

Urology

Research & Clinical Update

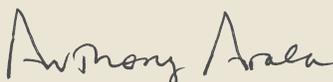
MESSAGE FROM THE CHAIR

Dear Colleagues,

As we begin a new year, I'm delighted to update you on the latest clinical and research news here at Wake Forest Baptist Urology. From an expanded clinical initiative for pelvic floor disorders to a project to develop a research model for post-prostatectomy incontinence and erectile dysfunction, I am proud of the innovative, pioneering spirit of our faculty.

Education is also an important part of our mission and I'm pleased to announce that we now offer four urology fellowship opportunities, including our newest offering in Female Pelvic Medicine and Reconstructive Surgery.

I hope you'll enjoy reading about our team's efforts to advance the field. We welcome collaborations and would be pleased to hear from you.



Anthony Atala, MD
William H. Boyce Professor and Chair

Innovations in Urology

From research on gene expression in interstitial cystitis to efforts to engineer testicular tissue in the lab, Wake Forest Baptist Health urologists are leaders in both basic science and innovative clinical therapies. Examples of current projects include:

3D Printed Tissue Closer to Reality

The idea of 3D printing replacement urologic tissues came a step closer to reality in 2016 when Wake Forest Baptist researchers reported success printing living tissue structures that developed a system of nerves and blood vessels when implanted in animals.

The potential applications for urology are varied, including printing the urologic tissues that have been engineered by hand and implanted in patients: bladder, urethra and vagina.

Reporting in *Nature Biotechnology*, the scientists said they printed ear, bone and muscle structures that have the right size, strength and function for use in humans.

With funding from the Armed Forces Institute of Regenerative Medicine, a federally funded effort to apply regenerative medicine to battlefield injuries, the team plans to implant bioprinted muscle, cartilage and bone in patients in the future.

A major challenge of tissue engineering is ensuring that implanted structures live long enough to integrate with the body. The bioprinting team addressed this by optimizing the water-based "ink" that holds the cells so that it promotes cell health and growth and by printing a lattice of micro-channels throughout the structures. These channels allow nutrients and oxygen from the body to diffuse into the structures and keep them alive while they develop a system of blood vessels.



Model of Post-prostatectomy Incontinence and ED



A reliable animal model of urinary incontinence and erectile dysfunction after prostatectomy is vital to understanding the pathophysiology of both conditions and developing new treatments. Urologists **Ashok Hemal, MD**, and **Gopal Badlani, MD**, are collaborating with **Joao P. Zambon, MD**, at the Wake Forest Institute for Regenerative Medicine to develop a model using

cynomolgus male monkeys. The ultimate goal is to develop and evaluate new therapeutic approaches such as cell-based therapy.

Monkeys are considered the ideal model because they have an intrapelvic bladder, similar genitourinary architecture and urinary sphincter shape, an upright sitting posture, and are large enough to perform a radical prostatectomy.

In work to validate the model, five of seven animals underwent radical prostatectomy. At three- and six-months follow-ups, all treated animals had urinary incontinence demonstrated by clinical assessment and urodynamic study.

A Blood Test to Predict BCG Response?

Although its mechanisms are not well understood, intravesical live *Bacillus Calmette-Guérin* (BCG) therapy remains the treatment of choice for bladder cancer in situ due to its response rate of up to 70 percent. But with more than 30 percent of patients failing to respond, is it possible to predict whether patients will benefit?

Ronald Davis, MD, is principal investigator on a Wake Forest Baptist study evaluating whether a simple blood test can identify non-responders so they could immediately be treated with other options. The study, which involves 40 patients slated for BCG therapy, is based on research by **Zheng Cui, MD, PhD**, associate professor of pathology. Cui's previous work on a line of cancer-resistant mice leads him to believe that BCG activates granulocytes that kill cancer cells. He has shown that some healthy humans possess the cancer-killing-activity observed in the mice.

For the clinical study, an assay developed by Cui will be used to measure the cancer-killing activity of bladder cancer patients' granulocytes. The results will be compared with how the patients respond to BCG therapy, with the goal of verifying the assay.

Biomarkers for Interstitial Cystitis/Painful Bladder Syndrome

With funding from the National Institute of Diabetes and Digestive and Kidney Diseases, faculty from the Wake Forest Institute for Regenerative Medicine and Urology are collaborating to identify biomarkers for the diagnosis and treatment of interstitial cystitis/painful bladder syndrome.

