative research projects. Next door in the Nanobiotechnology Laboratory, researchers are underway on several projects involving the development of nanocrystalline superhard coatings that would prolong the life of the implant by reducing wear. These coatings may also be used to create 'smart' surfaces that regulate cellular growth in order to enhance or prevent cell adhesion and proliferation as needed, to either improve health or prevent disease.

In addition, you can read about innovative arthritis research that we will soon be embarking upon due to the generosity of Ruth and Bill Scott. In the fall of 2006, the Ruth and Bill Scott Center for Outcomes Research is scheduled to open in Poynter Hall. In coordination with Dr. James O'Dell, professor of internal medicine and chief of the rheumatology and immunology section, we will create a study that, to our knowledge, will be the largest and most comprehensive study of its kind relating to arthritis epidemiology.

Over the past two years we have also shared with you the unfortunate news regarding the loss of three orthopaedic surgeons close to the heart of the department. Dr. Jackson Bence, a loyal teacher, and an active and devoted volunteer member, passed away February 3, 2004. Dr. O. Max Jardon will long be remembered as a mentor to residents, a valued faculty member, and a previous acting chairman of the department. Dr. Jardon passed away on August 3, 2004. Also a previous chairman of the department was Dr. James Neff, who passed away on July 12, 2005. Dr. Neff was an internationally recognized orthopaedic surgeon known for performing innovative procedures to help people lead a more normal life. In tribute to these inspiring individuals we have shared the stories of their many contributions in the "In Remembrance" section of this report.

We would like to extend our most sincere thanks to everyone who made private contributions to the department during the 2004-2005 calendar years. Please make sure to see the "Honor Roll of Contributors" that we have published to show our appreciation for these gifts, which provide vital support to the department's educational programs, research projects, and much more.

As the department progresses we will continue to bring you news of change. Hopefully you will enjoy the report and take heart in knowing that it is the support of our alumni and many friends of the department that help us to fulfill our mission of excellence in teaching, research, and patient care. Thank you for your support!

Of special note this year is the 125th Anniversary of the University of Nebraska Medical Center’s College of Medicine. We are proud to celebrate this significant milestone and to be a part of an organization with such a rich history and exciting future.

Kevin L. Garvin, M.D.
Professor and Chair
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The Department of Orthopaedic Surgery and Rehabilitation is a team of dedicated, caring, health professionals who specialize in the prevention, diagnosis, and treatment of musculoskeletal disorders in children, teenagers, and adults. Our department provides quality, cost-effective care to more than 35,000 patients each year from Nebraska, the Midwest, and around the world. Several of our department’s physicians are recognized on the annual "Best Doctors in America’ list and many serve the profession as leaders in local, state, national and international scientific organizations.

Orthopaedic surgeons work closely with caring, experienced nurses and consult with physicians in other medical specialties to provide the latest comprehensive care. Faculty physicians in Orthopaedic Surgery and Rehabilitation treat thousands of patients each year in the areas of:

**Adult reconstructive and general orthopaedics:**
inflammatory and degenerative joint problems, bone and soft tissue reconstruction and prosthetic joint replacement

**Foot and ankle surgery:**
foot and ankle disorders ranging from the common to the complex, from bunions to fractures

**Hand surgery:**
hand and wrist conditions such as arthritis, nerve compression, and repair of congenital hand deformities and injuries

**Orthopaedic oncology:**
benign and malignant bone and soft tissue tumors, bone grafts and custom prosthetic implants

**Shoulder and elbow:**
evaluation and management of shoulder and elbow arthritis, dislocations, fractures, and tendon tears

**Trauma:**
emergency evaluation, treatment, and long-term follow-up of fractures, dislocations, and other musculoskeletal injuries

**Pediatric orthopaedics:**
limb and spine deformities, bone and joint infections, and fractures and dislocations of the arms, legs, and spine in infants, children, and teenagers

**Sports medicine:**
treatment of injuries or illnesses related to sports such as sprains, ligament or cartilage injuries, or joint ailments in athletes of all ages

**Spine:**
evaluation and management of spine conditions such as deformities, injuries, and deterioration
In order to bring the newest treatment options to our patients, our faculty and researchers must remain on the cutting edge of orthopaedic research, which is also a large part of our department. Our Biomechanics Laboratory and Nano-Biotechnology Laboratory are housed in the Scott Technology Transfer and Incubator Center (STC), located on the Aksarben campus. In our Biomechanics Laboratory, biomedical engineers and other researchers are designing, building, and testing the next generation of orthopaedic implants and knee simulators. Our team of researchers and surgeons are developing a novel freehand computer navigational system for use in hip and knee replacement surgery, designed to improve surgical precision, help patients recover more quickly, and prolong the life of the artificial joints. In our Nano-Biotechnology Laboratory, another research team works with complex, highly sensitive equipment to analyze microcrystalline structures and to develop super thin, super hard ceramic/metallic coatings. This advanced technology will be instrumental in prolonging the life of metal orthopaedic prostheses and will have many other scientific and biomedical applications.

The department's researchers are attracting an increasing amount of external and international funding and acclaim, and have presented their results at prestigious national and international scientific and academic conferences. In October 2005, this research garnered international attention when the Department of Orthopaedic Surgery was awarded the HAP Paul Award for best research in new technology development (read more about this prestigious award on page 30.)

The department continues to build an ever-increasing surgery outcomes database linking research, patient treatment, and education. Currently there are over 2,135 patients in the database who have undergone total joint replacement, revision joint surgery, shoulder surgery, or treatment for Whiplash Associated Disorders (WAD). The database serves as a valuable tool for surgeons to evaluate and compare the effectiveness of various treatments.

Faculty and staff members consult and collaborate with physicians and researchers in other UNMC departments and colleges, including professionals in engineering, dentistry and oral surgery, neurosurgery, pediatrics, cardiology, and oncology to assist with patient care and research. Many of our department's scientists are collaborating with researchers around the world on innovative research projects that hold great promise for the future of orthopaedic surgery and other areas of medicine.

The department's 20 orthopaedic residents are involved in daily patient care and important research activities during their five years of intensive training. Fourteen full-time faculty and numerous staff members instruct, evaluate, and mentor our residents at various hospital locations on the UNMC campus. Many more Omaha-area orthopaedic surgeons serve as volunteer faculty members, supervising our residents as they rotate through different subspecialty private practice situations. Other department faculty, technicians, and a full-time research coordinator assist residents with their research projects.
KEVIN L. GARVIN, M.D., is professor and chairperson of the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation, as well as the L. Thomas Hood, M.D., Professor of Orthopaedic Surgery and Rehabilitation. He received his M.D. degree at the Medical College of Wisconsin. He completed a five-year internship and residency in orthopaedic surgery at the University of Arkansas for Medical Sciences in Little Rock and completed a fellowship in hip surgery at the Hospital for Special Surgery in New York City. He recently completed his term as Associate Editor for the Journal of Bone and Joint Surgery and continues to serve as a consultant reviewer. He is a deputy editor for Clinical Orthopaedics and Related Research and is on the editorial board for Techniques in Knee Surgery. Dr. Garvin is a board certified orthopaedic surgeon. He is a member of the Hip Society, the American Orthopaedic Association of Bone and Joint Surgeons, and the Mid-America Orthopaedic Association (Membership Committee Chair 2005-2006). Dr. Garvin was selected as one of Best Doctors in America 2005-2006. His special interests include hip and knee arthroplasty and orthopaedic infections.

PAUL W. ESPOSITO, M.D., is a Professor of Orthopaedic Surgery and Pediatrics at the University of Nebraska College of Medicine. He received his M.D. degree from Hahnemann Medical College and Hospital. He completed his internship and residency in orthopaedic surgery at the U.S. Naval Hospital, Oakland, California, and a pediatric orthopaedic fellowship at Children's Hospital Medical Center in Cincinnati. He is board certified and is a member of the Pediatric Orthopaedic Society of North America, a member of the American Orthopaedic Association, a Fellow of the American Academy of Orthopaedic Surgeons, and a Fellow of the American Academy of Pediatrics. Currently he is a reviewer for Pediatrics, and published by the American Academy of Pediatrics. Dr. Esposito was selected as one of Best Doctors in America 2005-2006, an honor he has received annually since 1998. Recently, Dr. Esposito was voted President-Elect of the Medical Staff at Children's Hospital (2006-2007), after which he will serve a two-year term as President. Until he begins his term as President, Dr. Esposito will continue to serve as Chief of Surgery at Children's Hospital, a position he held in 1996-1997 and again 2004-2007. Dr. Esposito's special interests are in children's extremity deformities, osteogenesis imperfecta, congenital and developmental disorders, and cerebral palsy.

EDWARD V. FEHRINGER, M.D., is an Assistant Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. He received his medical degree at the University of Nebraska College of Medicine. He then completed a five-year orthopaedic residency at the University of Nebraska/Creighton University Health Foundation. After completing his residency, Dr. Fehringer went on to complete a shoulder and elbow fellowship at the University of Washington School of Medicine in Seattle, Washington. He is board certified by the American Board of Orthopaedic Surgery, is a fellow of the American Academy of Orthopaedic Surgeons, and an associate member of the Arthroscopy Association of North America, a member of the American Medical Association, and a member of the Mid-America Orthopaedic Association. His clinical interests include shoulder and elbow arthritis, dislocations, fractures and tendon tears. His research interests include rotator cuff tears and their association with aging and shoulder socket reconstruction in shoulders with arthritis.
GLEN M. GINSBURG, M.D., is an Associate Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. He is also Medical Director of the Munroe-Meyer Motion Analysis Lab and of the Pediatric Botox Clinic. He earned his M.D. degree from the State University of New York at Buffalo and completed an orthopaedic residency at the State University of New York at Buffalo. Dr. Ginsburg completed a fellowship in pediatric orthopaedics at Children's Hospital in Los Angeles. A board certified orthopaedic surgeon, Dr. Ginsburg is a member of the Gait and Clinical Movement Analysis Society, the American Academy of Cerebral Palsy and Developmental Medicine, the American Academy of Orthopaedic Surgeons, and the Pediatric Orthopaedic Society of North America. He is a fellow of both the American Board of Orthopaedic Surgery and the Scoliosis Research Society. Dr. Ginsburg was selected as one of Best Doctors in America 2005-2006. His areas of focus include pediatric spine and gait disorders.

HANI HAIDER, PH.D. is an Associate Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. He is also Director of Biomedical Engineering Research. Dr. Haider earned his bachelor's and Ph.D. degrees in mechanical engineering at the University of Sheffield in England. He is a chartered member of the Engineering Council and the Institute of Mechanical Engineers in England. He is also a member of the Orthopaedic Research Society, the International Society for Technology in Arthroplasty, and the American Society of Testing and Materials (ASTM). He chairs the International Standards Organization (ISO) workgroup to review Total Knee Replacement wear testing standards, and co-chairs the ASTM's committee on knee wear testing. In October 2005, Dr. Haider received the prestigious HAP Paul Award for Outstanding Research in New Technology for Joint Replacement. Dr. Haider's focus in biomedical engineering and orthopaedics is on knee implant simulation and testing, minimally invasive implant design, and computer-aided orthopaedic surgery.

BRIAN P. HASLEY, M.D., is an Assistant Professor with the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. Dr. Hasley is a 1999 graduate of the University of Nebraska College of Medicine and completed his five-year orthopaedic surgery residency at the University of Nebraska/Creighton University Health Foundation. Following residency, Dr. Hasley completed the Dorothy and Bryant Edwards Fellowship in Pediatric Orthopaedic Surgery and Scoliosis at the Texas Scottish Rite Hospital for Children, University of Texas at Southwestern Medical Center, in Dallas, Texas. He then spent an additional three months in Dallas as the John S. Appleton Fellow in spine research. Dr. Hasley specializes in Pediatric Orthopaedic and Spine Surgery.
WALTER W. HUURMAN, M.D., is a Professor Emeritus of Orthopaedic Surgery and Pediatrics at the University of Nebraska College of Medicine. He received his M.D. degree from Northwestern University and completed his orthopaedic residency at the U.S. Naval Medical Center in Oakland, California. Dr. Huurman completed training in pediatric orthopaedic surgery at the A.I. duPont Institute. A board certified orthopaedic surgeon, Dr. Huurman has served on the editorial boards of the American Academy of Pediatrics journal, Pediatrics in Review, and the Journal of Pediatric Orthopaedics. He has served as associate editor of the Journal of Bone and Joint Surgery and on the editorial review boards of the Journal of the American Academy of Orthopaedic Surgeons, and Clinical Orthopaedics and Related Research. He is an oral examiner for the American Board of Orthopaedic Surgery, a member of the Pediatric Orthopaedic Society of North America, the American Academy of Orthopaedic Surgeons, the American Academy of Pediatrics, the North American Spine Society, and the American Orthopaedic Association. His areas of concentration include the juvenile spine, clubfoot, and juvenile hip disease, as well as editing pediatric publications. Dr. Walter Huurman retired to Professor Emeritus status on July 31, 2006. On page 12 you can read more about his career and accomplishments.

ANTHONY J. LAUDER, M.D., is an Assistant Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation, with a joint appointment in the Department of Plastic Surgery. Dr. Lauder received his medical degree from the University of Nebraska Medical Center in 2000. He completed an orthopaedic residency at the University of Nebraska/Creighton University Health Foundation in 2005. Following residency he moved to the west coast to complete a fellowship at the University of Washington Hand Surgery Program in Seattle, Washington. He is a candidate member of the American Society for Surgery of the Hand, and a resident member of both the American Academy of Orthopaedic Surgeons and Orthopaedic Research and Education Foundation. Dr. Lauder specializes in hand and upper extremity surgery and has special interests in traumatic and degenerative conditions related to the wrist.

SEAN V. MCGARRY, M.D., is an Assistant Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. Dr. McGarry received his medical degree from the Creighton University School of Medicine in 1998. He completed a surgery internship at the University of Colorado Health Sciences Center in 1999. Dr. McGarry continued on at the University of Colorado Health Sciences Center to complete his orthopaedic residency in 2004. Following residency, he completed an orthopaedic oncology fellowship at the University of Florida - Shands Hospital in 2005, where he began researching the role of stem cells in bone and soft tissue cancer. Dr. McGarry is a candidate member of both the American Academy of Orthopaedic Surgeons and the Musculoskeletal Tumor Society. He specializes in Orthopaedic Oncology with a focus on limb salvage.
MATTHEW A. MORMINO, M.D., is an Associate Professor and Residency Program Director, as well as the Herman Frank Johnson, M.D., Professor of Orthopaedic Surgery and Rehabilitation at the University of Nebraska College of Medicine’s Department of Orthopaedic Surgery and Rehabilitation. He received his M.D. degree from the University of Illinois College of Medicine and completed his orthopaedic surgery residency at University of Nebraska/Creighton University Health Foundation. He also completed a fellowship at the University of Washington. A board certified surgeon, Dr. Mormino is a diplomate of the American Board of Orthopaedic Surgery and a member of the American Academy of Orthopaedic Surgeons. He serves as a consultant reviewer of the Journal of the American Academy of Orthopaedic Surgeons, and was recently selected as one of the Best Doctors in America 2005-2006. Dr. Mormino's special concentrations include pelvic fractures, malunions and nonunions, foot and ankle trauma, and periarticular fractures.

FEREYDOON NAMAVAR, Sc.D. is a Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation, as well as Director of the Nano-Biotechnology Laboratory. He is an active member of the Center for Materials Research and Analysis (CMRA) at the University of Nebraska - Lincoln. Dr. Namavar earned a Sc.D. degree in nuclear physics from the Institute for Nuclear and Radiation Physics at the Katholieke Universiteit Leuven in Belgium. Presently, he is involved with the development of novel concepts and technologies to maximize the lifetime of orthopaedic implants and minimize the possibility of wear and revision surgery. These innovations include the development of novel nanostructure materials and diagnostic techniques for both in vitro and in vivo applications. Before joining the department, he was a Senior Scientist and Director of Nanotechnology at Spire Biomedical and Manager of Advanced Si-Based Technology for Spire Optoelectronics in Bedford, Massachusetts. Dr. Namavar has received grants and contracts from a variety of government agencies, ranging from NIH, NASA and NSF as well as from corporations. He holds several patents and collaborates with scientists at U.S. government laboratories and universities around the world.

N. ÅKE NYSTRÖM, M.D., Ph.D., is an Associate Professor at the University of Nebraska Medical Center’s Department of Orthopaedic Surgery and Rehabilitation, with a joint appointment in the Department of Plastic and Reconstructive Surgery. A native of Sweden, Dr. Nyström completed his medical training, internship, and residency at the University of Umea School of Medicine in Sweden. After completing a fellowship in hand and upper extremity surgery at the University of Louisville, he returned to Sweden. He later finished a Ph.D. in anatomy with research concentration in venous anatomy. He joined the UNMC faculty in 2001 after serving as Program Director of Hand Surgery at the University of Pittsburgh, 1994-2001. Dr. Nyström is board certified in Hand and Upper Extremity surgery, as well as Plastic and Reconstructive surgery. His research interests focus on cold intolerance after hand trauma, microvascular surgery, and surgical treatment of chronic pain in the head and neck after whiplash.
LORI K. REED, M.D., is an Assistant Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. Dr. Reed received her medical degree from the University of Iowa College of Medicine in 1999. She completed her orthopaedic surgery residency at the University of Nebraska/Creighton University Health Foundation. She then went on to complete her Foot and Ankle/Lower Extremity Reconstruction Fellowship at the Florida Orthopaedic Institute in Tampa, FL. Dr. Reed is a resident member of the American Academy of Orthopaedic Surgeons and the Orthopaedic Research and Education Foundation, a candidate member of the American Orthopaedic Foot and Ankle Society, and an Emerging Leader of the American Orthopaedic Association. Dr. Reed specializes in foot and ankle disorders, lower extremity post-traumatic reconstruction, and general orthopaedics.

SUSAN A. SCHERL, M.D., is an Associate Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. She earned her M.D. degree from the Boston University School of Medicine. Dr. Scherl completed two years of a general surgery residency at St. Luke's/Roosevelt Hospital Center in New York and completed a five-year orthopaedic residency at State University of New York Health Science Center, Brooklyn, NY. Dr. Scherl did her pediatric orthopaedic fellowship at Case Western Reserve University in Cleveland. She is board certified in Orthopaedic Surgery. Dr. Scherl is currently serving on the Pediatric Orthopaedic Society of North America Trauma and Prevention Committee Chair for 2005-2006, and is also a member of the AAOS Trauma Call Task Force. Her areas of focus are pediatric orthopaedic trauma and management of orthopaedic aspects of cerebral palsy.

TODD D. SEKUNDIAK, M.D., FRCS (C) is an Assistant Professor at the University of Nebraska College of Medicine's Department of Orthopaedic Surgery and Rehabilitation. He earned his M.D. degree from the University of Manitoba and completed an orthopaedic residency at the University of British Columbia, Vancouver, and the University of Manitoba, Winnipeg. Dr. Sekundiak completed fellowships in arthroplasty at the Arizona Centre for Joint Replacement in Phoenix and at Rush-Presbyterian St. Luke's and Central DuPage Hospitals, Chicago. Dr. Sekundiak is an international affiliate of the American Academy of Orthopaedic Surgeons, American Association of Hip and Knee Surgeons, and Canadian Orthopaedic Association. His areas of focus include hip and knee arthroplasty.
BEST DOCTORS 2005-2006

The Nebraska Medical Center had 176 physicians, representing 34 specialties, named to the 2005 Best Doctors in America list.

UNMC Physicians had over 100 of their physicians identified on the Best Doctors list.

From the Department of Orthopaedic Surgery, Drs. Paul Esposito, Kevin Garvin, Glen Ginsburg, Matthew Mormino and James Neff (deceased), were all named to the Best Doctors list for 2005-2006. The list is peer-selected and contains the top three to five percent of specialists in each state.

J.D. POWER & ASSOCIATES

In October of 2005, The Nebraska Medical Center was recognized by J.D. Power and Associates as being in a select group of hospitals nationwide to demonstrate the ability to consistently deliver "An Outstanding Patient Experience." The Nebraska Medical Center was the first hospital in Nebraska to receive this designation.

2005 Top Doctors

Thirty-one doctors at UNMC Physicians have been named among "America's Top Doctors," according to a national guide published annually by Castle Connolly Medical Ltd. of New York City.

From the Department of Orthopaedic Surgery, Dr. James Neff (deceased) was named to America's Top Doctors for 2004 and 2005. He was also named to America's Top Doctors for Cancer 2005.