Previously, the team identified a subset of patients with low bladder capacity who had an up-regulation of pro-inflammatory transcripts and a down-regulation of urothelial barrier transcripts in bladder tissue biopsies. To evaluate the clinical correlation between bladder capacity and lower urinary tract symptoms, as well as non-urological symptoms and syndromes, the team performed a chart review of all patients in their study registry.

The analysis, involving data from 145 women with a diagnosis of IC/BPS who had undergone hydrodistention, showed there was a significant age-adjusted inverse correlation between bladder capacity and three of the measured variables: (1) urinary frequency, (2) depression and (3) IBS. Cystoscopic findings suggested more severe disease in the low capacity (<400ml) group.

In addition to the ongoing gene expression research, Wake Forest Baptist was one of several new ancillary sites selected in 2016 to perform a pilot study as part of the Multidisciplinary Approach to the Study of Chronic Pelvic Pain Research Network. This study will evaluate the therapeutic efficacy of hydrodistention in IC/BPS patients.

(Abstract presented at Société Internationale d'Urologie Annual Meeting. WFIRM researchers are Stephen J. Walker, PhD, and Joao P. Zambon, MD. Urology faculty co-researchers are Robert Evans, Gopal Badlani and Catherine Matthews.)

Model to Study Racial Disparity in Prostate Cancer

The research team of **K.C. Balaji, MD**, has validated an in vitro cell line model to study the biological basis of racial disparity in prostate cancer. Although African-American men present with higher-grade and higher-stage tumors than Caucasians, until now, few well-characterized models have been available to understand the biological basis.

Balaji's team had previously discovered and studied the role of protein kinase D1 (PKD1), a novel tumor and metastasis suppressor in prostate cancer. The work demonstrated that PKD1 is down-regulated in advanced prostate cancer, leading to the conclusion that loss of PKD1 in the prostate is a late event and a marker of aggressive disease. The current research involved generating a multiplex biomarker panel that could portend progression in men with prostate cancer. The team then explored whether the panel could be used to study the biological basis of aggressive phenotype in men with prostate cancer.

The study demonstrates the biomarker panel is characteristically dysregulated in primary African-American cell lines similar to metastatic Caucasian cells. Therefore, the model may be used for comparative studies of potentially aggressive tumors in African-American men with prostate cancer.

As future biomarker development and validation studies establish the utility of the panel in clinical practice, "back from bed to bench" functional studies could be performed.

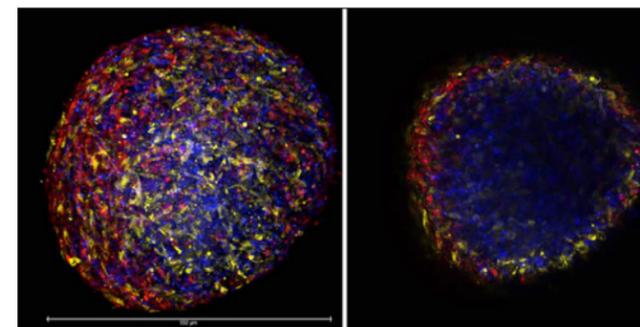
(Cell line modeling to study biomarker panel in prostate cancer. NickKholgh B, Fang X, Winters SM, Raina A, Pandya KS, Gyabaah K, Fino N, Balaji KC. Prostate. 2016 Feb 15;76(3):245-58. doi: 10.1002/pros.23116. PMID:26764245)

Resident Profile: A Chance to Make a Difference Engineering Testicular Organoids in the Lab

When first-year urology resident **Kara McAbee, MD**, successfully made a testicular organoid in the lab, she knew she had made the right decision to pursue a residency program with a research component.

"I said to myself, 'This is something that can have an impact in the real world.'"

She is especially glad she matched with a program where research occurs in the first year. "It provides the most protecting time possible to pursue this project."



Lab-engineered testicular organoids have the potential to replace the need for hormone replacement therapy.

Under the mentorship of **Hooman Sadri-Ardekani, MD, PhD**, **Ryan Terlecki, MD**, and **Colin Bishop, PhD**, McAbee is working to use human spermatogonial stem cell technologies to engineer testicular organoids. One application is to use the organoids as a toxicity model to test new drugs. Another is to engineer testicular organs for men who've lost their testicles or testicular function due to cancer or injuries. In vitro, the engineered organoids can secrete male hormones and have the potential to produce sperm, providing function similar to a normal organ. The next step is to evaluate the organoids in animals.