2005 Hospital of Choice Award

The Nebraska Medical Center earned the 2005 Hospital of Choice Award from the American Alliance of Healthcare Providers. The hospital is one of only 35 hospitals across the country to receive the award, and the only hospital in a six-state region (NE, IA, KS, MN, CO and SD) to receive the award.
On April 28, 2006, friends, colleagues and family gathered at the Ironwood Golf & Country Club to celebrate the career and achievements of long-time faculty member Dr. Walter (Walt) W. Huurman. A presentation was given highlighting the personal contributions Walt has made over the years to the lives of his students, colleagues, friends and many patients.

Walt Huurman was born on March 16, 1936, in Rochester, NY. He received a B.S. in chemistry and biology (cum laude) from the University of Notre Dame in 1958, and his M.D. degree from Northwestern University in 1962. Following medical school, Walt completed a rotating internship at the Cook County Hospital in Chicago, IL, in 1963 and spent a year at the Naval School of Aviation Medicine. Following six months of basic flight training he was assigned to a carrier air group in Coronado, CA. He embarked on the USS Hornet and spent one year in the Vietnam war zone, after which he returned for a short time to his assignment at Coronado. He was then assigned to the Naval Air Station Miramar, CA, as the assistant medical director and flight surgeon to two F4 and F8 fighter squadrons. It was during this period that he met his future wife, Lindsay McGuiness, on the Coronado beach. They subsequently married and are now proud parents of Sean and Anne, and grandparents of five.

After completion of these tours Walt felt it was time to "get back to medicine." He completed his orthopaedic residency at the U.S. Naval Medical Center in Oakland, California, in 1971, and went on to complete a year of training in pediatric orthopaedic surgery at the A.I. duPont Institute in Wilmington, DE. Walt returned to Oakland and spent five years on staff at the Naval Regional Medical Center, where as director of pediatric orthopaedics, he established the 'in house' pediatric orthopaedic residency training service. He came to Omaha in 1977 and began what would be a long and prosperous career at UNMC's Department of Orthopaedic Surgery and Rehabilitation. In addition, he has had a longstanding appointment in the Department of Pediatrics since 1978, and has served as director of Children's Orthopaedics since 1977.

During Operation Desert Storm he was recalled to active duty, along with Drs. Paul Esposito and David Brown, and served the U.S. Marines as chief of orthopaedics at the U.S. Navy Field Hospital on the Bahrain-Saudi Arabian border. He returned to UNMC in 1991 and retired from the Navy in 1996.

Over the years, Walt has sustained membership in several professional societies and served on dozens of committees both locally and nationally. He has published 37 articles, 22 book chapters and reviews, and has given over 70 presentations both nationally and internationally, including several visiting professor lectureships. Walt has served on numerous editorial boards, including Pediatrics, Pediatrics in Review, and the Journal of Pediatric Orthopaedics. He has served as an associate editor of the Journal of Bone and Joint Surgery and on the editorial review boards of the Journal of the American Academy of Orthopaedic Surgeons, Clinical Orthopaedics and Related Research, and as an oral examiner for the American Board of Orthopaedic Surgery. He is a member of the Pediatric Orthopaedic Society of North America, the American Academy of Orthopaedic Surgeons, the American Academy of Pediatrics, the North American Spine Society, and the American Orthopaedic Association.

Currently he serves as consultant to the Surgeons General, president of the Northwestern University Medical Alumni Board, and chairman of the Regional University of Notre Dame Scholarship Foundation.

We thank all who joined us in the celebration and recognition of our friend Walter W. Huurman, as he retires to the status of Professor Emeritus at Department of Orthopaedic Surgery and prepares for the next phase of his productive and illustrative career. We wish him good luck in all his future endeavors and thank him for the many years he dedicated to the department, to the field of orthopaedics, and to his many, many patients.
IN REMEBRANCE OF

DISTINGUISHED FACULTY

JAMES R. NEFF, M.D.

“A TRUE LEADER”
“A GIANT IN HIS FIELD”

James Russell Neff, M.D., internationally recognized orthopaedic surgeon and faculty member for the University of Nebraska Medical Center, Department of Orthopaedic Surgery, died July 12, 2005, at the age of sixty-five after an extended battle with cancer.

James (Jim) Neff was born in Beloit, Kansas, in 1940 but spent his childhood years in Topeka, Kansas, attending public school there until graduating from high school in 1958. He received his undergraduate degree from Kansas State University in 1962, and went on to receive his medical degree from the University of Kansas College of Medicine in 1966. Jim spent the years of 1966 - 1968 at the University of Michigan at Ann Arbor, completing an internship in Surgery, followed by a residency in General Surgery.

Jim's training was interrupted by the call of duty and he spent a year aboard the USS George Marshall as a Lieutenant Commander. Following a year at sea, he was stationed at the United States Naval Submarine base in Groton, Connecticut, as an orthopaedic surgeon.

His duty honored, Jim resumed his training in Michigan, completing his orthopaedic residency in 1973, followed by a fellowship in Musculoskeletal Pathology at the University of Florida. It was here that he was exposed to novel limb sparing procedures for patients afflicted with osseous and soft tissue malignancies. He was a gifted orthopaedic surgeon upon arrival and by the completion of his fellowship a consummate tumor surgeon. In due course, he would make his mark as an innovative surgeon on the regional, national and international scene.

Jim left the University of Florida a much richer institution for his contributions and returned to the University of Kansas in 1975, where he pioneered the development of an outstanding program of patient care, education and research. He was later appointed professor of surgery at the University of Kansas, and in 1991 he joined the University of Nebraska Medical Center as professor and chairman of the Department of Orthopaedic Surgery and Rehabilitation.

"He was really brilliant - probably the best surgeon to come through Nebraska in any field," said Dr. Walter Huurman, professor of Orthopaedic Surgery and a colleague of Jim’s for 14 years. Dr. Huurman was also very impressed with how Jim looked after and nurtured the resident orthopaedic surgeons under his charge.

"Jim always took the time to learn as much about the residents as he could," he said. "When the residents left, they took with them Jim's concern for his patients as well as great admiration for his abilities."

Residents recall him with great admiration and almost a sense of awe. "He had a great 'presence' about him," said Dr. Craig Mahoney (2001). "Not a sense of 'intimidation,' but rather a sense that he was a 'fatherly figure' in the department."

Dr. Brian Brigman (2000) remembers Jim encouraging him when others gave little consideration to his choice to pursue a Ph.D. during his residency. This inspiring trait was a constant in all facets of Jim's life.

"His patience, ingenuity and willingness to take on, with aplomb, the most demanding of cases in the most despairing and deserving of patients inspired me," said Dr. Brigman. "His composure, humbleness, and serenity with himself and everyone around him as he continued his demanding work through chemotherapy treatments, despite the physical pain and frailty he developed (certainly for the first time in his life) without complaint or explanation was awe inspiring. He gave me a model to comport myself for the rest of my life. I will miss him dearly."

(Continued on next page)
A specialist in treating cancer of the bone and soft tissues, Jim was known around the world for performing innovative procedures to help people lead a more normal life following cancer. Two such procedures were the rotationplasty and the hemipelvectomy. Jim developed a custom hemipelvis and modular implant system to be used during a hemipelvectomy that could be adjusted in the operating room to fit the patient’s precise needs.

Jim was an innovator who was always thinking, always tinkering with new ideas. He created a workshop in his basement to test out his ideas and invented a knee fusion device used for patients with failed knee surgeries. This device, created nearly 25 years ago, is known as the "Neff Nail" and continues to be frequently used by orthopaedic surgeons today.

Jim's presence at University of Nebraska Medical Center was evident far beyond the realm of orthopaedics, impacting the departments of Radiology, Oncology, Radiation Oncology, Pediatrics, Pathology, Genetics and Physical Therapy. The orthopaedic residency program was revolutionized by the vast amount of knowledge that Jim contributed in all of these areas, expanding their education and training far beyond orthopaedics.

Jim's resume was laden with accomplishments and honors. He published over 150 articles in scientific journals and authored 14 books or book chapters. He gave 149 presentations at local, national and international scientific meetings.

Over the years Jim was active in many national and international leadership roles, was a member of countless organizations, and served on dozens of boards and committees. For nearly two decades he served as an examiner for the American Board of Orthopaedic Surgery, and for twenty-five years was an associate editor for Clinical Orthopaedics and Related Research. In addition, Jim played an enabling role in the establishment of the North American Musculoskeletal Tumor Society and the International Society of Limb Salvage, known as a group of premier thinkers and visionaries. In 2005, he was selected to receive the University of Kansas Distinguished Medical Alumni Award.

Both colleagues and patients, including children, often praised Jim's compassionate demeanor. Patients described him as "caring and courageous," "calm and compassionate" and a "gifted healer." Hundreds of patients thanked Jim's family for allowing him to share his time and devotion with so many patients that desperately needed his healing hands.

Since his passing patients, operating room personnel, nurses, support staff and colleagues have offered their feelings of respect, affection and reverence for Jim, both personally and professionally. The medical community has lost an intellect; his patients have sustained the departure of a trusted friend and healer; his students are bereft of their mentor; colleagues will miss his counsel; and friends are left with memories.

Jim is survived by his wife, Julia Bridge, M.D., Professor, University of Nebraska Medical Center Pathology and Microbiology; daughters, Rachael and Kirsten; son, Gregory; and stepson, Stuart.

At a memorial service on August 6th, 2005, at the Dundee Presbyterian Church in Omaha, Nebraska, many people gathered to pay their respects to a surgeon, a colleague, a husband, a father, and a friend. In a heartfelt statement written by Jim prior to his death, he stated, "I have so many people to thank for my rich and eventful life - patients, colleagues, friends and family... I bid you farewell as I assume the role in my next challenge. I implore you to make the most of life..."

On October 5th, 2005, there was a burial service with full military honors for Dr. James Russell Neff at Arlington National Cemetery, in Arlington, Virginia.

To honor his many contributions, we have established the James R. Neff Endowed Chair at the University of Nebraska Medical Center, Department of Orthopaedic Surgery and Rehabilitation, so that those who come after this phenomenal individual may be as inspired by him as those of us who were able to experience him in life. If you are interested in making a donation, or would like more information regarding this endowment, please contact the University of Nebraska Foundation's Omaha office at 8712 West Dodge Street, Suite 100, Omaha, NE 68114. Or you may call them at (402) 595-2302.
O. Max Jardon, M.D.

Dr. O. Max Jardon, 72, passed away in Corpus Christi, TX, on August 23, 2004. He will be remembered for his many years as a faculty member and mentor to residents.

Born in Long Island, KS, Oscar M. Jardon graduated from Nebraska State College at Kearney in 1952 and from UNMC's College of Medicine in 1957. He completed an internship at Clarkson Hospital and served four years in the Army. Dr. Jardon operated a family practice in Loop City, NE, for before returning to UNMC for an orthopaedic residency. When he graduated in 1972, he became the second person to complete the department's modern-era training program. During his residency, Dr. Jardon joined the Air Force Reserve, eventually reaching the rank of Brigadier General.

Dr. Jardon joined the UNMC orthopaedic faculty and later served as acting chairman of the department. As a faculty member, Dr. Jardon focused on adult reconstructive surgery and trauma management. His research interests were in biologically fixed endoprosthetics, heat stress, and malignant hyperthermia. Dr. Jardon also served as a consultant to State Services for Crippled Children, was chief of orthopaedic surgery at Omaha's Veterans Administration Hospital, and was active in many medical organizations and civic groups. Dr. Jardon retired from the Air Force in 1993 and from UNMC in 1996, achieving professor emeritus status.

According to Dr. Walter Huurman, Dr. Jardon was widely known as an innovative, pioneering surgeon and endearingly recognized as a rough, gruff orthopaedist who was sensitive and soft under that veneer. "Max played a major role in molding the career of more than 75 orthopaedic residents," says Dr. Huurman. "They and all others who worked with him have forever etched in their memories a long list of never-to-be-forgotten euphemistic Max-isms." Teacher, counselor, surgical healer and friend, Max you will be missed.

Jackson Bence, M.D.

Dr. Jackson Bence, 75, passed away February 3, 2004, at his home in Lincoln, Nebraska. Dr. Bence supervised orthopaedic surgery residents training at the Veterans Administration Hospital. In 2003, he was promoted to clinical assistant professor.

After graduation from Broken Bow High School, he served in the U.S. Navy, then attended Hastings College. He was called back into the Navy Reserves during the Korean War and served another two years before finishing his pre-med education. He earned his M.D. from the University of Nebraska College of Medicine in 1958. After several years in private practice, he moved to Kansas City for an orthopaedic residency. He practiced in Grand Island until he retired in 1986. He moved to Lincoln and went to work at the VA Medical Center, still traveling to see patients in Grand Island and Omaha.

"We must learn constantly," Dr. Bence once said. "That's what makes medicine exciting; and that's why I enjoy teaching residents, because I learn too."
The UNMC Department of Orthopaedic Surgery and Rehabilitation is combined with Creighton University Medical School under the auspices of the Nebraska-Creighton Health Foundation. Located in metropolitan Omaha, our residency program provides an outstanding educational experience, a safe town with affordable living, and an enriched social environment.

The combined program is directed by Matthew Mormino, M.D., associate professor of orthopaedic surgery at UNMC. The program includes training in all the orthopaedic subspecialties:

- HAND
- FOOT AND ANKLE
- MAJOR JOINT RECONSTRUCTION
- ONCOLOGY
- PEDIATRIC ORTHOPAEDIC SURGERY
- SHOULDER AND ELBOW
- SPINE
- SPORTS MEDICINE
- TRAUMA

Our orthopaedic residents are involved in daily patient care as well as important research activities during their intensive training. As part of The Nebraska Medical Center, the University Hospital is a Level I Trauma Center, and our orthopaedic surgery residents play an integral role on the hospital trauma team.

The program received full accreditation by the Residency Review Committee of the Accreditation Council for Graduate Medical Education (ACGME) in February 2006. Recent changes have been added to the residency curriculum to address the six core competencies as outlined by the ACGME outcome project for Resident Education:

- PATIENT CARE
- INTERPERSONAL AND COMMUNICATION SKILLS
- PROFESSIONALISM
- MEDICAL KNOWLEDGE
- SYSTEMS BASED PRACTICE
- PRACTICE BASED LEARNING AND IMPROVEMENT

Likewise 80-hour work week restrictions have been met in our residents’ schedules. Overall the addition of new attending staff and the changes to the curriculum improved an already excellent residency training program.

Of all the men and women who have completed their orthopaedic surgical training through the Nebraska program, more than half are now practicing in the state or the Midwest. The remaining physicians are practicing around the country and overseas. Doctors throughout the region regard UNMC as a source of continuing education where they can learn the latest techniques for diagnosis, treatment, and prevention of bone and joint diseases.
Despite the city’s vibrant growth, residents enjoy a low-stress, small-town atmosphere. Visitors notice the friendly smiles and soon feel right at home. Omaha residents are proud of their city's reputation for superb health care, agriculture, telemarketing and tech businesses, and the affordable quality of life. Located on the west bank of the Missouri River in the U.S. "heartland" Omaha welcomes visitors from all over the world as they arrive at the city's airport, located only minutes from the medical center and comfortable accommodations.

Outside of work, residents can enjoy a variety of social activities including many wonderful restaurants and nightclubs, several sporting events, numerous music and arts venues, and various social gatherings held by the residents and their families throughout the year.

We tout a claim to fame for the Nebraska Cornhuskers, College World Series, Creighton University basketball, Omaha Royals baseball, three hockey teams and the annual Cox Classic, amongst others. Omaha is also well known for the historic Old Market, Qwest Center Omaha, Joslyn Art Museum, Holland Performing Arts Center, Bemis Center for Contemporary Arts, Durham Western Heritage Museum, Henry Doorly Zoo, and many more wonderful theatre and arts facilities.

Qwest Center Omaha is the site of the 2006 NCAA volleyball finals, the 2008 U.S. Olympic Swimming Trials and the 2010 NCAA Division I wrestling championships. Rosenblatt Stadium is home to the NCAA Men's College World Series and the Omaha Royals AAA baseball team.

The Omaha area also features many city and state parks, dozens of jogging and biking trails, family entertainment and water parks, championship golf courses, and several lake and recreation areas.

Each year residents get together for the infamous Crawfish Boil, Oktoberfest, Halloween, Christmas and New Years. There is an annual Welcome BBQ for incoming residents and various other events such as flag football and intramural basketball throughout the year.
MEET OUR

RESIDENTS

CURRENT RESIDENTS

CLASS OF 2007

DAVID BUCK, M.D.
Hometown: Sumner, WA
College: Western Washington University
Medical School: University of Washington
Area of clinical/research interest: General Orthopaedics/Trauma
Activities/hobbies: Photography, Golf, Baseball

BEAU KONIGSBERG, M.D.
Hometown: Omaha, NE
College: University of Colorado - Boulder
Medical School: University of Nebraska Medical Center
Area of clinical/research interest: Hip and Knee Arthroplasty

SCOTT SWANSON, M.D.
Hometown: Alliance, NE
College: Creighton University
Medical School: University of Nebraska College of Medicine
Area of clinical/research interest: Foot and Ankle Trauma
Activities/hobbies: Completed 10 marathons, including 2001 Boston Marathon

KIMBERLY TURMAN, M.D.
Hometown: Sioux Falls, SD
College: University of Nebraska - Lincoln
Medical School: University of Nebraska Medical Center
Area of clinical/research interest: Sports Medicine
Activities/hobbies: Hanging out with my kids

CLASS OF 2008

CURTIS HARTMAN, M.D.
Hometown: Hermann, MO
College: University of Missouri-Columbia
Medical School: University of Missouri-Columbia
Area of clinical/research interest: Arthroplasty
Activities/hobbies: golf, upland bird hunting, skiing, traveling, reading

MICHAEL HAWKS, M.D.
Hometown: Tampa, FL
College: Kennesaw State University/Oglethorpe University
Medical School: University of South Florida College of Medicine
Area of clinical/research interest: Trauma
Activities/hobbies: golf, basketball
LEONARD KIBUULE, M.D.

Hometown: Dallas, TX  
College: University of Texas at Austin  
Medical School: University of Texas Southwestern Medical Center  
Area of clinical/research interest: Orthopaedic Spine. Biomechanical research studies and innovative applied technology in orthopaedics. 
Activities/hobbies: Traveling overseas, hiking and biking, photography

RANDON JOHNSON, M.D.

Hometown: Goodland, KS  
College: The University of Arizona  
Medical School: University of Arizona Medical School

ERICA BURNS, M.D.

Hometown: Moxee, WA  
College: Central Washington University  
Medical School: Creighton Medical School  
Activities/hobbies: Volleyball & other sports, hiking, biking, outdoors

CLASS OF 2009

CASEY JOHNSTON, M.D.

Hometown: Alliance, NE  
College: University of Nebraska  
Medical School: University of Nebraska Medical Center  
Area of clinical/research interest: General Orthopaedics  
Activities/hobbies: Fishing, hunting, golf, outdoor activities, and Nebraska football

BRIAN KLEIBER, M.D.

Hometown: St. Louis, MO  
College: University of Missouri  
Medical School: University of Missouri  
Area of clinical/research interest: Trauma; General Orthopaedics  
Activities/hobbies: racquetball, hunting, fishing, college sports, St. Louis Cardinals fan

JUSTIN SIEBLER, M.D.

Hometown: Lincoln, NE  
College: University of Nebraska - Omaha  
Medical School: University of Nebraska Medical Center  
Area of clinical/research interest: Research project: Humeral Shaft Fractures  
Activities/hobbies: Spending time with my wife and children
RYAN ARNOLD, M.D.
Hometown: Omaha, NE
College: Vanderbilt University
Medical School: University of Nebraska
Activities/hobbies: Basketball, golfing, outdoor activities, music

KURT BORMANN, M.D.
Hometown: Algona, IA
College: Truman State University
Medical School: University of Iowa
Activities/hobbies: Home improvement, spending time with my wife and St. Bernard, reading

GUSTAVO CORDERO, M.D.
Hometown: Northridge, CA
College: University of California, Los Angeles
Medical School: University of California, Davis
Area of clinical/research interest: Total joints, evaluation of various fixation devices for fractures
Activities/hobbies: Fishing, skiing, basketball, computers

MICHAEL SHEVLIN, M.D.
Hometown: Helena, MT
College: Carroll College
Medical School: University of Washington
Area of clinical/research interest: General Orthopaedics
Activities/hobbies: Golf, skiing, watching football, reading

MICHAEL J. CARLSON, M.D.
Medical School: Medical College of Wisconsin

MICHAEL S. DEE, M.D.
Medical School: University of Utah

JASON M. ERPELDING, M.D.
Medical School: University of North Dakota

DANIEL E. FIRESTONE, M.D.
Medical School: University of Iowa
When Nebraska residents complete their training they move on to the next stage in their training. Many choose to continue their education by choosing one of many exceptional fellowship opportunities around the country. Below is a list of our most recent graduates and the fellowships they chose.

**2006 GRADUATES**

**Kathleen M. Grier, M.D.**
Florida Orthopaedic Institute  
Foot and Ankle Fellowship  
Tampa General Hospital  
Tampa, FL

**Charles E. Rosipal, M.D.**
Shoulder Surgery Fellowship  
University of Texas - San Antonio  
San Antonio, TX

**Steven J. Volin, M.D.**
Spine Fellowship  
University of Virginia Health System  
Department of Orthopaedics  
Charlottesville, VA

**Daniel S. Mulconrey, M.D.**
Washington University School of Medicine/  
Barnes-Jewish Hospital Spine Fellowship  
St. Louis, MO

**Mark E. Dietrich, M.D.**
Minnesota Sports Medicine Fellowship  
Minneapolis, MN

**2005 GRADUATES**

**Scott Humphrey, M.D.**
The Tom Norris Shoulder and Upper Extremity Surgery Fellowship  
California Pacific Medical Center  
San Francisco, CA

**Anthony Lauder, M.D.**
Hand Surgery Fellowship  
University of Washington  
Seattle, WA

**Edward Prince, M.D.**
Adult Reconstruction Fellowship  
University of Utah  
Salt Lake City, UT

**Ivan Tarkin, M.D.**
Twin Cities Orthopaedic Trauma Fellowship  
Minneapolis/St. Paul, Minnesota
Of all the men and women who have completed their orthopaedic surgical training through the Nebraska program, more than half are now practicing in the state or the Midwest. The following is a list of all department alumni since the orthopaedic residency program was established (1971-2006). The accompanying map shows the locations of our graduates in the United States, according to the department’s most recent records.

### UNIVERSITY OF NEBRASKA/CREIGHTON UNIVERSITY ORTHOPAEDIC ALUMNI 1971-2006

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<td>Oscar Jardon</td>
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* Deceased
In the department’s Nano-Biotechnology Laboratory (NanoLab) faculty and researchers are using ions and atoms undetectable by the human eye to make big advances in the field of orthopaedic surgery. They are using ion bombardment “ionic hammer” engineered surfaces with high hardness and ultra-hydrophilic properties to reduce friction and wear. The NanoLab is housed in the Scott Technology Transfer and Incubation Center (STC) on the Aksarben campus and is directed by Fereydoon Namavar, Sc.D., professor of the Department of Orthopaedic Surgery and Rehabilitation.

Artificial joint replacements are commonly used in hips and knees, frequently used in shoulders, and within the last two years the first artificial spinal disc has been approved by the U.S. Food and Drug Administration. In many aspects, these artificial implants share similar mechanic and material characteristics. The joint implants have articulating surfaces in various configurations of metal-polyethylene, metal-metal, ceramic-polyethylene, etc. Likewise, the most common designs of the artificial spinal disc have two metal plates attached to the vertebrae above and below the affected disc, which is then replaced by a polymer insert. While all these implants, including spinal discs, relieve pain and increase function, they are susceptible to wear because they involve some mode of articulation.

Although prosthetic joints often last more than 15 years, the devices are not always durable enough for young, active patients or for heavier patients. Revision surgery is required when the device fails, but these procedures are generally less successful than the primary surgery and costly in terms of patient hardship and expense. Extending the life of artificial implants would eliminate patient suffering and save substantial health care dollars. The potential impact of this research is huge. Arthritis affects more than 40 million Americans.

Dr. Namavar and his research staff are currently involved in several research projects focused on developing nanocrystalline superhard coatings that would prolong the life of the implant by reducing wear. Nanocrystalline coatings can also be used to create ‘smart’ surfaces that regulate cellular growth in order to enhance or prevent cell adhesion and proliferation as needed, to either improve health or prevent disease.

**Applying Nanotechnology in total joint arthroplasty: I. Reducing the wear of orthopaedic implants**

The core technology of the NanoLab is the ion-beam-assisted deposition (IBAD) system which was established at the STC in 2003. IBAD generates a vapor flux of atoms of metal, alloys, or ceramics from several crucibles. The crucible is heated to a few thousand degrees Fahrenheit by an intense electron beam from a powerful electron gun and the generated atoms are deposited on target substrates. Ion bombardment is crucial for designing nano-structured characteristics of the surface resulting in improved hardness, adhesion, morphology, and chemical composition. The energetic ions are employed to produce ‘engineered nanocrystals’ with superior mechanical properties that are then ‘stitched’ to any substrate by bombardment. Billions and billions of ions with controlled energy, direction and fluences act as an ionic hammer to forge a specific desired surface structure at the NANO-SCALE level.

“To our knowledge our IBAD system is unparalleled in any academic institution in the United States and is comparable or better than most systems that are being used by high technology companies,” said Dr. Namavar. NanoLab ion beam technology is also capable of creating materials for other biomedical applications such as cardiology stents, urology catheters, dental implants, as well as DNA microarray. The technology may even address important issues related to the energy sector or the environment. Dr. Namavar explained that, for example, by reducing the size of stainless steel or cobalt chromium crystals and their orders they have produced stainless steel or cobalt chromium which is three to five times harder than conventional ones (United States Patent 7,048,767, May 23, 2006, F. Namavar).
Furthermore, Dr. Namavar said that by combining the NanoLab capabilities with the expertise of Dr. Hani Haider (director of the Biomechanics Laboratory) and Dr. Kevin Garvin (professor and chair) we will be able to increase longevity of total joint arthroplasty by improving the wear properties of artificial implants.

II. Regulating bone growth and studying cell adhesion, growth and differentiation on Nano-structured Surfaces

How does a micron size cell communicate or interact with a nanostructure that is 1000 times smaller than it is? This is the new topic that Dr. Namavar and his collaborators are focusing on. He explains that, “our preliminary research, in collaboration with Dr. John Jackson of the Department of Pathology and Microbiology and Dr. Graham Sharp of the Department of Genetics, Cell Biology and Anatomy, indicates that both materials and their nanoscale properties influence attachment, survival and growth of bone marrow stromal cells.” Dr. Namavar went on to explain that “understanding how cells communicate with surfaces and nanostructures would pave the way for producing methods to reduce infection and regulate bone growth, as well as allow tissue engineering.”

Dr. Namavar’s research includes:

* Application of nanotechnology in total joint arthroplasty to:
  (i) Reduce wear of orthopaedic implants and thereby reduce revision surgery
  (ii) Control bone growth

* Interaction of cells and organisms with micro and nanostructured engineered materials (hard tissue engineering)

* Effects of electrical stimulation (or localized charges) on growth and differentiation of cells on nano-engineered surfaces (combining nanotechnology with adult stem cell technology for cell purification and proliferation)

* Development of smart infection-resistant coatings for orthopaedic and dental implants

* In vitro and in vivo absolute wear measurements of orthopaedic implants
When the department’s Biomechanics Laboratory moved into the Scott Technology Center (STC) in 2003, their focus was on developing new methods and technology for testing of artificial joints before clinical use, and advanced Computer Aided Orthopaedic Surgery (CAOS) tools for joint replacement. With the same primary focus, the research lab faculty and staff are expanding their current projects to explore new horizons in exciting areas. “Computers, intelligent cybernetics and robotics will play an even more important role in tomorrow’s surgical techniques and implant technology,” said Dr. Hani Haider, director of the Biomechanics Laboratory and associate professor of Orthopaedic Surgery.

Navigated Freehand Bone Cutting Research:

One of the most exciting projects underway in the Biomechanics Lab is the creation of a novel navigation system that will exploit computer navigation in a new way, to reduce the need for bulky alignment instruments (jigs) in knee replacement surgery. This technology was born in Nebraska through a large-scale project which has progressed over the course of several years. Our researchers have developed a software environment to create patient-specific 3-D bone models on a computer screen, drive several cameras to track movement of instruments and bones, and render those movements and how they interact realistically on a computer screen and in real-time. The desired surgical bone cuts are depicted as target planes superimposed on the 3-D models of the bones. The surgeon can see on the screen the bone, the desired target cuts and also the instantaneous position of their hand-held cutting or other instruments. Real-time computer guidance is provided to achieve faster, more accurate bone cutting and better alignment of implants with less trauma to the soft tissue and bone. A prototype of the system has been created, and our lab researchers and arthroplasty surgeons are collaborating to test and evaluate how the system will be configured for an actual OR environment. Both the electronics of the instrumentation, and the computer graphical user interfaces are evolving fast to make the system “smarter.” Eventually, the computer will have the ability to “tell” the surgeon in a variety of ways before an error is likely to occur and will indicate the correct action. The reduction in mechanical alignment jigs will also facilitate MIS incisions and add speed and more utility to the hardware required for joint replacement surgery.

This research and the technology it produced have garnered national and international attention. In October of 2005, Dr. Haider and his team were honored with the HAP Paul Award for outstanding research in new technology for joint replacement by the International Society for Technology in Arthroplasty (ISTA), the group’s highest honor for distinguished research. (Read more about this honor and the research involved on page 30.) Early in 2006, a team of seven arthroplasty surgeons from various hospitals in the USA participated in objectively evaluating the technology in the lab, and all showed great enthusiasm. One esteemed surgeon asked if they could have a system to use now in their clinic; it would enable them to more flexibly and truly less invasively align their total and unicompartmental knee replacements.

Robotics; the next generation of simulators:

For artificial joint implants to be successful and to please the modern patient, they have to “perform” better and “last” for a much longer lifetime in-vivo. Rigorous testing must be completed on implants to determine their performance and durability before they are approved for use clinically. Researchers in the Biomechanics Lab in Nebraska continue to play an important role internationally in developing the next generation of methodologies and simulators for wear testing of implants. This field continues to evolve to keep up with new developments in implant technology. For instance, in recent years most companies have developed new “high flexion” implants which cater to rising expectations from the younger and more active patients. Current simulators principally designed to test for wear, struggle to capture some aspects of implant performance, let alone test for those advanced and most subtle features.
Orthopaedics Biomechanics Laboratory

Advanced Surgical Technologies

Our preliminary results of this work have been published in 17 papers:
- International Society for technology in Arthroplasty (ISTA)
- American Academy of Orthopaedic Surgeons (AAOS)
- International Society for Computer Aided Orthopaedic Surgery, (CACS)
- Orthopaedic Research Societies of Canada, USA, Japan and Europe
- International Conference on Mechanics of Biomaterials & Tissues (ICMBT)
- Orthopaedic Research Society

This work has won the HAP Paul Award
As the best research paper "... on new development in the field of orthopaedic arthroplasty" at the International Society for technology in Arthroplasty, Kyoto, Japan 2005.

Nebraska’s in-house developed Navigation System for Knee Surgery

The use of JIGS for cutting bones to fit the implant can be avoided

by creating a virtual 3D environment system with meaningful feedback to the surgeon for cutting freehand by navigation.

Future promise: Smart Implants

On-board microprocessor:
- Process measurements
- Store results
- Communicate them non-invasively (by radio) to the surgeon/therapist during follow-up visits.

Pilot study conducted with the help of UNL.

Our preliminary results published in:
- J. Mechatronics ASME/IEEE 2005 (two papers)

Rapid Prototyping (RP) & RP surgical modeling

We have processed (in-house)
- CT imaging data, and manufactured (in-house)
- rapid 3D anatomical prototypes representing complex patient anatomy.
The models were used to aid planning of knee and hip surgery in our hospital.

Most tangible & realistic representation of a patient’s anatomy
... physically in the hands of a surgeon!

Smart Instrumented Implants

Our ultimate goal

In-vivo diagnostics for early detection of:
- implant wear
- misalignment
- loosening
- and self-healing implants

Diagnostics & adaptive action

We demonstrated the feasibility of using piezoelectric ceramics to generate electrical energy within Total Knee Replacement (TKR) implants

Finite Element Analysis & Minimally-invasive implant design

Philosophy of Minimally invasive surgery:
- Smaller surgical access - small scar
- Little bone removal – conservative, leaves options open
- Less soft tissue trauma
- Faster recovery time - one day operation possible
- Suitable for the younger, more active patient.

Our Studies published:
9 presentations have been made on this work in ISTA 2005, ICMBT 2005 and ORS 2006.
of high flexion and other extremes of motion. Researchers in the Biomechanics Lab are designing and building a lower limb simulator to test these high flex implants, but with a twist that to their knowledge is unique. Resembling a robotic leg, this simulator features "fluidic muscles" which exert more realistic forces onto cadaveric or synthetic knee specimens. This machine can demonstrate and help solve TKR design to prevent bony impingement, subluxation and to improve patellar tracking.

Researchers have also adapted a knee simulator to allow for testing of a total ankle replacement system, and commissioned a new state-of-the-art hip wear simulator to test total hip replacement systems. The latter was adapted recently to also test a spinal disc implant, something not many labs do. The lab’s innovative work on wear testing of joints is helping to set national and international standards for testing of knee replacement systems. Dr. Haider was elected to chair the International Standards Organization (ISO) task group responsible for reviewing the two standards for testing of Total Knee Replacement Systems; and is Co-Chair of the American Society for Testing and Materials (ASTM) committee for developing standards for testing of Total Knee Replacement Systems. He also chairs the ASTM’s new committee for developing standards for specifications and testing of Total Ankle Replacement Systems. In 2005, Dr. Haider and Research Associate Andres Barrera, were invited to be committee members of the ASTM committee for Computer Assisted Orthopaedic Surgery (CAOS) standards.

**Finite Element Analysis:**

Joint replacement implants will become less invasive and generally more bone-conservative. Researchers in the lab have combined their expertise on mathematically interpreting 3-D computer tomography imaging (CT) with established finite element analysis techniques to help computationally simulate the loading of implant-bone combinations. A novel technique was created to model the bone’s non-uniform shape and very complex variations in bone density (and therefore strength) in such Finite Element solutions. The suite of software tools created help gather information on how the bone and the implant share the mechanical stress when under load in the body. The desire is to optimize and help predict the sharing of such stress. If the bone is not stressed enough it will essentially be reabsorbed over time; in addition, if it is loaded improperly, the implant can loosen and its life will be minimized. The finite element analysis research happening in Nebraska helps more accurately, and therefore more realistically, determine the stress patterns of bone-implant combinations by taking into account the “fully-distributed” nature of bone properties extracted from CT imaging; these range from the hard cortical, to the softer cancellous bone all the way to the softest bony regions. This new technique was presented at ISTA’s annual meeting in Japan (2005) and recently at the Orthopaedic Research Society’s annual meeting (2006).

**Electronically Instrumented Implants:**

Two years ago researchers in the Biomechanics Lab were interested in finding out if it was possible to use the piezoelectric effect to harness forces within knee implants to self-generate power for electronics on board the implant. Future “Smart Implants” can perpetually collect information about the status of the implant, including wear, alignment and other data, etc. Today, the lab is in the process of creating a model to
Simulation & durability testing of Orthopaedic Knee Replacement implants

Knee implant motion
Laboratory (in-vitro) simulation and testing (human walking activity)

Knee laxity studies

Produced state-of-the-art simulator to test Knee Replacement implants

Methodology now adopted as an International Standard Test Method (ISO 14243-1)

We have 3 of these knee simulators in our lab and are fast becoming the top lab internationally in knee testing. Research evaluates new knee implant designs before clinical use, or produce reliable lab performance data for regulatory purposes and design improvement.

Knee implant wear studies

Our Studies published:

Kinematics (motion) of knee implants

Our studies published:

Effect of surgical misalignment of knees

Our published studies:

Hip, spine and ankle implant testing

State-of-the-art AMTI 12-station Hip and Spine Simulator

Testing machine design

Design and prototype manufacture of new innovative biomechanics test machines

Special jigs and fixtures built in our lab
This setup is almost unique in the world
To aid design of new implants with high flexion capability for younger and more active patients.
American Standard method (ASTM F1223) has recently been revised based on our results.

Our Studies published:

Friction Measuring Machine (tribometer)

Specially high dynamic range for orthopaedic and other industrial applications.

Research contract work at our lab from:
- AstraTech Inc. Sweden
- Biomet Inc. IN
- Encore OrthoTech Inc. TX
- Smith & Nephew Inc. IN
- DePuy Johnson & Johnson Inc. IN
- Kyoeika Inc. Japan
- Zimmer Inc. IN

All are multinational orthopaedic manufacturing companies.
UNMC RECEIVES THE HAP PAUL AWARD FOR OUTSTANDING RESEARCH IN NEW TECHNOLOGY FOR JOINT REPLACEMENT

The HAP Paul Award for best research in new technology development in joint replacement was awarded to the University of Nebraska Medical Center (UNMC) by the International Society for Technology in Arthroplasty (ISTA). The award is the international group’s highest honor for distinguished research, established to honor the outstanding contribution of Howard A. Paul, DVM, a tireless researcher advancing the science and technology of arthroplasty, and the first ever pioneer in robotics for surgery.

The award was presented on October 1, 2005, at ISTA’s 18th annual symposium held in Kyoto, Japan. The award-winning research paper, “Minimally Invasive TKR Surgery through Navigated Freehand Bone Cutting - Assessed by 3d Analysis of Surface Finish and Alignment” will be published by ISTA as a special article in the Journal of Arthroplasty. Hani Haider, Ph.D., Director of the Biomechanics Laboratory, accepted the award at a special plenary session during the conference. The work was part of a team effort involving Research Associate Andres Barrera, M.S.c., Engineering Technician Benjamin O’Brien, and orthopaedic surgeons Drs. Kevin Garvin, and Todd Sekundiak.

The research involved a revolutionary technology developed recently at the UNMC orthopaedic laboratories, made possible by funds donated from Christina M. Hixson of the Lied Foundation. It allows surgeons to use computer image-based navigation to guide them in freehand cutting of bones to prepare them for insertion of implants for joint replacement. Conventional systems use complicated and cumbersome mechanical jigs to align the cutting instruments. New commercial navigation systems still use these jigs, and are therefore still as invasive. Navigated freehand bone cutting on the other hand has the potential to produce easier, faster, less costly and less invasive total joint replacement procedures, according to the study.

The research has been presented at the American Academy of Orthopaedic Surgeons and has received wide attention in the last year at various national and international scientific conferences, as well as from the orthopaedic manufacturing community.
One growing project that links research, patient treatment, and medical education is the department’s surgery outcomes database. Clinical Research Coordinator Connie Feschuk oversees the project, which began in March 2003 and has since grown tremendously. In the fall of 2003, there were over 850 hip and knee entries in our database. Currently, there are 2135 patients in the database who have been surgically treated for a hip, knee, or shoulder condition, or a Whiplash Associated Disorder (WAD).

After patients consent to participate in the database study, they fill out a 5-minute survey that collects information about pain, joint function, and general physical and psychological health. The physician then completes a physical examination of the joint. Patients complete the survey before surgery and again at regular intervals, usually at six months, one year, two years, and then every second year indefinitely. Feschuk says most patients are willing to participate in the study and be part of the database.

Each week, data is collected from up to 40 hip and knee surgeries performed by Drs. Kevin Garvin and Todd Sekundiak. That includes total joint replacement, revision surgeries, and uniknees. Data is also collected for total shoulder surgeries, rotator cuff surgeries, and neurolysis surgeries for several areas of the body afflicted by Whiplash Associated Disorders (WAD).

With more than three years of information gathered, the database is becoming a useful tool for surgeons. “Now that our numbers are increasing, we will be able to complete more studies analyzing outcomes after surgery,” says Feschuk. The huge undertaking of collecting such a mass of information is paying off, and trends in surgery outcomes are starting to emerge. It is this kind of information surgeons in the department will be able to utilize in the future to better treat their patients and share their findings with the scientific community.

Recently the department switched from an outside data collection service to using IntúiaCare, a software application designed by the Surgery Clinical Applications Development Team (under the direction of Dr. Byers Shaw of the University of Nebraska Medical Center). The new service offers on-site service and support, and is compatible with the hospital’s patient information system, allowing the department to access much more comprehensive information regarding the patient’s care. In the long run that means more informed data being generated by the outcomes database.