Leading National Study on Urolift for Median Lobe

Daniel Rukstalis, MD, is the principal investigator for a national 10-site study to evaluate the safety and effectiveness of the UroLift® System when used in symptomatic benign prostatic hyperplasia subjects with an enlarged median lobe.

"Twenty-five percent of men with BPH have enlarged median lobes and cannot currently use the device," said Rukstalis. "This is one of the most difficult types of BPH to treat using any surgical treatment."

The device continues to show positive results in men with obstruction caused by lateral lobes. In 2016, Rukstalis and colleagues released new data showing the effectiveness of the prostatic urethral lift procedure in men with lower urinary tract symptoms who initially underwent a sham procedure as part of a blinded trial. After receiving the crossover procedure to receive the device, participants reported rapid symptom relief, increased urinary flow rate and quality of life improvement that remained stable over two years.

(24-month durability after crossover to the prostatic urethral lift from randomised, blinded sham. Rukstalis D, Rashid P, Bogache WK, Tutrone RF, Barkin J, Chin PT, Woo HH, Cantwell AL, Cowan BE, Bolton DM. BJU Int. 2016 Oct;118 Suppl 3:14-22. doi: 10.1111/bju.13666. PMID:27684483)

Offering National Clinical Trials

Through participation in a variety of national clinical trials, Wake Forest Baptist Urology offers the latest treatments to patients:

Waterjet Ablation Therapy for BPH—Gopal Badlani, MD, is the local PI on a multicenter randomized study comparing waterjet ablation therapy and transurethral resection for the treatment of lower urinary tract symptoms due to benign prostatic hyperplasia. The investigational arm involves an image-guided tissue removal system based on a proprietary heat-free, high-velocity waterjet technology.

Comparing Sutures for Hysterectomy and Sacrocolpopexy—Catherine Matthews, MD, is PI on a randomized trial comparing a permanent versus delayed-absorbable monofilament suture for vaginal graft attachment during robotic total hysterectomy and sacrocolpopexy. The primary outcome measure is vaginal mesh exposure. Postoperative symptoms of pelvic floor disorders, including urinary incontinence, voiding dysfunction, pelvic organ prolapse, sexual dysfunction and quality of life will also be compared between the two groups.

BOND II Study—Ronald Davis, MD, is local PI on a safety and efficacy study of CG0070 Oncolytic Virus Regimen for high grade non-muscle invasive bladder cancer after BCG failure (the BOND2 study). The study is enrolling patients who failed BCG therapy and refused cystectomy.

Daily Enemas Superior to Traditional Therapies for Nonneurogenic Pediatric Overactive Bladder

This prospective, controlled trial of 60 children with non-neurogenic overactive bladder (OAB) evaluated the efficacy of treatment with daily enemas and osmotic laxatives. Forty control patients were treated with standard therapies, including timed voiding, constipation treatment with osmotic laxatives, anticholinergics and biofeedback physical therapy.

On assessment of improvement of OAB symptoms, only 30 percent of the traditionally treated patients' parents reported resolution of symptoms at three months, compared to 85 percent of enema patients. At the onset of the study, the average pediatric voiding dysfunction score of all patients was 14. On follow-up, average scores for traditionally treated patients were 12 and enema-treated patients were 4.

This study demonstrates that daily enema therapy is superior to traditional methods for the treatment of OAB. The study authors conclude that when children's symptoms do not resolve with traditional therapy, it may be due to undiagnosed and inadequate treatment megarectum.

(Daily Enema Regimen Is Superior to Traditional Therapies for Nonneurogenic Pediatric Overactive Bladder. Hodges SJ, Coloco M. Glob Pediatr Health. 2016 Mar 4;3:2333794X16632941. doi: 10.1177/2333794X16632941. PMID:27336003)

Early Fertility Preservation Program for Klinefelter Patients

Stanley Kogan, MD, and Hooman Sadri-Ardekani, MD, PhD

Klinefelter syndrome (KS, XXY or variant karyotypes) is a common cause of male infertility and occurs with a significant frequency (1:500-750 male births). Boys with this condition appear phenotypically normal at birth, but peri-pubertally the testes undergo growth arrest, atrophy and progressive fibrosis, ultimately resulting in sub-fertility in up to 90 percent and sterility in 70 percent as adults. Recent research in this condition has indicated that the testes are functional through the time of peri-puberty, offering a "safe window" before deterioration onset occurs.