In addition to studies being utilized in the outcomes database, there are a variety of clinical studies also going on in the department. Below is a list of all outcomes and clinical studies that have taken place in the department from 2004 to present.

**Active Studies**

- Stem Cell Quality Assays: Correlation with Aging/Health
- Non-prosthetic Resurfacing of the Shoulder with Prosthetic Replacement of the Humerus Registry
- Review of THA/TKA Outcomes after Gastric Bypass and with Obesity
- Correlation of Body Mass Index to Outcomes Following Hip and Knee Arthroplasty
- Follow-up after Surgical Treatment for Whiplash Associated Disorder
- Review of Infected Total Hip Arthroplasty Revisions
- MIS™ Minimally Invasive Solutions™: Primary Hip Arthroplasty Outcome Study
- MIS™ Minimally Invasive Solution™ Total Knee Arthroplasty Outcome Study
- Gait Analysis after Intramedullary Fixation of Femoral Shaft Fractures
- Non-operative Treatment of Zone III Sacral Fractures
- Correlation of Upper Extremity Function With Angulation of the Humerus after Humeral Fracture
- Factors that Influence Medical Students Choice of Residency
- Displaced Femoral (Neck Fx) Arthroplasty Consortium for Treatment and Outcomes
- Osteoporosis Diagnosis and Education Following Frailty Fracture
- Outcomes Following Total Hip Arthroplasty for Acetabular Fracture
- Outcomes Following Total Knee Arthroplasty With and Without Computer Assisted Navigation

**Completed Studies**

- A Case Report Study to Compare Anterior Knee Pain Between Total Knee Arthroplasty
- Subjects and Matched Cohorts Who Have Not Had Knee Treatment
- Total Hip Arthroplasty Using Modified Components for Patients with Dwarfism
- Predictors and Formula to Determine Blood Transfusion Requirements for Hip Arthroplasty
- Minimally Invasive Two Incision Primary Hip Arthroplasty
- Early Operative Experience of the Fassier-Duval Telescopic Rod System for Children with Osteogenesis Imperfecta
Anterior Plate Supplementation Increases Ankle Arthrodesis Construct Rigidity: A Biomechanical Analysis

Ivan S. Tarkin, M.D., Hani Haider, Ph.D., Michael P. Clare, M.D., Matthew A. Mormino, M.D.

Investigation Performed at the University of Nebraska Medical Center
Department of Orthopaedic Surgery Biomechanics Laboratory

Introduction

Arthrodesis is the gold standard treatment for definitive management of patients with post-traumatic ankle arthritis. Superior patient outcomes can be realized when union is achieved and complications are avoided. Obtaining and maintaining rigidity across the prepared ankle joint is of paramount importance. Excessive motion at the tibio-talar interface should be minimized in an effort to promote ankle fusion. A popular ankle arthrodesis internal fixation technique utilizes three strategically placed partially threaded cancellous screws. Although encouraging clinical results have been reported with this technique, screw fixation alone may not be sufficient in certain clinical situations. The purpose of the current study was to determine the biomechanical effect of anterior plate supplementation to the standard three-screw ankle arthrodesis construct.

Materials and Methods

Biomechanical testing was performed on six fresh frozen cadaver ankles to determine the rigidity of the three-screw ankle arthrodesis construct with and without anterior plate supplementation. All specimens were obtained from elderly subjects with qualitatively osteopenic bone. Of the six specimens, 4 were matched pairs.

The ankle joints were positioned in neutral flexion, 10 degrees of external rotation, and slight valgus. Three 6.5 partially threaded cancellous screws were then inserted. As shown in figure 1, the first screw was placed from the postero-lateral tibial metaphysis to the talar head. The second screw was positioned from the medial distal tibia into the medial talar body. The last screw entered the lateral malleolus seating in the lateral talus body. A contoured 3.5 five-hole reconstruction plate was then applied to the anterior surface of the tibio-talar articulation. Four fully threaded 3.5 cortical screws were then placed into the tibia and talus to secure the plate. Ligamentous structures around the ankle were subsequently removed. Both the proximal tibia and distal talus were then potted using methylmethacrylate cement

Specimens were tested in three different modes to determine construct rigidity in the sagittal, coronal, and torsional planes. A six-degree-of-freedom ankle simulator was used. It was based on a 4-axis MTS Bionix test machine with specially fabricated loading jigs and sensor configurations as shown in figure 2. The set-up enabled the following three stiffness tests: Plantarflexion/dorsiflexion, inversion/eversion, and internal/external rotational stiffness.

Each specimen was tested with and without the anterior plate to determine rigidity in the three planes of potential ankle motion. Considering each of the three loops of loading performed for each condition as a stiffness curve (experiment), a total of 108 experiments where conducted in total for the 6 specimens studied. An average rigidity for each condition (loop) was calculated and recorded with and without the anterior plate.

Statistical analysis was performed to determine if a significant difference existed between the rigidity of the ankle fusion construct with and without anterior plate supplementation. A Wilcox rank test was used.

Results

All the stiffness curves were continuous, and showed the expected non-linear behavior with some hystereses. The range of motion in each case was small, and so the slope of the regression straight line (based on least square error) fitted to the data was the used parameter to characterize stiffness in each case.

Specimens instrumented with three large fragment partially threaded screws with anterior plate supplementation yielded increased rigidity compared to the three screw construct alone in all conditions tested (p=0.031). Superior rigidity was most evident in the sagittal plane (dorsiflexion/plantarflexion moment). Average rigidity across all specimens demonstrated a 3.5 fold increase with the addition of the anterior plate. For torsional and coronal rigidity, an averaged 1.9 and 1.4 fold improvement in construct stiffness was realized with anterior plate supplementation (Figure 3).

Between specimens, there was substantial variability with regards to rigidity. Stiffness in the sagittal plane varied from 7.4-26.5 Nm/deg (avg 14.2) with the plate to 1.3-6.5 Nm/deg (average 4.2) with screws alone. Similar variability in stiffness between specimens was noted for torsional and coronal plane testing. Rigidity of specimens tested in the torsional plane ranged from 0.6-5.5 Nm/deg (avg 2.3).
for the screws alone while plate supplementation yielded results ranging from 0.9-8.6 Nm/deg (avg 3.9). Plate supplementation rigidity in the coronal plane ranged from 1.1-23.5 Nm/deg (avg 11.5) and without supplementation was from 0.7-18.2 Nm/deg (avg 8.2).

**Discussion**
Anterior plating increased construct stiffness by a factor of 3.5 in the primary plane of potential ankle motion. The plate acted as a tension band resisting plantar flexion moments. Ankle dorsiflexion was minimized by the buttress effect of the anteriorly placed implant. Additionally, increased construct rigidity was appreciated in the torsional and coronal planes by a factor of 1.9 and 1.4 respectively.
BLOOD SALVAGE AND ALLOGENIC TRANSFUSION NEEDS IN REVISION HIP ARTHROPLASTY

Kevin L. Garvin, M.D., Todd D. Sekundiak, M.D.,
Connie A. Feschuk, R.N., M.S., and Elizabeth R. Lyden, M.S.

Introduction
Perioperative blood loss during revision hip arthroplasty and the dependency on allogenic transfusions may be relieved to some extent by autotransfusion replacement systems (ATRS). The ATRS allows the collection of surgical blood loss, separation of the red blood cells from other blood components, and return of the washed red cells to the patient. The purpose of this retrospective review was to determine if ATRS blood salvage decreased the need for allogenic blood in revision hip arthroplasty at our institution. Secondly, we questioned if the components revised and pre-operative hematocrit were risk factors for allogenic transfusion.

Materials and Methods
Analysis was completed on 147 revision hip arthroplasty surgeries done over a two year period using an autotransfusion replacement system, either the Cell Saver® (Haemonetics, Braintree, Massachusetts) or the OrthoPat® (Zimmer, Warsaw, Indiana).

The average age of the patients was 66 years (range, 33-94 years), 69 were men (47%) and 78 (53%) were women. Cell Saver® was used for 68 (46%) of 147 patients (15 femoral revisions, 18 acetabular, 34 femoral and acetabular, and one exchange). OrthoPat® was used for 45 (31%) patients (13 femoral revisions, 8 acetabular, 23 femoral and acetabular, and one exchange). Thirty-four (23%) patients did not have either system. Eight of these patients had a femoral revision, 9 had an acetabular revision, 14 had both components, and 3 had an exchange.

Data was collected on hematocrit, blood loss, ATRS collection and return, allogenic use, and implants replaced. Continuous data were expressed as mean ± standard deviation. Odds ratios (with 95% confidence intervals) were used to measure associations between predictive factors, categorized at clinically relevant cut-points (e.g. hematocrit: < 45% and ≥ 45%, ATRS return: < 300 mL and ≥ 300 mL) and allogenic transfusion. Analysis of variance was used for comparisons between groups (e.g. type of surgery and type of machine). Non-parametric methods were also used for group comparisons and yielded similar results. Multiple comparisons were adjusted with Bonferroni's correction. All statistical tests were 2-sided and a p-value <0.05 was considered statistically significant.

Results
The mean blood loss and percent of lost blood returned to the patients was similar for both auto transfusion replacement systems. For patients using the Cell Saver®, mean blood loss was 931 ± 549 mL with 42% of blood loss returned. The mean blood loss for patients using OrthoPat® was 1029 ± 658 mL with 43% of blood loss returned. The average blood return with Cell Saver® was 330 ± 203 mL and with OrthoPat® average return was 411 ± 357 mL. There was no statistical difference in the salvaged blood returned to the patient between the two systems.

The component revised affected the volume of salvaged blood returned to the patient. Autotransfusion replacement system return mean was 386 ± 217 mL for the femoral component group, 241 ± 157 mL for the acetabular group, and 413 ± 328 mL for the femoral and acetabular group. The mean ATRS return was significantly greater (p<.05) for those undergoing revision of both components compared to those undergoing only acetabular revision.

There was no statistical difference between the Cell Saver® and the OrthoPat® in the number of patients requiring allogenic blood, but the use of an ATRS machine reduced the amount of allogenic blood needed by 31%. In our group of revision patients, 61 of the 147 (41%) required allogenic blood. Of the 68 patients using Cell Saver®, 26 (38%) required transfusion (mean of 299 ± 424 mL), while 26 of the 45 (58%) patients using OrthoPat® required transfusion (mean 506 ± 507 mL), and nine patients of the 34 (26%) who did not use an ATRS required allogenic blood (average 238 ± 476 mL).

Patients receiving greater than or equal to 300 mL of ATRS return had a 2.6 greater chance of receiving allogenic blood than patients who received less than 300 mL of ATRS return (95% CI: 1.2, 5.6; p=0.02).

The average total blood loss was greater for femoral revision than for acetabular revision (p<0.05) , and there was no difference of average total blood loss between femoral revision and revision of both components. The average total blood loss for the femoral component group was 1078 ± 829 mL, for the acetabular group it was 690 ± 479 mL, and for the group with both acetabular and femoral revision average total blood loss was 952 ± 564 mL.
The component replaced was associated with the need for allogenic transfusions (Table 1). This need for allogenic transfusion correlates with the increased total blood loss in femoral and femoral and acetabular revision.

Preoperative hematocrit was associated with the need for transfusion. Patients with a hematocrit less than 45% percent were 5.4 times more likely to need a transfusion than patients with a hematocrit greater than or equal to 45% (95% CI: 1.2, 24.8; p=0.02)

Results

We found that the auto transfusion replacement systems, Cell Saver® and OrthoPat®, can replace up to 43% of blood lost during revision hip surgery. We also found a decreased need for allogenic blood if ATRS return was less than 300 mL.

Allogenic blood was needed by fewer patients with no machine as compared to patients on an ATRS (9 of the 34, 26% with no machine; 26 of the 68, 38% with Cell Saver®; and 26 of the 45, 58% with OrthoPat®) even though patients with no machine had a lower hematocrit (37%) compared to Cell Saver® (39%) and OrthoPat® (41%). We attribute the decreased need for allogenic blood when no machine was used to two factors. First, patients with no machine had a lower percentage of femoral revisions (8 of the 34, 24%) and revision of both components (14 of the 34, 41%) which were found to require more allogenic transfusions (femoral 30% and both 56%). Secondly, the decreased need for allogenic blood can also be explained by the surgeon’s experience. If the surgeon anticipated the revision would be simple and straightforward and the patient was healthy, then the ATRS machine was not used. Although this supposition was generally accurate, to further decrease the need for allogenic blood it may be beneficial to use an ATRS machine for all revision surgeries.

Total blood loss with this series of revision hip arthroplasties, was found to be dependent on the components revised. Total blood loss was greatest for femoral revision and followed closely by revision of both components. Blood loss for femoral revision was significantly more than for acetabular revision (0.03).

In comparing the Cell Saver® and the OrthoPat®, our review found no statistical difference between the two ATRS machines in amount of salvaged blood return, percent returned, need for allogenic transfusion, or volume of allogenic blood transfused. Since the results from both machines are comparable, choice may best be made by cost and surgeon preference.

Overall, we found the amount of allogenic blood needed was reduced by 31% with regular use of an ATRS machine for revision hip arthroplasty. We also found that femoral component revision or femoral and acetabular revision, hematocrit less than 45%, and ATRS return greater than 300mL increased the likelihood of allogenic transfusions.

| Table 1. Allogeneic Blood Use by Component, Hematocrit, and ATRS Return |
|------------------|------------------|------------------|------------------|
| Components: Number (%) | Yes Allogeneic Transfusion (n = 61) | No Allogeneic Transfusion (n = 86) | Odds Ratio (95% CI) | p Value |
| Femoral | 18 (30%) | 18 (21%) | NA | 0.04 |
| Acetabular | 8 (13%) | 27 (31%) | 5.37 | 0.02 |
| Both | 34 (56%) | 37 (43%) | 1.16, 24.78 |
| Exchange | 1 (2%) | 4 (5%) | 2.56 | 0.02 |
| Hematocrit: Number (%) | Yes Allogeneic Transfusion (n = 61) | No Allogeneic Transfusion (n = 86) | Odds Ratio (95% CI) | p Value |
| < 45% | 57 (97%) | 69 (84%) | 5.37 | 0.02 |
| ≥ 45% | 2 (3%) | 13 (16%) | 1.16, 24.78 |
| ATRS Return: Number (%) | Yes Allogeneic Transfusion (n = 61) | No Allogeneic Transfusion (n = 86) | Odds Ratio (95% CI) | p Value |
| ≥300 ml | 35 (67%) | 27 (44%) | 2.56 | 0.02 |
| <300 ml | 17 (33%) | 34 (56%) | 1.20, 5.56 |

CI = Confidence interval; ATRS = Autotransfusion replacement system; NA = Not applicable
Children with osteogenesis imperfecta, recurrent fractures, and long bone deformity require realignment osteotomies and intramedullary fixation for optimal comfort and function. The Fassier-Duval Growing Rod System, combined with a percutaneous technique is described. This technique allows treatment of multiple bones simultaneously with minimal soft tissue disruption. The early results of treating nine patients with 17 femurs with an average followup of 13 months are presented. Technical considerations and potential pitfalls to the operative procedure are also described.

Osteogenesis imperfecta is a complex disorder involving Type I collagen (COL-I, A1, COL-I, A2). Silene classification is most commonly used 1, 4, 5, 6, 7, but other types have also been described 2, 3, 4.

Bisphosphonate treatment has radically changed the classification of the children and allowed more optimal operative treatment. Physician Review Board approval was obtained. Retrospective clinical and x-ray reviews were performed. The series included a total of nine patients, eight males and one female, between September 2003 and September 2004. Average age was 22 months (11-45 months). Seventeen femoral roddings were performed for recurrent fractures or severe bowing deformity. The average followup was 13 months. All patients were receiving cyclic Pamidronate treatment intravenously prior to their operative procedure.

The Fassier-Duval nail was utilized. This was comprised of a solid male nail with a threaded distal epiphyseal end and a cannulated female nail with screw fixation in the region of the greater trochanter. Growth is accommodated by these nails. Operative technique is similar to that described by Fassier6. Preoperative planning on neck radiographs and clinical grounds is imperative. Percutaneous osteotomies are used whenever possible with occasional open osteotomies required.

Seventeen femoral roddings were performed in nine patients in 11 operative settings. Seven patients underwent bilateral femoral roddings at the same operative setting. Tibial roddings with smooth nails or wires were done as necessary at the same operative setting.

One patient required an intraoperative transfusion, but no patients subsequently required transfusion. The average hospital stay was 3.7 days. There was one unstable proximal fixation requiring revision through a 1 cm incision with 10 nails developing distal migration of the female rod into the trochanter with growth of the greater trochanter apophysis. All rods continued to expand with growth. Four major complications were encountered. One required hip spica casting for postoperative pain, with the same patient having persistent discomfort in the buttocks and pain in the greater trochanter. This required trimming of the male nail, which was protruding into the buttocks. The same patient had proximal migration of the female rod on the contralateral side, which required advancement of the female rod at the time of the ipsilateral tibial Rush rodding. One patient required repeat operative treatment for apparent intraarticular penetration of the male rod. Arthrogram demonstrated that the nail was deep to the articular cartilage, and the rod was shortened.

The multiple osteotomies technique was originally described and popularized by Sofilled and Millar in 1959 6. Bailey-Dubos developed their extensible growing rod 7. Significant technical problems were noted with this rod, as well as a need for an extensive operative dissection. The Sheffield modification attempted to overcome these mechanical complications (9). Several studies have confirmed a decreased revision rate with extensible rods from 2 to 2.5 years with standard rods and every five years on average, with extensible rods resulting in improved quality of life 10, 1 1. Percutaneous technique has improved the ability to perform these procedures 12.

The Fassier-Duval nail allows for continued growth while utilizing a percutaneous technique. This study demonstrated the ability to perform multiple bilateral femoral and tibial osteotomies and roddings in one setting. This requires very close attention to detail, the key being central placement in the distal epiphysis of the femur. If proximal migration occurs, it is a relatively simple and straightforward procedure to revise this through a 1 cm incision.

The key to success, however, is medical management of these children, which improves the quality of the bone and allows for safe operative treatment.
Significant improvement in bone mineral density and decreased fracture rates are well documented\textsuperscript{13}. Children under two years of age show more pronounced response to treatment\textsuperscript{14}. The main effect of bisphosphonate is increase in cortical thickness\textsuperscript{15}. Delayed healing has been suggested, but this effect is not noted in this study. All children in this study are pain and fracture free in the affected bones at this time.

The early results are promising, and long-term followup is still needed to determine the overall efficacy, frequency of revision procedures and potential for growth abnormalities.
Open Anterior Repair Without Capsulorraphy for Traumatic Anterior Shoulder Instability by a Community Surgeon

Edward V. Fehringer M.D., David C. Buck M.D., Susan E. Puumala M.S.,
David J. Clare M.D., and Patrick E. Clare M.D.

Investigation performed at the University of Nebraska Medical Center
Department of Orthopaedic Surgery and Rehabilitation (Omaha, Nebraska)
and Nebraska Orthopaedic and Sports Medicine PC (Lincoln, Nebraska).

Introduction
Numerous reports exist concerning the results following anterior repairs for traumatic anterior shoulder instability. Most reports describe repairs by surgeons that practice in a teaching setting and that perform concomitant capsulorraphies as part of the repair. Most reports also utilize outcomes assessment scales that are not patient self-assessed. However, presumably many anterior instability surgeries are performed by those outside a teaching setting, with or without concomitant capsulorraphies, and without outcomes assessments of any kind. Our goal was to document patient self-assessed outcomes of anterior capsulolabral repair for traumatic anterior instability by a single community surgeon that performs shoulder surgery but does not routinely perform concomitant capsulorraphies at the time of instability repair.

Materials and Methods
Open anterior capsulolabral repairs without capsulorraphy were performed by a single community surgeon in 58 consecutive patients with traumatic anterior instability. All patients in this surgeon’s series sustained traumatic shoulder injuries that occurred with the injured shoulder in varying amounts of abduction and external rotation or extension.

Mean age at surgery was 21. Four patients were female (Table I). Four patients had undergone previous instability surgery elsewhere: one thermal capsulorraphy, one open Bankart repair, one arthroscopic Bankart repair, and one arthroscopic debridement. We did not pre-operatively or intra-operatively quantify Hill-Sachs lesions, bony Bankart lesions, or anteroinferior glenoid bone loss nor was any shoulder excluded from our analysis because of the radiographic or visual size of these lesions. Furthermore, no final outcome radiographic or range of motion analysis was performed. Only one patient had sustained a work-related injury for which a worker’s compensation claim had been filed. There were no complications. This study was approved by our institutional review board (IRB) and focused on the shoulders for which follow-up questionnaire data was available.

The open anterior capsulolabral repair was performed through a low axillary incision as described by Thomas and Matsen. The subscapularis was incised transversely from proximal to distal along with the glenohumeral capsule in full thickness fashion, leaving a one-centimeter mate of tendon and capsule at the lesser tuberosity for eventual repair. The anterior humeral circumflex vessels were not sacrificed. All patients had detachments of the glenohumeral ligaments from their anteroinferior glenoid insertion sites. Three patients had lesions that also involved the superior glenoid labrum; one patient also had a posterior labral lesion. Any additional labral lesions were addressed at the time of surgery. After aggressively burring the anteroinferior glenoid neck with a high-speed burr to create a healing bone surface without compromising the glenoid lip, bone tunnels were placed in the anteroinferior glenoid quadrant for suture repair. Tunnels were evenly spaced approximately five millimeters apart and approximately five millimeters onto the articular surface from the edge of the lip. A number two, braided non-absorbable suture was placed in each bone tunnel, exiting through the glenoid neck. Sutures and bone tunnels alone were used in 12 shoulders to repair the anteroinferior capsulolabral lesions; in the remaining 23 shoulders a combination of bone tunnels with sutures and suture anchors was used with an average of 1.91 anchors per shoulder. When anchors were used, almost always one was placed at the six o’clock position, particularly in more muscular shoulders with more difficult exposures. A number two, braided non-absorbable suture was used in each anchor. In two shoulders, a concomitant humeral-sided t-capsulorraphy was also performed. In five shoulders, the capsule was separated from the subscapularis to facilitate capsulolabral repair at the glenoid but it was not overlapped upon repair to its mate at the lesser tuberosity at the time of final subscapularis and capsular closure.

Patients were started on an early post-operative passive motion program that was instituted within the first week post-operative and aggressively advanced once six weeks post-operative. Immobilization was planned for four weeks post-operative, but it varied depending upon patient compliance.
All patients were asked to complete self-assessment questionnaires at a minimum of two years post-operative. These included a modified Rowe score, an American Shoulder and Elbow Surgery (ASES) self-evaluation score, and an ASES Patient Self-Evaluation Activity of Daily Living survey at a minimum two years post-operative. Results were analyzed by a second, independent surgeon.

**Results**

Responses were obtained from 36 of 58 (62%) patients at a mean of five years. The mean follow-up modified Rowe score was 85.1. There were 29 (83%) good to excellent outcomes, three fair outcomes, and three poor outcomes based upon the modified Rowe scores and Rowe’s stratification criteria. The mean ASES self-evaluation instability score was 2.6 based on a range of 1 to 10 with a score of one being defined as “very stable”. The mean ASES ADL score was 27.8 out of a maximum of 30. All patients would recommend the procedure to a friend and 30 of 32 graded their results as either good or excellent. There were no complications. Those with 100% forward elevation had better outcomes than those that did not (p<0.05). Those without 100% external or internal rotation did not have worse outcomes than those that did (p<0.05).

**Discussion**

Thomas and Matsen described their open anterior repair technique in 1989 as an approach to the avulsion of the glenohumeral ligaments with 97% good to excellent results based upon Rowe’s criteria.

Most studies describing anterior repair for recurrent traumatic anterior instability have also been performed in academic centers that involve(d) residency and/or post-residency training by surgeons that have performed many repairs. Because of many variables, it is unknown if results reported by those surgeons are applicable to community orthopaedic surgeons. Yet, surgeons in the community that do not formally assess outcomes presumably perform a significant number of repairs for anterior instability. Case volume has been shown to be important in reducing complications and improving outcomes in total hip arthroplasty. Our goal was to assess patient self-assessed outcomes in a patient population that underwent anterior capsulolabral repairs for traumatic anterior shoulder instability by a surgeon that is not in an academic center and who does not typically report surgical outcomes.

**Conclusion**

Surgeons familiar with the technique and pathology may effectively perform open repair without routine capsulorraphy for traumatic anterior shoulder instability and achieve excellent clinical results.
KNEE SIMULATORS UNDER FORCE CONTROL CAN DISCRIMINATE WEAR DUE TO SMALL DIFFERENCES IN TKR DESIGN


Introduction

Skepticism has been rife about the efficacy of knee simulators in screening implants, let alone their dependability as design tools. Designers do however need accurate “what-if” wear tests to verify the effectiveness of minor design changes of already successful implants. Such tests are faster, more economical and should preempt slow-coming clinical results. This study examined whether this is plausible on small design changes. A suitable opportunity occurred with the Biomet “Vanguard” and the “Maxim” Total Knee Replacement systems. The Vanguard is a new design upgrade to the Maxim, which primarily, but only incrementally, improved the geometry of the posterior stabilization post against wear. Only slight changes in kinematics were expected but they targeted ambitious wear reduction. We hypothesized that the much debated force-control simulation method [1,2] would not only produce reasonable wear rates for these two knee implants, but should yield differences in the TKR kinematics and wear rates to suitably reflect the expectations from the incremental design changes.

Methods

A force-control wear test was conducted on two Vanguard and two Maxim specimens. Both designs had similar femoral components, and identical tibial trays, and conventional UHMWPE bearing insert material, but with slightly different shapes of the stabilizing post as shown in Fig. 1.

The implants were aligned identically on an Instron-Stanmore Knee Simulator (Fig. 2). The soft tissue simulation was tuned with the softer spring settings [3] simulating a situation of both ACL and PCL resected. Testing was carried out to 5.5 million cycles, at 1Hz with calf-serum lubrication diluted with deionized water to contain 20g/l protein concentration. Two passive UHMWPE soak controls were used for each design to correct for liquid absorption. The AP-displacement and axial-rotation and all input variables were measured at tens of intervals to verify their consistency with the desired (input) waveforms of [2].

Results

The logged kinematics (Fig. 3) were not only consistent throughout the test, but those of each pair matched closely. Astoundingly, the kinematics of one pair differed from the other in the small predictable way. The Vanguard had slightly less axial rotation with tiny reduction in overall laxity compared to the Maxim due to the different shape of the stabilizing post.

After correction for liquid absorption, the gravimetrically measured wear rates (Fig. 4) averaged 31.71±2.9 mg/million cycles for the Maxim, and only 9.05±0.2 mg/million cycles for the Vanguard. Therefore the small design alterations achieved a 71% reduction in wear, which was statistically significant (p<0.05).

Upon close examination of the implants the wear reduction could easily be attributed to the differences in the wear regions on the stabilizing post (Fig. 5).

Discussion and Conclusion

In a posterior stabilized design which is supposed to exhibit above moderate constraint, the small decrease in the laxity of the Vanguard compared to the Maxim in both AP translational and rotational constraint was insignificant compared to the substantial improvement in the Vanguard’s wear resistance.

The force control wear simulation method has indeed produced, from identical force and torque inputs, slightly but appropriately different TKR kinematics, which suggested significantly different wear rates of only slightly modified knee designs. If these improvements in wear are proven clinically, then properly tuned knee simulators would have come of age, and will continue to be useful as discriminatory and screening design tools for the benefit of future patients.
Fig. 3: Kinematics averaged over 20 cycles near the start and at the end of the test. 43 other sets of results have been logged and observed in this manner throughout the test.

Wear averages, best fit straight lines and 95% confidence limit error bars

Fig. 4: Wear Results

Some wear

Wear regions on the post of the Maxim after @ 5.5 million cycles.

Much less wear

Medial Side  Lateral Side

Wear regions on the post of the Vanguard Station 1 specimen.

After 5.5 million cycles.

Station 3 was very similar.

Fig. 5: Wear regions on the stabilizing posts.

References

*Biomet Inc., Warsaw, IN
Introduction

Unicondylar Knee Arthroplasty (UKA) has increased in popularity for faster recovery time, preserving ligaments, restoring normal knee kinematics, and prolonging the time before Total Knee Arthroplasty is needed. It is reported that misalignment of the knee implants could severely affect the success of unicondylar arthroplasty. Published Finite Element (FE) analysis reports have recommended some inclination of the uni-tibial component with respect to the tibial bone in the coronal and sagittal planes [1],[2] for optimum duty and fixation life.

It is known that the accuracy of an FE analysis in orthopaedic biomechanics improves with bone geometry and material distribution extracted from imaging data. Using optimized bone mesh and bone material distribution extracted from Computer Tomography (CT), FE bone models were developed to study the effect of misalignment of a uni-tibial component in the coronal and sagittal planes. To compare to the findings of Sawatari et al [1], our 3D FE study had a similar bone model and similar misalignments [1]. Our solution was also made to directly compare with the results of Iesaka et al [2] (same laboratory as [1]), who earlier presented a 2D FE study with regionalized bone material model under varying varus-valgus inclinations [2]. These studies recommended slight valgus angle for lower bone stress and that too much posterior tilt could increase the bone stress. They reported that the maximum bone stress was observed in the proximal end of the diaphyseal cortex and that this bone stress could lead to bone fracture. Our 3D analysis on a bone model with fully-distributed material properties was found to produce interesting and somewhat contradictory results to the ones referred to above.

Methods

The proximal tibial bone model was extracted from the female’s dataset of the Visible Human Project® by the process of segmentation and reconstruction (Fig. 1).

ABAQUS 6.5 was used to generate and solve the FE models. Using an in-house developed routine, pixel intensities from the CT data were mapped onto the finite elements of the tibial bone to generate a fully-distributed material model for the tibial bone. For FE models with uni-implants at square inclination in both the planes (coronal and sagittal planes), FE bone mesh was optimized with the distributed material model. A direct compressive femoral load of 2600N was distributed into 60% on the medial side which is taken up by the unicondylar knee implant and 40% was applied on the lateral condyle of the proximal tibia. The load was applied on a circular area of 13mm diameter as shown in Fig. 2. To maintain the tibio-femoral angle for all cases of misalignments, the distances from the centroid of this load area on the medial and lateral sides to the distal end of the tibial bone were kept constant.

Results

The maximum von Mises stress in the bone was found on the medial side of the diaphyseal cortex, with concentration towards the distal side. We speculate that the numerical value of the bone stress would be lower if the complete tibia was...
The majority of the load was transferred through the keel of the tibial tray into the cortex (Fig. 3).

With the increase in the posterior tilt, the maximal bone stress increased from 39.5 to 49.6 MPa (Table 1). For the variation in tibial inclination along the coronal plane, the maximum bone stress decreased from 57.8 to 25.2 MPa (Table 2).

Discussion and conclusion
As reported in other FE studies, the maximal bone stress was not found in the proximal end of the diaphyseal cortex but was found midway and lower in the diaphyseal cortex of the tibial bone model. The difference could be due to the material property distribution assigned in the present case; every element had a different modulus value from the CT data. The bone material model used by Sawatari et al [1] involved distributed material properties for the cancellous and the bone marrow region, but the cortical bone was regionalized into 2 parts only, with two different properties. The stress concentration observed in their FE study might be due to the (too) abrupt a change in the strength of the bone. In the present study, the stress patterns showed that the load transferred from the keel of the tibial tray into the diaphyseal cortex (Fig. 3). Further investigation proved that the difference was due to the bone density distribution.

For the misalignment along the sagittal plane, bone stress increased by 20% for 10° posterior tilt and by 7% for 2.5° and 5° posterior tilt. It is known that increased posterior tilt would promote increased flexion and femoral rollback. To strike a balance a posterior tilt in the range of 2.5° to 7.5° seems the best. Similar ranges were reported by other published clinical and experimental studies [3], [5]. Our results suggest (if anything) that a slight varus tilt would reduce the bone stress. Although higher varus tilts could yield lower bone stresses but in the long run the high shear stresses would not be useful for the implant. This finding contradicts the earlier reports of recommendations towards slight valgus tilting, which was interesting at best, and now perhaps invites a more thorough examination.

<table>
<thead>
<tr>
<th>Posterior Tilt Angle</th>
<th>Posterior Tilt (at 0° Varus Tilt)</th>
<th>Von Mises Stress (MPa)</th>
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<tbody>
<tr>
<td>0°</td>
<td>39.5</td>
<td></td>
</tr>
<tr>
<td>2.5°</td>
<td>42.3</td>
<td></td>
</tr>
<tr>
<td>5°</td>
<td>42.5</td>
<td></td>
</tr>
<tr>
<td>7.5°</td>
<td>44.1</td>
<td></td>
</tr>
<tr>
<td>10°</td>
<td>49.6</td>
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Table 1: Variation of maximum bone stress with posterior tilt

<table>
<thead>
<tr>
<th>Varus-Valgus Tilt Angle</th>
<th>Varus-Valgus Tilt (at 5° Posterior Tilt)</th>
<th>Von Mises Stress (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>Valgus Tilt Angle</td>
<td>Square</td>
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<tr>
<td></td>
<td>6°</td>
<td>4°</td>
</tr>
<tr>
<td></td>
<td>57.8</td>
<td>55.3</td>
</tr>
</tbody>
</table>

Table 2: Variation of maximum bone stress with varus-valgus tilt

References
DISLOCATION OF THE HIP AFTER REIMPLANTATION.
AN ANALYSIS OF RISK FACTORS.
Curtis W. Hartman, M.D. and Kevin L. Garvin, M.D.

Introduction
Dislocation has been reported as one of the most frequent complications after revision total hip arthroplasty (THA). Numerous risk factors associated with dislocation have been identified, including gender, previous hip surgeries, surgical approach, size of the articulating head, limb-length discrepancy, component orientation, trochanteric migration, and component impingement. Dislocation as a complication after reimplantation of the hip for periprosthetic infection also has been reported; however, the risk factors associated with dislocation after reimplantation for infection are not as well defined.

Our purpose in performing this study is to determine the rate of dislocation after reimplantation for infection and to determine whether the following variables are risk factors for dislocation in our patient population. The variables include age at reimplantation, number of previous operations on the hip, length of time from resection to reimplantation, limb length discrepancy, femoral offset, and femoral head size. We hypothesize that greater age, an increased number of operations on the hip, a greater length of time from resection to reimplantation, greater limb length discrepancy, decreased femoral offset, and smaller femoral heads will increase the risk of dislocation.

Materials and Methods
We retrospectively reviewed 37 consecutive patients who underwent a two-staged revision THA for deep infection between May 1991 and July 2002. A minimum two-year follow up was required for inclusion. Three patients failed to meet these inclusion criteria. After identification of the patient from the adult reconstruction database, a comprehensive chart review was performed to determine how many patients sustained a dislocation. We then compared the age, number of previous hip operations, length of time from resection to reimplantation, limb length discrepancy, femoral offset, and femoral head size in these patients to those in the patients without a dislocation.

The cohort consisted of 15 men and 19 women. The original diagnoses included primary osteoarthritis in 24 patients (70.5%), femoral neck fracture in six patients (17.6%), post-traumatic arthritis in two patients (5.8%), avascular necrosis in one patient (2.9%), and congenital hip dysplasia in one patient. The mean age at reimplantation was 68 years (range, 38–83 years). The mean number of operations on the affected hip before reimplantation was 2.9 (range, 2–8 operations). The average length of time from resection to reimplantation was 157 days (range, 54–362 days). The mean limb-length discrepancy was -6.35 mm (range, 0 to -30 mm). The mean offset was 44 mm (range, 25–61 mm). The most common head size was 28 mm followed by 32 mm. A 26 mm head was used least frequently. The mean follow-up was 59 months (range, 25–111 months).

The diagnosis of a deep periprosthetic infection was made after isolation of an organism from preoperative aspirates or from examination of intraoperative specimens (frozen section, gram stain, and culture). The first stage consisted of aggressive débridement and removal of all implants. Patients then received 6 weeks of intravenous antibiotics based on the sensitivities of the isolated organisms. Inflammatory markers (erythrocyte sedimentation rate and C-reactive protein) also were followed to ensure eradication of infection. Patients were considered for reimplantation after completion of antibiotics and return of inflammatory markers to baseline levels.

All of the hypothesized risk factors for dislocation were subjected to univariate and multivariate analysis. Univariate analysis was done using PC SAS. A p-value of <0.05 was considered significant. Multivariate analysis was performed with a multiple logistic regression analysis.

Results
During the 11 years between 1991 and 2002 five patients sustained 16 dislocations after reimplantation of the prosthesis. Four patients developed recurrent instability, having three or more dislocations each. The overall rate of dislocation was 14.7%. Dislocations occurred in three of 19 women (15.7%) and two of 15 men (13.3%).

Patient age at the time of reimplantation, number of previous hip operations, length of time from resection to reimplantation, limb length discrepancy, femoral offset, and head size were not found to be significant risk factors for dislocation in this population. A multivariate analysis was also unable to demonstrate significance with combinations of risk factors.

We had one recurrent infection (2.9%) in the cohort of 34 patients. This was diagnosed at revision arthroplasty for osteolysis nine years after reimplantation. The patient had no subjective complaints and no constitutional symptoms.

Discussion
We have attempted to provide insight into the risk factors for dislocation in a particularly difficult population. We showed an overall dislocation rate of 14.7%. Charlton et al reported a
dislocation rate of 11.4% in a similar population.

Berry et al described the age of the patient as an important risk factor for hip dislocation. Woo and Morrey and Alberton et al found no difference in instability based on the age. We too found no significant difference between the age of those who had dislocations and those who did not.

Woo and Morrey demonstrated that previous surgery was a significant risk factor for dislocation after primary THA. We evaluated the number of operations on the affected hip before reimplantation and found no significant difference. The reason behind this discrepancy is not clear, although a number of possibilities exist. Seventy percent of those studied by Woo and Morrey had no prior surgery while every patient in our cohort had at least two surgical procedures before reimplantation.

The appropriate length of time from resection to reimplantation of components has not been clearly defined. It was our goal to determine whether prolonging the length of time from resection to reimplantation had any deleterious effect on hip stability. We were unable to show a significant difference in rates of instability.

We evaluated limb-length discrepancy as a risk factor for instability. We found no correlation between the limb-length discrepancy and the risk of dislocation. We must conclude from this data that limb-length discrepancy does not significantly affect hip stability in this patient population.

Offset as a risk factor for hip instability has not been discussed widely in the literature. It often is mentioned as part of the overall soft tissue tension. Maintenance of offset would seem to be important as a factor of soft tissue tension and subsequent hip stability. We were unable to show offset as an important risk factor for hip instability after reimplantation for infection.

Alberton et al found that the risk of dislocation increases significantly for patients receiving a 22-mm femoral head compared with those receiving either a 28-mm or 32-mm femoral head. As in our study, they were also unable to detect a difference between 26-mm, 28-mm, and 32-mm heads.

Conclusion
We provide information about the risk factors for dislocation after a two-stage revision THA for deep periprosthetic infection. While we found that no single risk factor was predictive for hip instability after two-stage revision, we have shown that the risk factors for dislocation after reimplantation are not the same as those cited for instability after aseptic revisions. Instability in the infected patient almost is certainly a multifactorial problem.
ANTERIOR KNEE PAIN AND TOTAL KNEE ARTHROPLASTY: ARE THEY RELATED?

Randson Johnson, M.D., Kevin Garvin, M.D., Connie Feschuk, R.N., Christopher Pelt, M.D.

Introduction

Total knee arthroplasty (TKA) offers an effective and reliable treatment for arthritis of the knee. Numerous studies have proven the results of TKA to be predictable, offering pain relief, a durable implant, and return to a high level of activity. Despite excellent results over a long period of time, patellofemoral complications are commonly cited after the procedure3,13. Of these complications, anterior knee pain is reported in 2 to 19 percent of patients following TKA2,5,11,12.

The exact cause of anterior knee discomfort or pain is not entirely known. Many etiologies have been suggested, and an understanding of the various factors is important in order to counsel patients regarding the problem, provide effective treatment for the pain, and prevent pain in future patients.

Factors related directly to the total knee implant have been linked to anterior knee pain. These factors include wear, loosening, instability, and implant design. Posterior-stabilized prostheses have frequently been associated with post-operative anterior knee pain12,13. The posterior-stabilized condylar knee compared to the total condylar prosthesis has shown an increase in patellofemoral complications12. However, these complications have greatly been reduced since the femoral components have been redesigned to eliminate sharp anterior edges17. Implants that produce a larger extensor moment arm have been shown to reduce patellofemoral forces. This reduction of forces may reduce patellofemoral complications such as pain, component wear, and loosening4,7,14.