Testis tissue preservation by obtaining a biopsy to store spermatogonial stem cells (SSC) and subsequent transplantation back to the sterile Klinefelter patient or in vitro maturation of stored SSC offers a potential cure for later infertility. Though similar techniques of banking and transplantation have proven successful in several animal models, SSC transplantation back in humans has not yet been done since this technique is new and children with various causes of potential future infertility/sterility (i.e., bilateral cryptorchidism, gonadotoxic treatments for cancer, etc.) have not as yet aged to the point of establishing their fertility status.

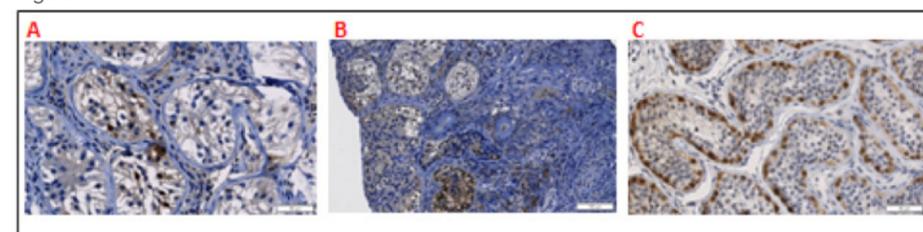
At Wake Forest Baptist, an active multidisciplinary clinical and research program has been established for children at increased risk for potential future infertility. Central to the clinical arm is an Institutional Review Board (IRB)-approved

program for testicular tissue banking and cryopreservation of SSC for children at high risk for infertility, including boys with Klinefelter syndrome. For boys at increased risk for testis deterioration and damage, a single-encounter, complete fertility preservation evaluation and treatment program has been initiated. This program offers penile vibration stimulation, electroejaculation and micro-testicular sperm extraction. In addition, drawing on the urological ultrasound expertise in our group, coordinated by **Daniel Rukstalis, MD**, we are assessing the use of high-resolution ultrasound elastography as a predictor of early testis fibrotic deterioration in these children who are at increased risk for later infertility.

Along with these clinical undertakings, the Male Fertility Research group at the Wake Forest Institute for Regenerative Medicine is conducting basic research to characterize the growth characteristics of Klinefelter testes and SSC and attempting to determine the natural history and causes of the spontaneous deterioration that occurs. Going forward, the main challenges are to learn why the Klinefelter testis fails, whether interventions such as pre-failure banking of SSC are confirmed as useful, and the optimum timing for intervention if proven clinically useful.

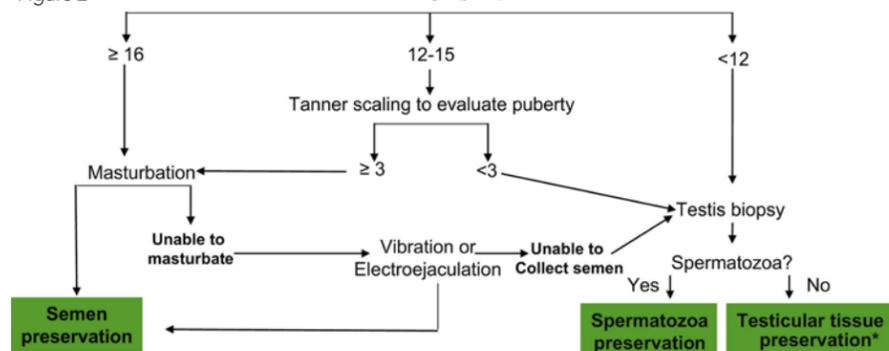
For more information and patient referral, contact Dr. H. Sadri-Ardekani at 336-713-1493 (leave a message for callback) or email fertilitystudy@wakehealth.edu.

Figure 1



MAGE-A4 staining as a spermatogonial marker, brown signal. Testes biopsy of A) 11-year-old with Klinefelter Syndrome (KS), B) 13-year-old with KS, C) 11-year-old normal XY testis.

Figure 2



Clinical and research algorithm for fertility preservation.

Congratulations

Gopal Badlani, MD, received the highest award given by the Medical Council of India, the Dr. B.C. Roy National Award, to recognize his service in the field of socio-medical relief. Badlani serves as a volunteer physician and brought together two organizations in a project to care for the underserved in India, which resulted in more than 6,000 people receiving urologic care over the past 15 years. Badlani also received the 2016 Most Distinguished Physician Award from the Association of Physicians of Indian Origin. This award is given to a physician whose work has had significant impact on science, innovations in patient care that have had widespread impact, or health-related community service that has served humanity at large.