Surgical technique is another important factor in the development of anterior knee pain following TKA. One goal of arthroplasty of the knee is to restore a functional joint by recreating a near-normal anatomy. Deviation from this restoration may create abnormal mechanical forces with resultant patellofemoral complications. Component malrotation has shown to be a significant factor in the development of post-operative anterior knee pain5. The surgeon should also pay attention to restoration of the joint line. An excessively elevated joint line may lead to pseudo-patella baja. When this occurs, the distance between the patella and tibia is diminished with resultant development of abnormal patellofemoral forces as the mechanics of the extensor mechanism are changed6.

Additional factors related to the patient may be associated with anterior knee pain. In the normal population of adults who have not undergone TKA, anterior knee pain has been reported to occur in up to 15-33 percent of the population16. The etiology of idiopathic anterior knee pain, often referred to as patellofemoral pain syndrome, remains unclear, and many different hypothesis exist as to the cause. Fulkerson identified six major anatomical sources that cause patellofemoral pain: subchondral bone, synovium, retinaculum, skin, muscle, and nerve. These structures often cause problems secondary to lower extremity malalignment, muscle imbalance, or overuse9,19. Anatomic alignment factors of femoral neck anteversion, Q angle, knee hyperextension, and genu valgus have all been associated with the development of anterior knee pain. Clinical studies, however, have not always found that clinical detectable anatomic variants correlate with patellofemoral pain syndrome10,19.

Given the fact that idiopathic anterior pain exists without definitive cause in a certain percent of the population, it is possible that anterior knee pain may be an unavoidable outcome for a small percentage of patients following TKA. The purpose of this study is to compare anterior knee pain between a group of patients that have undergone TKA and a group of matched healthy cohorts to determine if anterior knee pain is consistent in the two groups and therefore may be an unavoidable outcome for a certain percentage of patients following TKA.

Materials and Methods

This study reviewed retrospective data from 51 patients who underwent total knee arthroplasty between July 1996 and December 1998 by a single surgeon (KLG). All patients had a posterior-stabilized prosthesis and achieved excellent clinical results based on a previous study. All of the patients underwent patellar resurfacing. At a minimum two years (mean 38 months) follow-up each TKA patient had been scored using the Hospital for Special
Surgery (HSS) Knee Scoring System and an anterior knee pain score had been completed.

A group of healthy cohorts was also enrolled in this study. Cohorts were matched to TKA patients based on: 1) gender, 2) age within 5 years, 3) body mass index within 10%, and 4) HSS scores within 5 points. Each healthy cohort was examined and assigned an HSS knee score and an anterior knee pain score. In addition, each healthy cohort was examined radiographically with a skyline view of the involved knee to assess for patellofemoral joint disease and were removed from the study for degenerative joint disease and osteophytes, but were retained with tilt (1 of 51) and lateral tracking (2 of 51). Patients were excluded from this study if they had a history of treatment or diagnosis of lower limb injury or condition, a history of lower limb fracture, a medical condition that limits mobility, or a history of fibromyalgia.

The mean HSS knee score for both groups were calculated and compared as were the anterior knee pain scores. Using statistical analysis, the difference in scores between the two groups was analyzed.

Results

There were 51 patients in the TKA group, 33 females and 18 males. The average age of the patients at follow-up was 67 years of age. The average time of follow-up was 38 months. The mean HSS score at follow-up was 92.1. The mean anterior knee pain score in this group was 25.9 out of 30. Anterior knee pain was reported by 11 of 51 (22 percent) of the TKA patients. Of these 11 patients, 8 (73 percent) described their pain as mild, while 3 (27 percent) described their anterior knee pain as moderate.

In the group of matched healthy cohorts, the average age at time of exam was 66 years of age. The mean HSS score was 93.0. The mean anterior knee pain score was 28.8 out of 30. In this group of healthy cohorts, 7 of 51 patients (14 percent) reported anterior knee pain. Of these 7 patients (86 percent) described the anterior knee pain as mild. Only one patient (14 percent) described the pain as moderate.

As expected with the inclusion criteria to match TKA patients with healthy cohorts, there is no statistical significance between the two groups with regards to age, BMI, or HSS score. The difference in anterior knee pain score between the TKA patients and the group of healthy cohorts was 8 percent. The difference was not found to be statistically significant (p=0.44).

Discussion

The results of this study suggest that anterior knee pain exists in a certain percentage of the adult population who do not have patellofemoral joint disease. As a result, anterior knee pain following TKA may be an unavoidable outcome for a small number of patients and may not be related to the surgery itself.

In our group of healthy cohort patients, the rate of anterior knee pain was found to be similar to the rates published in the literature. The etiology of the anterior knee pain in these patients is unclear. Idiopathic anterior knee pain remains a significant problem for both researchers and patients, with many factors having been studied and no definitive cause having been found. Studies indicate that a disruption in tissue homeostasis is present in cases of anterior knee pain, whether it be secondary to anatomic, mechanical, or neurosensory factors.

The percentage of TKA patients in this study with anterior knee pain (22 percent) is slightly higher than the percentage of patients with pain cited in the literature. It is realized, however, that anterior knee pain was determined based on a questionnaire separate from the calculated HSS score. The presence of anterior knee pain was self-reported on this questionnaire, and all patients in the TKA group were noted to have an excellent clinical result (mean HSS score 92.1). Regardless, it is evident that anterior knee pain is a troublesome complication following TKA, and that multiple studies have failed to find a definitive etiology.

This study does not mean to suggest that anterior knee pain in TKA patients should readily be dismissed as idiopathic. Surgical technique and implant design must remain considerations when evaluating patients with complaints of anterior knee pain. As with all patient complaints of pain following knee replacement, anterior knee pain must be investigated and followed. If clinical evaluations and investigative studies are normal, the patient may be reassured to know that a few people, following replacement or even without degenerative joint disease, will have mild occasional patellofemoral pain without a known cause.

References - Continued on next page
References

ETIOLOGY OF LOW BACK PAIN IN ADOLESCENT PATIENTS IN A BUSY PRIVATE ORTHOPAEDIC SPINE PRACTICE

Leonard K. Kibuule, M.D., Timothy Burd, M.D., John McClellan, M.D., and Nancy Fullmer, R.N.

Investigation performed at Nebraska Foundation for Spinal Research, 11819 Miracle Hills Drive, Suite 102, Omaha, NE 68154

Introduction

Low back pain is thought to be a common occurrence in adults. Approximately 80% of the general population will be afflicted with low back pain at some point in their adult life[1]. Low back pain can also be found in the pediatric population; specifically adolescents. Some studies report an incidence as high as 50% for low back pain in children[2-4]. Often times, the cause of this pain is simply musculoskeletal strain and is a self-resolving phenomenon over time. However, many times low back pain may be an indicator for abnormal pathology involving the spine[5, 6]. It may be an indication of soft tissue injury such as a herniated disc, an alignment abnormality such as idiopathic scoliosis, or even bony injury such as a pars interarticularis fracture.

Past studies of patients with low back pain have focused on adolescents who have presented primarily to sports-related clinics with such a complaint. These studies have helped demonstrate the incidence of common causes of low back pain such as pars fractures in this patient population[2, 7-8]. The primary objective of this study was to determine the etiologies of low back pain that present to an orthopaedic spine practice, to assess the time span from symptom presentation or exacerbation to evaluation by an orthopaedic spine surgeon, and to encourage primary health practitioners not to hesitate referring to an orthopaedic specialist when concerned about the etiology of the pain.

Materials and Methods

Between January 1, 2004 and December 31, 2004 six-partnered community orthopaedic spine surgeons evaluated and treated 194 adolescent patients, between ages 9 and 18, with concomitant complaints of pain localized to their spine. Other physicians referred all patients to the group for problems related to their spine. These problems ranged from an incidental discovery of scoliosis to the treatment of trauma to the spine. During or prior to the initial clinic visit, each patient completed a standard questionnaire, which identified any history of back pain or other symptoms related to their current visit. These charts were subsequently scanned and filed in an electronic database along with their clinical exams and diagnostic results (CT, x-rays, MRI, and bone scan).

A chart review was performed of these patients and information regarding their demographic information (gender, age, weight and height, involvement in sports and type), location and nature of their pain, time to evaluation by the orthopaedic spine surgeon from their initial presenting symptoms, treating surgeon, diagnostic evaluations, final diagnosis and recommended treatments (included surgical and nonsurgical interventions) were recorded. Only patients who had a specific complaint of low back pain (lumbar spine) during examination or who made reference to low back pain in their history questionnaire were included in the final analysis of this study. When available, radiographic reports were reviewed and findings also documented for each patient.

Results

In 2004, a total of 195 patients were seen by the 6 practicing orthopaedists. Of this number, 71 were seen and discovered to have a condition of deformity (i.e. scoliosis) regardless of back pain. However, only 122/195 patients had specific complaints of low back pain and were further analyzed. Of this group of patients, 55 were male and 67 were female. The average age of females was 15.4 years of age, and males, 15.2 years of age. Of the adolescent patients included in the study, most were not obese (average BMI 24) and many were involved in some form of sports activity 54/122 at some time during their complaints of discomfort.

Of the 122 adolescents with low back pain evaluated, 132 problems were identified. Thirty patients had some form of pars defect discovered either by plain x-ray, CT, bone scan or by a combination of the three. This represents approximately 25% of patients (30) presenting with low back symptoms with resultant pars abnormality. An almost equal number, 32 patients, had some form of discogenic pathology identified either through MRI or CT scan. This may have been an incidental discovery and does not necessarily imply causation of their symptoms. Another 18% either presented with or were diagnosed with idiopathic scoliosis and 17% with myofacial strain or lumbago. The remaining patients were found to have had various other diagnoses including increased thoracic kyphosis(6), vertebral body fracture(1) or incidental spina bifida(10).

The mean number of months from initial injury or exacerbation of symptoms to evaluation by a spine surgeon was approximately 10.5 months (3 days-54
months). All patients were referred to the clinic by other physicians and were seen within a month of their requested referral or referred to another physician for timely evaluation.

Once evaluated for their complaints of low back pain, 97 of the 122 patients were treated with conservative management; activity restriction/modification, anti-inflammatory medication and/or, physical therapy or exercise program with close observation. Conservative treatment was instituted for a vast majority of patients, 80%, and is the expected management regiment given the benign nature of most cases diagnosed. Another 9% (11 patients) received or were offered some form of minimally invasive procedure such as an epidural injection or facet injection with steroids. The remaining 10 of 122 patients were recommended to undergo surgery for the treatment of their presenting condition. Surgeries performed included spinal fusions for scoliosis(3), diskectomy for herniated discs(2), and lumbar fusions for spondylolisthesis(5).

Discussion
As adolescents present to spine practices with complaints of low back pain, it is important that physicians remain aware of the increasing likelihood of abnormal spinal pathology. Defects of the pars interarticularis are the most common cause of low back pain in adolescents[5, 6]. In our series, 25% of patients had some form of defect of the pars, and 16% were recommended to have operative treatment. The number of patients with this pathology was surpassed only by the incidental number of patients with discogenic pathology ranging from minor disc bulges to frank herniation. Readers should be aware that this pathology does not necessarily imply causation of symptoms. Imaging studies, such as MRI, should be interpreted with caution because they may show abnormalities which may be no different from a control group[4]. Despite this, it may raise the index of suspicion for further workup or close follow-up of patients.

Although patients in our study were seen on the average 10 months from the onset of their symptoms, any delay in their presentation to their PCP or in making an appointment to be seen by an orthopaedist would alter this number. Once again, the emphasis is for patients to be seen in a timely manner so that that treatment can be initiated.

Conclusion
Low back pain may be the presenting symptom for a multitude of spinal disorders. Although many involve benign conditions, which may be treated conservatively, others may have abnormal pathology necessitating immediate treatment. It is imperative that clinicians who see adolescents with back pain perform a thorough history and physical examination to insure that this pathology, if present, is identified and that expedient referral or treatment can be instituted in order to prevent further harm.

References
Introduction

Radiostereometric Analysis (RSA) is the most precise method for measuring in-vivo micromotion of bones and implants, where inserted marker beads are tracked with conventional x-rays [1]. The technique is being extensively used to evaluate the polyethylene wear and migration of implants into the bone for Total Hip Arthroplasty (THA). It is, however, vital to practically estimate the accuracy and precision of RSA, prior to its use clinically. Such estimates should simulate (as far as possible) the clinical conditions and over the long period of a typical clinical RSA study. A comprehensive study of RSA precision and accuracy based on a phantom model has been reported recently for THA [2]. It conservatively simulated wear not exceeding 0.2mm in each direction. Astounding accuracies for RSA were reported, to <86µm in most cases. We present here a similar phantom study to estimate both accuracy and precision of the RSA method in measuring THA polyethylene wear for larger motion ranges. We hypothesized that more realistic (larger) distances, and a different statistical interpretation would provide more conservative estimates for RSA precision and accuracy.

Materials and methods

A phantom rig was built in the laboratory (see Fig. 1), comprised of a rigid ‘L’ shaped frame of 24mm thick acrylic sheets. A hemi-pelvis (Sawbone model) fitted with THA components (Zimmer, Warsaw, IN) were fastened to the vertical side of the rigid structure. The horizontal base rigidly supported an XYZ positioning stage fitted with micrometers with 1µm resolution. The latter was used to rigidly hold and impart incremental displacements to the femoral stem, relative to the cup and pelvis.

The orientation and positions of the RSA marker positions are all shown in Fig. 2. They were determined by an arthroplasty surgeon based on their limited access during surgery.

Eight Tantalum (Ta) beads, of 0.8mm diameter, were inserted into the pelvis in locations based on the recommendations of [3]. Five (M4) nylon screws, specially prepared with a 1mm dia. Ta marker on the threaded end of each, were used to hold the cup to the hemi-pelvis; these screws and beads represented the cup position. Another three 1mm dia. Ta beads were attached to the THR femoral stem; one on the shoulder, one on the collar and one at the distal tip of the stem. Each bead was embedded at the tip of a nylon peg, offset 5mm from the surface. Nylon material was used in the phantom study for convenience, instead of Titanium which is used clinically; both materials have similar radiographic intensities.

Fig. 1: Phantom rig to investigate the accuracy of RSA with a Total Hip Replacement implant
The relative motion between the Ta markers on the femoral stem with respect to the acetabular cup markers simulated penetration into the UHMWPE liner due to wear; whereas the relative motion between the acetabular cup markers and the hemi-pelvis markers simulated socket migration. In this study, the first motion (wear) was a controlled variable and the second motion (migration) was not changed.

Forty-two experiments were performed in total; each based on a separate pair of radiographs and involved a full RSA digitization and analysis using software [4] from Biomedical RSA/Sweden.

Ten initial experiments involved no motion, and were carried out essentially to estimate the precision of the RSA technique. They were followed by 32 experiments, representing two consecutive analyses (experiments) at each of 16 motion positions as follows: 0.2, 0.5, 1.0 & 2.0mm then back to 0.0mm in the medial direction. This was followed by 0.2, 0.5, 1.0, 2.0 & 0.0mm in the superior direction and -0.5, -1.0, 0.0, 0.5, 1.0 & 0.0mm in the posterior direction. The consecutive experiments at each position involved radiographs of the first followed by radiographs of the second without moving the X-Ray generators or the phantom model. Simultaneous exposures (within 0.3 sec) were made by a combination of stationary and mobile generators operated at 120kV and 10mAs.

For every pair of radiographs, the difference between the (RSA) measured value of position in a certain direction and its true value was calculated. The scatter of these errors (measured through the standard deviation) was used to estimate precision. Accuracy of RSA was estimated from a 95% prediction interval (i.e. mean difference between each measurement and its true value ± sd of the differences).

Results

Fig. 3 shows a sample digital x-ray. High quality RSA recognition of the individual components resulted as characterized by the “condition number” [4]. Lower being better; optimum range for this number is 25-60 with maximum upper limit about 110 to 140 (provided the mean error is small) [4]. For the cup’s marker configuration the condition number of this study averaged 67±0, and for the hemi-pelvis 30.57±14.87. The latter deviated more, as one of its eight markers was shadowed in some radiographs and could not be used.

For Pelvis/Cup relative positions, where no actual motion was involved in all 42 cases, precision ranged from 0.013mm (best) to 0.071mm (worst). For Pelvis/Stem, precision ranged from 0.023 to 0.182mm, and for cup-stem from 0.029 to 0.230mm.

Accuracy for Pelvis/Cup (hence no motion) ranged from ±0.026 to ±0.139mm. Accuracy for Pelvis/Stem and Cup/Stem with no motion imposed range from ±0.055 to ±0.536mm, and with translational motion it ranged from ±0.033 to ±0.228mm.

Discussion and Conclusion

The worst estimates of accuracy (approx. ±0.5mm) and precision (approx. 0.23mm) were consistently along the anterior-posterior direction (depth into the radiographs), and naturally when motions were involved. Our accuracy estimates were consistent with the 0.26-0.4mm results reported in [5,6]. Although the phantom model of [2] was almost identical, greater discrepancies (lower accuracy) resulted from our study. Estimates for Cup/Stem movement reported in [2] showed a 4, 3, 6, and 4-fold better accuracy in the medial, superior, anterior-posterior and resultant directions respectively. On first inspection, we assumed that the main reason was the smaller range of translations in [2] (<0.2mm in any direction), compared to the maximum of 2nm of this study, which still represented realistic THR wear after 20 years.
years in-vivo with conventional UHMWPE. However, closer inspection revealed that the statistical analysis of [2] essentially yielded estimates of accuracy in the mean of a set of measurements, yet in this study we tried to estimate the accuracy expected in each measurement during a follow-up visit. We believe the former [2] is useful for characterizing RSA phantom setups, but the latter is more relevant for clinical use.

RSA precision based on this phantom study was 0.23mm and its accuracy was ±0.5mm at worst; both of which were still very impressive. Clinical RSA results should be viewed with these figures in mind.

Fig. 3: Part of one digital x-ray showing the 3 beads around the hip stem. The sawbone hemi pelvis does not show because of its low density, but its markers were also clear.

References
Each year the Department of Orthopaedic Surgery hosts several ‘visiting speakers’ who present seminars for orthopaedic faculty, residents, staff, and practicing surgeons in the area. Being able to share the expertise and experience of so many individuals with our residents is an important part of providing a quality educational experience.

“Bringing in speakers who are excited to share their knowledge is an important part of this program,” said Dr. Kevin Garvin. “We would not be able to provide such a vast array of topics without support from our alumni and friends. Private contributions from alumni and friends are used to support the residency education program by paying transportation costs to bring lecturers to campus.”

Below is a list of all presentations given by visiting speakers from January 2004 through June 2006.

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<td>May 2006</td>
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<td>Dr. Mike Sun</td>
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November 2005

11  **Dr. John J. Callaghan**
University of Iowa College of Medicine
“Mobile Bearing Knee Replacements. Are We Going Forwards, Backwards or Sideways?”

21  **Dr. B. Matthew Hicks**
Fort Wayne Indiana Orthopaedics
“The History, Science and Clinical Applications of BMPs”

September 2005

30  **Dr. Kirby Hitt**
Scott and White Memorial Hospital
“Maximizing Range of Motion in Total Knee Replacement”

June 10-11, 2005

**Graduation Ceremonies**

**Dr. Robert Hart**
Oregon Health and Science University
“Lumbar Degenerative Disease in the Presence of Osteoporosis”
“Jack’s Back – The Politics of Low Back Pain”

**Dr. Kenneth Follett, Chairperson**
UNMC, Department of Neurosurgery
“Intrathecal Baclofen Therapy for Treatment of Spasticity”

**Dr. Joanne Swartzbaugh**
UNMC, Department of Neurosurgery
“Outcomes of Lumbar Spine Fusion”

**Dr. Reginald Knight**
Orthopaedics International, Kirkland, WA,
“Minimally Invasive Transpsoas Interbody Fusion for Lumbar Degenerative Conditions”

May 2005

27  **Dr. Lori Reed**
“Ankle Replacement: Is it the Answer to Ankle Arthritis?”

20  **Dr. Virginia Aita**
UNMC, Department of Preventive and Societal Medicine
“Patient Care”

April 18, 2005

**Biomedical Engineering Symposium**

**Dr. Jeffery Taylor**
Diamicron, Inc.
“Are Diamonds Forever? Eliminating the Bearing as the Limiting Factor in Arthroplasty.”

February 2005

7  **Dr. Brian Hasley**
“Surgical Dislocations”

November 2004

15  **Dr. Nicholas Ahn**
University of Missouri-Kansas School of Medicine
“Causative Factors in the Development of Lumbar Degeneration: the 53-year Johns Hopkins Prospective Study”

June 11-12, 2004

**Graduation Ceremonies**

**Dr. John Anthony Herring**
Texas Scottish Rite Hospital for Children
“The History of Polio”
“Multicenter Legg Perthes Study”

**Dr. Jeffrey Farber**
Iowa Orthopaedic Center
“Pediatric Femur Fractures”

**Dr. Horacio Plotkin**
UNMC, Pediatrics Metabolism
“Bisphosphonate in Osteogenesis Perfecta”

**Dr. Eric Gordon**
St. Louis Children’s Hospital
“Trochanteric Nailing of Pediatric Femur Fractures”

August 2004

16  **Dr. Brian Brigman**
Duke University Medical Center
“Musculoskeletal Oncology”

April 2004

30  **Dr. John Miyano**
Orthopaedic Hand Surgeon, Seattle, WA
“Distal radius fractures”
“Vascularized bone grafts for wrist surgery”

February 15-17, 2004

**ASEAN American Orthopaedic Association Traveling Fellows:**

- **Kian Chuan Ang, M.D.**
  National University Hospital
  Dept. of Orthopaedic Surgery
  Singapore, 0511

- **Rodolfo L. Nitollama, M.D.**
  Philippine Orthopaedic Association
  Quezon City, Philippines

- **Vasan Sinnadurai, M.D.**
  Ipoh, Malaysia

- **Surachai Sae-Jung, M.D.**
  Khonkeen University
  Dept. of Orthopaedics
  Khonkaen, Thailand
The department’s research and education programs received extraordinary financial support during the 2004-2005 calendar years, including gifts from two former chairs of Orthopaedic Surgery, a volunteer faculty member, and a major philanthropic foundation. In addition, dozens of other alumni and friends “gave back” to the department’s annual Development Fund, which supports resident education activities.

The names of these donors have been added to the department’s Wall of Honor which permanently recognizes individuals and organizations who have given $100,000 or more to the Department of Orthopaedic Surgery and Rehabilitation.

“The more people learn about our research activities and our resident training program, the more they want to support these efforts,” said Dr. Kevin Garvin. “People who provide financial support receive the satisfaction of knowing that their gifts advance scientific research, medical education, and patient care.”

Earnings from the endowed JACKSON BENCE, M.D., EDUCATION AND RESEARCH FUND will be used to support educational activities and research projects. The late Dr. Jackson Bence was an active and devoted volunteer faculty member. A Navy veteran and 1958 Nebraska College of Medicine graduate, he practiced general surgery in Grand Island for seven years before returning to UNMC for his orthopaedic residency training. In 1984 Dr. and Mrs. Carrie Bence moved to Lincoln where he joined the staff of the Veterans’ Administration Hospital staff. For many years, Dr. Bence supervised orthopaedic residents at the V.A. Hospital in Lincoln and Omaha. He once said, “I love teaching residents because I learn too.” Dr. Bence passed away February 3, 2004, at age 75. Earnings from the principle of this fund will eventually provide perpetual support for the departmental research and education.

THE CONNOLLY ORTHOPAEDIC SURGERY AND REHABILITATION FUND was established by Dr. John Connolly, who served as chair of the Department of Orthopaedic Surgery (1974-1990). He and his wife, Anne, now live in Orlando, Florida, where he is head of Orthopaedic Surgery at the Orlando Medical Center, one of the nation’s largest health care systems. “I believe the old saying ‘you make a living by what you get; and you make a life by what you give,’” said Dr. Connolly. As a former department chair, he knows private gifts provide vital resources beyond fluctuating annual budgets. Each year, the department presents the John F. Connolly Award for Outstanding Research to a graduating resident. “Research was fulfilling in my life, and this fund will be used to help residents and others conduct research and solve problems, which in turn benefits our entire field,” he said.

During the 9 years the late DR. JAMES NEFF served as chair of the Department of Orthopaedic Surgery (1991-2000), he was responsible for the development of a Biomechanics Laboratory. Prior to his death, he and his wife, Dr. Julia Bridge, gave a valuable in-kind gift of equipment for the lab that is now located in theScott Technology Transfer and Incubation Center. “I’ve always been interested in biomechanics,” Dr. Neff had said. He designed the Neff Femoro-Tibial Nail and a system of modular implants used in tumor reconstruction. A graduate of the University of Kansas Medical School, Dr. Neff completed his orthopaedic training at the University of Michigan, served in the Navy, and completed a musculoskeletal fellowship at the University of Florida. The vertical milling machine, engine lathe, drill press, hand tools, and many parts and accessories will make it easier to customize fixtures that can be used for multiple projects in the department’s world-class laboratory. “I feel indebted to the faculty and residents of the department,” Dr. Neff had said. “Donating my equipment will enhance the capabilities of the laboratory; it was a natural fit.” Dr. Bridge, a cytogeneticist and pathologist, is a courtesy professor in the Department of Orthopaedic Surgery.
**DR. WAYNE AND EILEEN RYAN** were first added to the department’s Wall of Honor in the spring of 2004, in recognition of their generous donation designed to support various research activities within the department. Dr. Ryan was a former faculty member in the Departments of Biochemistry, and Obstetrics and Gynecology, and also gained a campus-wide perspective as Dean for Research at UNMC’s College of Medicine. Currently, Dr. Ryan is professor emeritus of Ob/Gyn. He is also founder of Streck Laboratories, a leader in the innovation, research, and manufacturing of hematology, chemistry, immunology, and histology products for the clinical laboratory. “As a long-time faculty member and now emeritus professor, I feel a great deal of pride in what has been accomplished at UNMC,” said Dr. Ryan. “As our corporation grew, I found I could support more and more research. UNMC faculty members told me how their research suffered from lack of funds, the same problem I had experienced as a faculty member.” In 2005, Dr. Ryan and his wife made a second generous donation to the department, continuing their long-time support of the department’s various research activities. By supporting the department’s research efforts and other UNMC areas, Dr. Ryan feels he is able to support causes in his own area of interest.

Also in the spring of 2004, **MS. CHRISTINA HIXSON** of the Lied Foundation was inducted into the department’s Wall of Honor. Ms. Hixson became the trustee of the Lied Foundation in 1980 after the death of Ernest Lied, whom she had worked with for over 40 years. Since that time she has created a legacy of generosity that has influenced thousands of lives across Nebraska. Her gift to the department in 2004 established an endowment, and the annual earnings from that perpetual fund supports a variety of orthopaedic research and education projects. In 2005, Ms. Hixson made a second generous gift to the department, which made it possible for the department to purchase a top-of-the-line hip simulator for use in the orthopaedic research laboratories. “Without the ability to purchase and maintain equipment essential for use in the research labs, the inspiration and ingenuity of our faculty and research staff would not be realized at the level that is now possible,” said Dr. Kevin Garvin. “We offer sincere gratitude to each of the individuals and corporations that are willing to support our efforts in the hopes that the outcome will benefit not only the department, but patients and the orthopaedic community as well.”

**PROFESSORSHIPS COMMEMORATE LIVES OF OUTSTANDING ORTHOPAEDIC SURGEONS**

The late Drs. L. Thomas Hood and Herman Frank Johnson are two names that run deep through Nebraska’s orthopaedic heritage. Mrs. Marjorie Hood (wife of Dr. Hood and daughter of Dr. Johnson) wanted to make sure that they were remembered for their remarkable contributions to the field of orthopaedics, while also supporting the mission of the Department of Orthopaedic Surgery that they both helped to build.

Dr. Herman Frank Johnson graduated from the University of Iowa College of Medicine in 1922. For over two decades he shared his ideas on improving orthopaedic care with the medical community at meetings and in publications covering a broad range of topics. Two of Dr. Johnson’s landmark publications included, “Reconstruction Procedures in Traumatic Lesions of Bone and Joint Where Conservative Methods Fail,” and “The Orthopaedic Care of the Arthritic Patient.” In 1932 he became an assistant professor of both Orthopaedic Surgery and General Surgery at the Nebraska College of Medicine, and shared his expertise with many young medical students. In addition to this appointment, Dr. Johnson was a senior partner in the office of Lord, Schrock and Johnson. Dr. Johnson practiced at Methodist, Clarkson and Immanuel Hospitals, consulted at Lutheran Hospital, and practiced in some out of state facilities as well.

(continued on next page)
Dr. L. Thomas Hood graduated from UNMC in 1946. During his years at UNMC he also worked part-time at the orthopaedic office of Lord, Schrock, and Johnson. Being exposed to Dr. Johnson’s expertise and extensive knowledge, Dr. Hood was inspired and decided to specialize in orthopaedic surgery. After serving two years in the Army Medical Corp and completing a three-year fellowship in orthopaedic surgery at the Mayo Clinic, he returned to Omaha and became a partner in his father-in-law’s office until he retired in 1984.

In 1968 Dr. Hood became the first chair of the Department of Orthopaedic Surgery and Rehabilitation at UNMC. During his time as chair (1968-1974) he pioneered the residency program in orthopaedics and was personally responsible for the first twelve people to enter the program. In 1970, upon his return after traveling to Europe to study hip arthroplasty, he performed the first hip replacement in Nebraska and shared his knowledge of the procedure with other orthopaedic surgeons. In private practice Dr. Hood operated at many hospitals in the community and served as president at Methodist and Immanuel at different times in his career.

Mrs. Hood has generously donated to the Orthopaedic Department through the establishment of professorships in the names of her husband and father. The professorships are intended to be awarded to those who have followed in their footsteps and set the standards of patient care, education and research at a level that encourages others to do the same; in turn, perpetually inspiring the orthopaedic surgeons of the future to maintain the department’s mission and standard of excellence. Drs. Kevin Garvin and Matthew Mormino have shown just these qualities.

Dr. Garvin has been awarded the “L. Thomas Hood, M.D., Professor of Orthopaedic Surgery and Rehabilitation,” for showing strong leadership skills as chair of the department, increasing the research focus of the department’s faculty, and building and maintaining a strong clinical practice while also excelling in his duties as chair of Orthopaedic Surgery.

Dr. Mormino was honored with the “Herman Frank Johnson, M.D., Professor of Orthopaedic Surgery and Rehabilitation,” for demonstrating outstanding surgical and academic skills, excelling as director of the residency program, and being a principal investigator on a ground-breaking clinical trial to enhance bone healing.

“As a department, we are very grateful for this generous donation,” said Dr. Kevin Garvin. “These funds provide support to so many areas of our department, including the advancement of our scientific research and making various programs within the department a possibility.”

Over time, the intent of this generous donation is that the endowed funds will generate enough principal to allow the Professorships to ascend to the level of endowed Chairs of Orthopaedic Surgery.
HONOR ROLL OF CONTRIBUTORS
2004-2005

Gifts from orthopaedic alumni, friends, faculty members, foundations, and corporations support the department’s mission by providing vital resources for resident education, scientific research, and various other programs within the department. Private gifts make a day-to-day difference in the educational opportunities we are able to provide for our orthopaedic residents, the cutting-edge research we perform in our laboratories, and the treatment we are able to offer our patients.

Some people choose to support the department’s annual fund (department-wide fund) that is used primarily for resident education; others choose to their gifts to specific funds for scholarships, research, library resources, or laboratory equipment for example.

The following honor roll alphabetically lists the names of individuals and organizations that supported the Department of Orthopaedic Surgery Rehabilitation during the calendar years 2004 and 2005.

ON BEHALF OF THE DEPARTMENT’S FACULTY, RESIDENTS, STAFF, AND PATIENTS WHO BENEFIT FROM YOUR PRIVATE CONTRIBUTIONS, WE EXTEND OUR MOST SINCERE THANKS FOR YOUR VITAL SUPPORT.

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<td>Central Nebraska Orthopaedics &amp; Sports Medicine</td>
<td>Bhuller, Gurpal S., MD</td>
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<td>Esposito, Paul W., MD</td>
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<td>Davis, Richard T., MD</td>
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<td>Hixson, Christina M.</td>
<td>Drs. Gross, Iwersen, Kratochvil &amp; Klein</td>
<td>Diprima, Adam</td>
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<td>Hood, Marjorie</td>
<td>Fitzgibbons, Timothy C., MD</td>
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<td>Neff, James R., MD &amp; Julia Bridge, MD</td>
<td>Garvin, William, MD, &amp; Jeanne</td>
<td>Emodi, George, MD</td>
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<td>Ryan, Wayne, MD &amp; Eileen</td>
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<td>Scott-Miller, James R., MD</td>
<td>Hansen, Stephen, MD</td>
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<td>Sicuranza, Michael, MD</td>
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<td>Surgical Solutions of Nebraska Inc.</td>
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<td>The Durham Foundation</td>
<td>Wiebe, David A., MD</td>
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<td>Wall, Roger</td>
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Please note: If you have a question or correction to this honor roll, please contact the University of Nebraska Foundation’s Omaha office at 8712 West Dodge, Suite 100, Omaha, NE 68114, (402) 595-2302.

Those who contributed to departmental funds this calendar year (2006) will be recognized in an honor roll to be published in the fall 2006 issue of the department’s newsletter, Breaking News, and in a future Orthopaedic Department Report, a publication which is produced every other year.
GRANTS, FUNDS, AND ENDOWMENTS: LIGHTING THE SPARK OF MEDICAL EDUCATION, SCIENTIFIC INNOVATION, AND PATIENT CARE

The UNMC Department of Orthopaedic Surgery and Rehabilitation has a national reputation for educating outstanding surgeons, and our reputation for innovative research is garnering national attention. In addition to research related to patient care, departmental faculty members are doing research in basic science, biomechanical engineering, computer simulation, and nano-biotechnology.

The following list shows the names, sources and funding of grants the department has received from 2004 through early 2006:

A. PEER-REVIEWED GRANTS:

National Institute of Health
National Institute on Aging
* “Assays of Stem Cell Function in Clinical Aging Research” $937,500

American Geriatric Society
* “Assessing the prevalence of rotator cuff tears in men and women 65 years of age and older”

* Dennis Jahnigen Career Development Award from the American Geriatrics Society to study the prevalence of asymptomatic rotator cuff tears and associated shoulder function in patients 65 years and older using ultrasound and shoulder function metrics.

American Geriatrics Society
* “Assessing the prevalence of rotator cuff tears in men and women 65 years of age and older”

* Dennis Jahnigen Career Development Award from the American Geriatrics Society to study the prevalence of asymptomatic rotator cuff tears and associated shoulder function in patients 65 years and older using ultrasound and shoulder function metrics.

Nebraska Research Initiative
* “Design of nanoceramic materials with enhanced wettability and reduced brittleness” $319,723

Total of Peer-Reviewed Grants: $1,457,223

B. ENDOWMENTS:

Christina M. Hixson:
* Endowment Sub-fund for Research in Orthopaedic Surgery and Rehabilitation Medicine (annually) $157,000

Wayne and Eileen Ryan:
* Orthopaedic Research Development Fund

Total of Endowments: $162,000

C. DEPARTMENT FUNDS/DONATIONS:

The department maintains several non-endowed funds at the University of Nebraska Foundation in Omaha. Some funds have been established by generous individuals for specific purposes, while the department’s Development Fund is a department-wide, unrestricted resource. The following is a list of the department’s non-endowed funds as of January 1, 2004:

Christina M. Hixson:
* Research Project Start-up Sub-fund (orthopaedic research) (annually) $420,000

Wayne and Eileen Ryan:
* Orthopaedic Research Development Fund

Total of Department Funds/Donations: $641,000

The Department of Orthopaedic Surgery Development Fund is a department-wide resource used primarily for resident training activities, such as supporting residents who present research projects at national meetings; bringing renowned speakers to campus to share their knowledge with residents, faculty, and staff; and even helping to make resident graduation a memorable celebration. The department chair uses this unrestricted fund to take advantage of unforeseen opportunities. Each year, Dr. Garvin writes to orthopaedic residency alumni and asks them to contribute to the Development Fund. Although this fund is not large or endowed, it provides vital, flexible resources to support a variety of resident education and faculty-related projects.

Those who contributed to the Department of Orthopaedic Surgery Development Fund during calendar years 2004 and/or 2005 are included in the department’s Honor Roll of Contributors.

Orthopaedic Surgery Department Development Fund (annually) $21,000

Total of Department Funds/Donations: $641,000
### D. INDUSTRY:

**Biomet, Inc.**
- “Collaborative research with Biomet Manufacturing Corp. to investigate the longevity of a new mobile bearing total knee replacement system being designed by Biomet”
  - $40,000

**DePuy Products, Inc.**
- “Investigating the feasibility of freehand navigated bone cutting for total knee replacement surgery”
  - $74,155

**Biomet, Inc.**
- “A study of the laxity and constraint of the Biomet vanguard anterior-stabilized (AS) knee replacement system”
  - $45,000

**Aastrom Biosciences, Inc.**
- “OCG-1 autologous bone marrow cells for the treatment of appendicular skeletal fracture non-union”
  - $100,698

**Zimmer, Inc.**
- “A multi-center, prospective clinical outcomes study to obtain data on Zimmer revision or primary hip arthroplasty devices for primary and revision total arthroplasty of the hip joint in patients with large boney defects of the acetabulum or proximal femur”
  - $30,000

**Advanced Total Ankles, Inc.**
- “An experimental investigation on the biomechanics of the advanced total ankle replacement system”
  - $40,000

**Zimmer, Inc.**
- “Zimmer minimally invasive solutions satellite institution agreement”
  - $782,180

**Advanced Orthopaedics Implants, LLC**
- “Pin-on-Disk wear testing of a novel ceramic material for use in total joint prostheses”
  - $11,000

**Zimmer, Inc.:**
- “Minimally invasive solutions primary hip arthroplasty outcome study”
  - $18,900

**Zimmer, Inc.:**
- “Minimally invasive solutions total knee arthroplasty outcome study”
  - $18,900

**Total of Industry Funds:** $1,160,833

**Total of categories A, B, C, and D:** $2,849,696

### OTHER ENDOWED FUNDS:

Endowed funds provide perpetual resources for a variety of education and research activities. When an individual establishes an endowed fund through the University of Nebraska Foundation to benefit the Department of Orthopaedic Surgery, the principal of the fund is invested and the earnings from the invested endowment provide spendable earnings for assistantships, resident education, equipment and technology purchases, library resources, seed money for scientific research projects, and much more. Some of the department’s endowed funds are restricted for specific purposes, while others are flexible and may be used by the department to support a variety of areas.

**Jackson Bence, M.D. Education and Research Fund**
- Resident education, research and related activities

**James R. Neff, M.D. Musculoskeletal Fund**
- Establishment of James R. Neff, M.D., Chair of Musculoskeletal Oncology

**Ruth and William Scott Center for Outcomes Research Fund**
- Establishment, benefit and support of the Ruth and William Scott Center for Outcomes Research

**L. Thomas and Marjorie Hood Professorship of Orthopaedic Surgery**
- Faculty support/professorship

**Dr. Foster Matchett Research Assistantships**
- Research assistantships

**Frank P. Stone Professorship of Orthopaedic Surgery**
- Faculty support/professorship

**H. Winnett Orr Memorial Research Fund**
- Research and teaching supplies and materials

**James R. Neff, M.D., Children’s Orthopaedic Cancer and Molecular Genetics Fund**
- Orthopaedic surgery and rehabilitation

**Jean Brug Jardon Endowment Fund**
- Residents library and teaching resources

**Robert C. Hendler, M.D., Fund**
- Center for Excellence in Muscular Skeletal Diseases

**Robert G. Volz, M.D. Research Fund**
- Research and education

**The Chapin Endowment Memorial Fund**
- Osteoporosis research support
The University of Nebraska Medical Center will establish a new center to better understand the epidemiology of arthritis and to better analyze the determinants, which predict outcomes for arthritis sufferers.

The center, which would be called the Ruth and Bill Scott Center for Outcomes Research, will go before the University of Nebraska Board of Regents later this year to gain formal designation as a center. It is expected to open this fall and be located on the third floor of Poynter Hall.

Three studies with potentially huge implications for the public will initially be undertaken by the center, which was made possible by a major gift by Omaha philanthropists Ruth and Bill Scott.