Robert Evans, MD, was named "2015 Doctor of the Year" as part of an IC Awareness Month campaign conducted by the Interstitial Cystitis Society. According to the society, "the comments shared about his treatment exemplify the dignity and compassion that he and his team show to the patients struggling with IC and pelvic pain. They are an absolute treasure to their patients and the IC community as a whole ... It's not unusual for patients to fly from across the country (and world) for a consultation."

Ashok Hemal, MD, received the 2016 Sushruta Award from the Indian American Urological Association (IAUA). This annual award is given to a physician who has contributed to the field of medicine or performed noteworthy charitable work. IAUA, an affiliate organization of the American Urological Association, promotes interaction among practicing urologists and affiliated scientists of Indian origin in the United States.

Catherine Matthews, MD, was one of three "star" surgeons selected to participate in "Operating with the Stars" during the 45th Congress of Advancing Minimally Invasive Gynecology Worldwide.

Ryan Terlecki, MD, won two "Best Abstracts" at the 2015 Sexual Medicine Society of North America Annual Meeting: "Development of gene therapy for erectile dysfunction: delivery to corpus cavernosa using viral vectors" and "Engineering of corporal tissue constructs using non-human primate and human corpus cavernosal smooth muscle and endothelial cells for clinical applications." He was also named "2016 Best Reviewer" by the *Journal of Urology*.

Wake Forest Baptist Among First to Offer New Treatment

Wake Forest Baptist Urology was the first medical practice in North Carolina—and the 4th in the U.S.—to offer women a new, non-surgical treatment for accidental bowel leakage. This devastating condition is associated with a profound negative impact on quality of life.

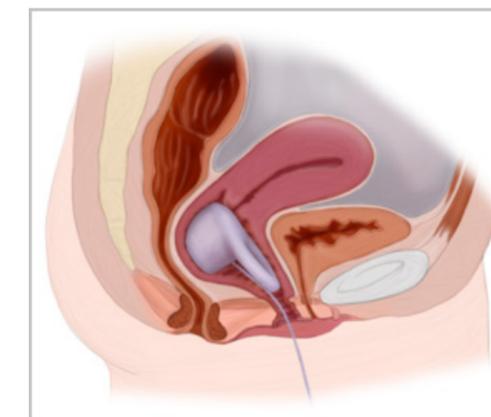
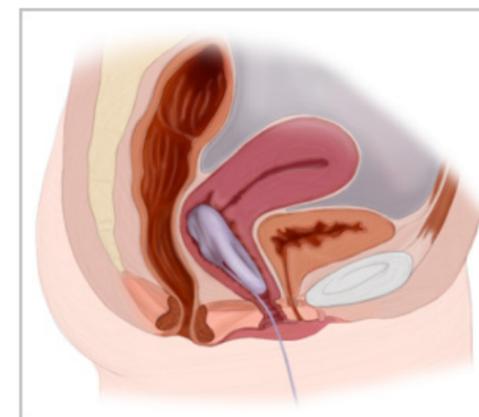
The vaginal bowel control device was previously offered only through research studies. The system has a dynamic balloon mechanism that externally compresses the rectum to achieve continence. Of participants successfully fitted with the device, 80 percent achieved treatment success, defined as a greater than 50 percent reduction in fecal incontinence episodes.

Catherine Matthews, MD, was part of the clinical study that evaluated the insert prior to approval by the U.S. Food and Drug Administration. About 45 percent of study participants were unable to enter the treatment phase as device fitting was not successful.

Matthews evaluated the clinical characteristics associated with device fitting in women with moderate to severe fecal incontinence. The study involved 110 women, ages 19-75, at six clinical sites in the U.S. Multivariate, logistic regression analysis revealed that previous prolapse surgery and shorter vaginal length were independently associated with unsuccessful fitting of the device.

Women who had not undergone previous prolapse surgery had 4.7 times the odds of a successful fit. Also, for every additional centimeter of vaginal length, women had 1.49 times the chance of a successful fit. The findings may be used to inform patients on the expectation of a successful fitting.

(Characteristics Associated With Successful Fitting of a Vaginal Bowel Control System for Fecal Incontinence. Matthews, Catherine A.; Varma, Madhulika G.; Takase-Sanchez, Michelle M. *Female Pelvic Medicine & Reconstructive Surgery*. 22(5):359-363, September/October 2016.)