“After watching three generations of our families suffer from arthritis, this project really piqued our interest,” Ruth Scott said. “Hopefully, future generations will profit from this research study.”

The center will be under the direction of Kevin Garvin, M.D., professor and chair of orthopaedic surgery, and James O’Dell, M.D., professor of internal medicine and chief of the rheumatology and immunology section. It will allow the two physicians to create what is believed to be the largest and most comprehensive study of its kind relating to arthritis epidemiology.

Researchers in the Ruth and Bill Scott Center for Outcomes Research will be examining surgical outcomes in arthritis patients undergoing total joint replacements. Total joint replacement of the knee and hip are increasingly used treatments for patients with end stage joint disease secondary to arthritis. Each year, approximately 120,000 patients undergo total hip replacement and an additional 270,000 undergo total knee replacement in the U.S.

Using a large national database, the National Surgical Quality Improvement Program database through the Veterans Affairs hospitals, UNMC researchers will explore determinants of poor surgical outcomes among U.S. veterans with arthritis undergoing joint replacement. Findings from this study will guide the development of future interventions aimed at improving surgical outcomes in arthritis sufferers, Dr. Garvin said.

In a second database study, UNMC investigators plan to examine the potential association of statins (commonly used cholesterol-lowering drugs) with the development of arthritis. Results of preliminary reports have been somewhat contradictory suggesting that the use of these lipid-lowering drugs is associated with both an increased and decreased risk of developing arthritis.

Using a large national medical database, researchers hope to examine the association of these agents with common forms of arthritis. Given the increasing prevalence of arthritis in the U.S., coupled with an increased use of lipid-lowering drugs, these findings may have important public health implications, Dr. O’Dell said.

A third study, led by UNMC orthopaedic surgeon Dr. Edward Fehringer and rheumatologist Dr. Amy Cannella, will examine the frequency and impact of chronic rotator cuff tears in patients with rheumatoid arthritis. Researchers will be recruiting UNMC and Omaha VA patients with rheumatoid arthritis. The patients will be examined using state-of-the-art imaging techniques including dynamic ultrasound. Findings from this study will allow researchers to better quantify the contribution of shoulder problems to poor outcomes in rheumatoid arthritis, a condition associated with substantial work-related disability.

The Centers for Disease Control and Prevention (CDC) estimate that arthritis impacts the daily lives of more than 40 million Americans, including more than 500,000 Nebraskans. The annual cost of treating arthritis in the U.S. is nearly $64 billion. For Nebraska, this translates into annual costs of more than $320 million.

“The generosity of Ruth and Bill Scott will allow us to embark on research that is critical to the field of arthritis,” Dr.
Garvin said. “In addition, this research will hopefully allow us to offer improved treatments to the countless numbers of arthritis sufferers we see each year. We can not thank them enough for this opportunity.”

A plaque in recognition of the Scotts’ generous donation has been added to the Department of Orthopaedic Surgery’s Wall of Honor, which permanently recognizes individuals and organizations who have given $100,000 or more to the department.

“Ruth and Bill Scott’s vision and generosity will not only ensure ongoing collaborative efforts between rheumatology and orthopaedics,” Dr. O’Dell said, “but it also will be the catalyst that will allow us to begin building the infrastructure for what we believe will be one of the largest arthritis outcome centers in the United States.”

This marks the third major gift the Scotts have made to the medical center. In 2003, their contribution to the Durham Research Center established the Ruth and Bill Scott Neuroscience Research Laboratories located on the third floor. Earlier this year, they made the largest gift to the University of Nebraska Foundation in support of a new education building at UNMC. Instead of having the building named in their own honor, the Scotts requested that it be named the Michael F. Sorrell Center for Health Science Education in honor of Michael Sorrell, M.D., a legendary UNMC physician.

“Through their incredible support, Ruth and Bill Scott are allowing the medical center to do things that will impact the quality of health care in Nebraska for generations to come,” said Harold M. Maurer, M.D., UNMC chancellor. “They are true visionaries who are making a difference. We are eternally grateful to them.”

Ruth and Bill Scott are both graduates of the University of Nebraska-Lincoln. Bill Scott is a former vice president of Berkshire Hathaway. Ruth Scott is a bridge instructor and founder of the Omaha Bridge Studio.
Kevin L. Garvin, M.D.

Research interests:
- Adult reconstruction
- Infected total joint arthroplasty

Current research grants:

Refereed Articles:

Book Chapters:

Book Reviews:

Honors and Awards:
- Special Achievement Award, UNMC College of Medicine, 2006.
- Featured in an article in *Orthopedics Today* titled “Freehand cutting in TKR can slash cutting time,” by Stephen B. Sherretta on the study presented by Dr. Hani Haider, Mr. Andres Barrera, Dr. Todd Sekundiak and Dr. Kevin Garvin at the American Academy of Orthopaedic Surgeons, June 2005.
- Professorship, L. Thomas Hood Professor of Orthopaedic Surgery and Rehabilitation, 2005.
- Recipient, Jeannette Wilkins Award given by the Musculoskeletal Infection Society (MSIS). Awarded for best clinical paper at the annual scientific meeting, 2005.
Featured in an article in UNMC Discover Magazine titled “Leading the way in joint replacement surgery,” by Mr. Tom O’Connor, highlighting the arthroplasty outcomes and minimally invasive research of Dr. Kevin Garvin and Dr. Todd Sekundiak. The article centrally featured the novel Computer Navigated Freehand Bone Cutting system for knee replacement developed by Dr. Hani Haider and Mr. Andres Barrera, 2005.


Consultant Reviewer, Clinical Orthopaedic and Related Research, 1991-present.

Consultant Reviewer, European Journal of Epidemiology, 1995-present.

Examiner, American Board of Orthopaedic Surgery, 2001-present.

Deputy Editor, Clinical Orthopaedics and Related Research, 2003-present.

Editorial Board, Techniques in Knee Surgery, 2002-present.


Mid-America Orthopaedic Association President, 2004-2005

American Orthopaedic Association, 1997-present

Member, Exchange Fellowship Committee, 2002-2005

Member, ABC Selection Committee, 2004

Member, Resident Leadership Forum, 2005-present

Hip Society, 1997-present

Member, Membership Committee, 2002-2004

Chair, Membership Committee, 2005-present

Mid-America Orthopaedic Association, 1993-present

Member, Planning Committee, 2003-2006

Chair, Audit Committee, 2003-2004

First Vice-President, 2003-2004

President, 2004-2005

Chair, Nominating Committee, 2005-2006

Member, American Medical Association, 1982-present.

Member, American College of Surgeons, 1992-present.

Member, American Academy of Orthopaedic Surgeons, 1992-present.

Member, Orthopaedic Research Society, 1990-present.

Member, Musculoskeletal Infection Society, 1993-present.

Member, Association of Bone and Joint Surgeons, 1996-present.

**PAUL W. ESPOSITO, M.D.**

**Research Interests:** Stabilization and management of deformities and fractures in patients with osteogenesis imperfecta

**Referred Articles:**


**Honors and Awards:**

President-Elect of Medical Staff, Children’s Hospital, 2006-2007; President, 2008-2009.

Special Achievement Award, UNMC College of Medicine, 2006.


Member, American Orthopaedic Association, June 2005-present.

Reviewer, Pediatrics, August 2005-present.


Chair, Department of Surgery, Children’s Hospital, January 2004-present.


**EDWARD V. FEHRINGER, M.D.**

**Research Interests:** Rotator cuff tears and their association with aging and other co-morbidities

Shoulder socket reconstruction in shoulder with arthritis

**Current Research Grants:** $200,000 Dennis Jahnigen Career Development Award from the American Geriatric Society

**Referred Articles:**


Glen M Ginsburg, M.D.

Research Interests:
Gait disorders
Spinal deformity

Current Research Grants:
Research Support for Motion Analysis Laboratory at Munroe-Meyer Institute.
PI: Glen M. Ginsburg, M.D., Co-I: Wayne Stuber, Ph.D. Total: $500,000. August 1, 2000 – August 1, 2005.


Pre- and Post-Operative Motion analysis for Evaluation of Patients with Chronic Neck Pain. Dr. Glen M. Ginsburg, M.D., N. Åke Nyström, MD, PhD. Total: $10,000 (50% UNMC Department of Surgery, 50% Department of Orthopaedic Surgery), 2002-2004.

Honors and Awards:
Chairman-Elect, Membership Committee, American Academy of Cerebral Palsy and Developmental Medicine, 2006; Chair, 2007.

Special Achievement Award, UNMC College of Medicine, 2006.

Best Doctors in America, 2005-2006.

Prevalence and Natural History Committee, Scoliosis Research Society, 2005-present.


Hani Haider, Ph.D.

Research Interests:
Total Knee Replacement simulation and testing
Minimally invasive TKR design and finite element analysis

“Smart implants”: instrumented implants with miniature electronics and computers on-board

Computer-aided orthopaedic surgery: Development of image-guided systems for navigation freehand bone cutting for total knee replacement surgery

Current Research Grants:
An experimental investigation of the biomechanics of the Advanced Total Ankle Replacement System. Funded by Advanced Total Ankles, Topez Orthopedics, Principal Investigator, $40,000, 2005-present.

Investigation of the longevity of a new mobile bearing total knee replacement system being designed by Biomet Inc. Funded by Biomet Inc. /IN, Principal Investigator, $45,000, 2005-present.

Investigating the feasibility of Freehand Navigated Bone Cutting for Total Knee Replacement Surgery - Phase 1a: Principal Investigator, $74,155, 2005-present.

Refereed Articles:


Honors and Awards:
Outstanding Professional Achievement
Award, UNMC College of Medicine, March 2006.

Special Achievement Award, UNMC College of Medicine, March 2006.

Elected chairperson of the American Society for Testing and Materials (ASTM) committee F04.22.25 for developing standards for testing artificial ankle replacement implants prior to clinical use, November 2005.

Received the “HAP Paul Award” for the best research paper “… on new development in the field of orthopaedic arthroplasty” at the 18th Annual Symposium for The International Society for Technology in Arthroplasty, Kyoto, Japan, October 2005.

Elected to chair the International Standards Organization Task Group for reviewing ISO 14243-1 and 14243-2, the two standards for testing Total Knee Replacement Systems, October 2005.

Featured in an article in *Orthopedics Today* titled “Freehand cutting in TKR can slash cutting time,” by Stephen B. Sherretta on the study presented by Dr. Hani Haider, Mr. Andres Barrera, Dr. Todd Sekundiak and Dr. Kevin Garvin at the American Academy of Orthopaedic Surgeons, June 2005.

Received the “ASTM Robert Fairer Award” bestowed by the American Society of Testing and Materials, Committee (F4) on Medical and Surgical Materials and Devices for providing leadership and making great contributions to the development of medical device and materials standards, May 2005.

Elected chairperson of the American Society for Testing and Materials (ASTM) committee F04.22.22 for developing standards for testing the patella of knee replacement systems prior to clinical use, May 2005.

Elected as chairperson of the organizing committee of the Heartland Biomedical Engineering Symposium hosted at the Scott Technology Center, April 2005.

Elected chairperson of a work group to develop the first Phantom for validating Computer Aided Orthopaedic Systems (CAOS), by the ASTM committee for developing standards for CAOS systems, February 2005.

Featured in an article in *UNMC Discover Magazine* titled “Leading the way in joint replacement surgery," by Mr. Tom O’Connor, highlighting the arthroplasty outcomes and minimally invasive research of Dr. Kevin Garvin and Dr. Todd Sekundiak. The article centrally featured the novel Computer Navigated Freehand Bone Cutting system for knee replacement developed by Dr. Hani Haider and Mr. Andres Barrera, 2005.

Elected to continue as co-chairperson of the American Society for Testing and Materials (ASTM) committee F04-22.11 for developing standards for testing methods of artificial knee implants prior to clinical use, May 2004.

**Brian P. Hasley, M.D.**

Research Interests:
Spine deformity

Honors and Awards:
Pfizer Scholars in Pain Management Award, June 2004.
John F. Connolly Outstanding Research Award, June 2004.

**Walter W. Huurman, M.D.**

Research Interests:
Pediatric Orthopaedic Manpower,
Long-term outcome of past treatment for developmental and congenital problems in the immature skeleton

Honors and Awards:
America’s Top Surgeons, 2006.
Distinguished Service Award, American Academy of Pediatrics, Section on Orthopaedics, 2004.

**Matthew A. Mormino, M.D.**

Research Interests:
Adult derived stem cells for treatment of nonunion
Functional outcomes of humerus fractures treated with functional bracing

Gene chips for identification of bacterial colonization of orthopaedic hardware aseptic nonunions

**Refereed Articles:**


**Honors and Awards:**
Special Achievement Award, UNMC College of Medicine, 2006.
Best Doctors in America, 2005-2006.
Promoted to Associate Professor of Orthopaedic Surgery, July 2004.
Program Director, Residency Training Program, UNMC Department of Orthopaedic Surgery and Rehabilitation, July 2004 – present.
Howard Rosen Outstanding Table Instructor Award AO-ASIF Principles of Fracture Management Resident Course, Indianapolis, IN, May 2005.
Professorship, Herman Frank Johnson, M.D., Professor of Orthopaedic Surgery and Rehabilitation, 2005.
Award for Faculty Excellence in Teaching Orthopaedic Surgery Residents 2005.
Listed in Best Doctors in America 2005.
Award for Faculty Excellence in Teaching Orthopaedic Surgery Residents 2004.
Fereydoon Namavar, Sc.D.

Research Interests:
Application of nanotechnology in total joint arthroplasty for reducing orthopaedic implant wear and controlling bone growth through material and surface design

Interaction of stem cells and organisms with micro and nanostructured engineered materials (tissue engineering)

Effect of electrical stimulation on growth and differentiation of stem cells on nano-engineered surfaces

Development of smart infection-resistant coatings for orthopaedics and dental implants

In-vitro and in-vivo absolute wear

Development of medical imaging technology by non-ionizing radiation

Current Research Grants:


Refereed Articles:


Honors and Awards:
Courtesy Professor, Department of Electrical Engineering, University of Nebraska-Lincoln, December 2005-present.

Permanent Member, Ceramics, Cells and Tissues International Scientific Committee, Italian National Research Council, Institute of Science and Technology for Ceramics, 2004-present.

Co-Chairperson, round table on Nanomedicine in bone reconstruction: basic science and clinical application, Ceramics, Cells and Tissues 10th annual meeting, Faenza, Italy, May 2006.

Faculty Member, Center for Materials Research and Analysis, University of Nebraska-Lincoln, Fall 2004-present.

N. Åke Nyström, M.D., Ph.D.

Current Research Grants:
Pre- and Post-Operative Motion analysis for Evaluation of Patients with Chronic Neck Pain. Dr. Glen M. Ginsburg, M.D., Co-I: N. Åke Nyström, MD, PhD. Total: $10,000 (50% UNMC Department of Surgery, 50% Department of Orthopaedic Surgery), 2002-2004.

Refereed Articles:
Nystrom NA, Gold K, Meza J, Hagert C-G. A retrospective two-to-four year outcome study of 20 patients with negative MRI who received surgical treatment for chronic Whiplash Associated Disorder (WAD). Pain, April 2006, Submitted for publication.


Lori Reed, M.D.

Research Interests:
Post-traumatic hindfoot reconstruction

Refereed Articles:


Honors and Awards:

Emerging Leaders Program, 2004 – present.


Susan A. Scherl, M.D.

Research Interests:
Pediatic orthopaedic trauma, especially femur fractures
Non-Accidental pediatric orthopaedic trauma
Neuromuscular disorders
Medical student and resident education

Refereed Articles:


Book Chapters:


Honors and Awards:
Special Achievement Award, UNMC College of Medicine, 2006.

Pediatric Orthopaedic Society of North America Trauma and Prevention Committee Chair, 2005-2006.

Member, AAOS Trauma Call Task Force, August 2005 – present.

Promoted to Associate Professor of Orthopaedic Surgery, July 2005.


Todd D. Sekundiak, M.D.

Research Interests:
Adult Reconstruction
Minimally Invasive and Navigated Surgery

Current Research Grants:


A multi-center, prospective clinical outcomes study to obtain data on Zimmer revision or primary hip arthroplasty devices for primary and revision total arthroplasty of the hip joint in patients with large boney defects of the acetabulum or proximal femur. Zimmer, Inc. Primary Investigator, $30,000, 2005-present.

Refereed articles:


Book chapters:

Honors and Awards:
Member, Presidential Advisory Committee, Zimmer, Inc., 2006.

Featured in an article in Orthopedics Today titled “Freehand cutting in TKR can slash cutting time,” by Stephen B. Sherretta on the study presented by Dr. Hani Haider, Mr. Andres Barrera, Dr. Todd Sekundiak and Dr. Kevin Garvin at the American Academy of Orthopaedic Surgeons, June 2005.

Featured in an article in UNMC Discover Magazine titled “Leading the way in joint replacement surgery,” by Mr. Tom O’Connor, highlighting the arthroplasty outcomes and minimally invasive research of Dr. Kevin Garvin and Dr. Todd Sekundiak. The article centrally featured the novel Computer Navigated Freehand Bone Cutting system for knee replacement developed by Dr. Hani Haider and Mr. Andres Barrera, 2005.

Featured in Physicians Practice, a journal published by The Nebraska Medical Center, regarding his work with minimally invasive hip and knee joint replacement surgery, 2004.

International Society for Technology in Arthroplasty, 2004-present.

Facilitator, Zimmer Institute Training Center, Omaha, NE, 2004.

American Medical Association, 2002 present.

American Academy of Orthopaedic Surgeons, 2002-present.

American Association of Hip and Knee Surgeons, 1999-present.

Canadian Orthopaedic Association, 1996-present.

Fellow, Royal College of Physicians and Surgeons of Canada, 1994-present.
2006 Graduating residents with department chair. Left to Right: Drs. Charles E. Rosipal, Daniel S. Mulconrey, Kathleen Grier, Kevin L. Garvin (professor and chair), Steven J. Volin, and Mark E. Dietrich.

Dr. Kevin Garvin addressing the 2006 graduating residents and their spouses.

Graduation 2006, left to right: Susan Siebler, Office Supervisor, and Gerianne Miller, Residency Coordinator

2006 Graduation, golf outing, left to right: Kurt Bormann, HO II, and Randy Johnson, HO IV. Rear: Gustavo Cordero, HO II.

2005 Holiday party, left to right: Tami Jenson, Connie Feschuk, Jamie Baumert, and Christine Julian.

2005 Holiday: Scott Swanson, HO V, with wife, Roxane.
2005 Holiday party: Leonard Kibuule, HO IV, and his wife, Dr. Danette Kibuule.

2005 Graduation: Dr. Kevin Garvin and his wife, Janette.

2005 Graduation banquet, left to right: Bonnie and Ben O’Brien, Dr. Hani Haider, Shailaja Varma, Shashank Mupparapu, and Julieta and Andres Barrera.

2004 Graduation, golf outing, left to right: Chuck Rosipal (2006), Dr. Danette Kibuule.

2005 Graduation banquet, left to right: Drs. Scott Swanson, HOV, Anthony Lauder (2005), Ivan Tarkin (2005), Casey Johnston, HO III.


2005 Graduation: Department faculty, residents, alumni and staff take a break from scientific presentations for the annual group photo.

Pediatric Orthopaedic staff spring 2006, left to right: Renee Jackson, Linda Kraut, Cyndi Tarbox Whitmyre, Emily Schoech, Rutaanne Haverman, Mary Jo Anzalone, Gina Bedford, Lauri West, Debbie Knowlton, Kathy Hash. Not pictured: Vickie Raemakers.

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**Editor-in-Chiefs:**
Kevin L. Garvin, M.D., Professor and Chair
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**Editors:**
David Staiert, M.B.A., Administrator
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**Writer:**
Dana Meyer, B.J., Communications Assistant

**Contributing Writer:**
Thomas O’Connor, UNMC Public Affairs

**Layout and Design:**
Dana Meyer, B.J., Communications Assistant

**Design Assistance and Print Coordinator:**
Joe Edwards, Joe Designer

**Photographer:**
Jim Birrell, Birrell Signature Photography

**For more information contact:**
Dr. Kevin Garvin, Professor and Chair
Department of Orthopaedic Surgery and Rehabilitation
981080 Nebraska Medical Center
Omaha, NE 68198-1080

Phone: 402-559-4533
Fax: 402-559-5511

Visit the department online at:
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