MEET OUR Faculty



Anthony Atala, MD, FACS, professor and chair, is editor-in-chief of *Scientific American Urology*, *Therapeutic Advances in Urology*, and *Stem Cells Translational Medicine*. He is a past recipient of the Ramon Guiteras Award from the AUA and the Barringer Medal from the American Association of Genitourinary Surgeons for his contributions to the field of urology. He is a member of the Institute of Medicine and is one of 98 innovators named a charter fellow of the National Academy of Inventors. Atala directs a team of more than 450 researchers at the Wake Forest Institute for Regenerative Medicine, which works to engineer replacement tissues and organs for more than 30 different areas of the body. He serves on the American College of Surgeons Board of Regents.



Gopal Badlani, MD, FACS, professor of urology and obstetrics/gynecology and vice chair for urology clinical affairs, directs Female Pelvic Health Services, a collaboration with Obstetrics and Gynecology. His NIH-funded research focuses on urinary incontinence. Badlani is currently serving a two-year term as chair of the annual meeting of The Société Internationale d'Urologie and in 2017 will assume the role of secretary of the American Association of Genitourinary Surgeons. Badlani received several prestigious awards in 2016 (see page 5). He is a past board member of the National Institute of Diabetes and Digestive Health and Kidney Diseases. He is a co-editor of the 4th edition of *Smith's Textbook of Endourology* and serves as historian of the Endourological Society.



K.C. Balaji, MD, professor, specializes in prostate and kidney cancers. His federally funded basic science research focuses on cell signaling and stem cells in prostate cancer. In addition, his laboratory works on stem cells, transgenic mouse modeling and health disparity in prostate cancer, and he serves as a study section reviewer for the Department of Defense Prostate Cancer Research Program and on the editorial committee for the basic science section of *Journal of Urology*. He is the principal investigator on several Wake Forest Baptist Comprehensive Cancer Center clinical trials and has organized an active genitourinary oncology clinical trial working group at the Medical Center.



Ronald L. Davis, MD, MBA, FACS, associate professor, specializes in adult urology with an emphasis on urologic oncology. Davis is an experienced clinical investigator. He was part of one of the first teams in the nation to offer modern ultrasound-directed brachytherapy for prostate cancer. His expertise and research interests include minimally invasive prostate cancer surgery and novel therapies for bladder cancer. He is the past president of the N.C. Chapter of the American College of Surgeons (2014-15), is a voting member of the AUA Legal Action Committee and is appointed to the AUA State Advocacy Board. He is a board member of the N.C. Urological Society and is the urology board member at the N.C. Chapter of the American College of Surgeons.



Robert J. Evans III, MD, FACS, associate professor, directs the department's clinic operations. He specializes in pelvic pain syndrome and serves on the medical advisory boards of the Interstitial Cystitis (IC) Association and the Interstitial Cystitis Network. He is involved in several clinical trials evaluating new treatments for painful bladder syndrome, as well as directing a study to determine the optimum injection site for botulinum

toxin to treat the condition. In addition, he is part of a genomics study looking at genetic differences in subsets of IC patients. He was selected by the American Urological Care Foundation to provide oversight on patient education materials related to bladder pain.



Jorge Gutiérrez-Aceves, MD, professor, heads the department's endourology and stone disease program. He is assistant editor of the *Journal of Endourology* and is editor of the Spanish edition of the *AUA News*. He is a member and honorary member of various urological associations, including the American Association of Genitourinary Surgeons. He has served on the board of directors of the Endourological Society. Gutiérrez co-directs the fellowship program on Endourology and Laparoscopy/Robotic Surgery at Wake Forest Baptist. He is General Secretary of the Confederación Americana de Urología, a Latin-American urological association with more than 10,000 members in 24 Spanish- and Portuguese-speaking countries.



Ashok K. Hemal, MD, MCh, FACS, professor and director of the Robotic and Minimally Invasive Urologic Surgery Program, specializes in uro-oncology, robotic and pure laparoscopic surgeries. He is principal or co-investigator on several research projects and is well known internationally for his pioneering work in minimally invasive surgery. He has edited several books and more than 350 scientific papers in peer-reviewed journals. He is invited as a visiting professor to deliver lectures and perform live surgeries during major conferences around the world. He has been the recipient of many academic distinctions and awards. In 2016, he received the Sushruta Award from the Indian American Urological Association. He currently serves as president of the Society of Urologic Robotic Surgeons.



Steve Hodges, MD, associate professor, specializes in pediatric urology. His research interests include the prevention of luminal strictures and scar disease throughout the urinary tract and body, and dysfunctional elimination. He is an associate editor of the *Scientific World Journal*, and is on editorial boards of the *Indian Journal of Urology* and *BMC Urology*. Multiple new treatments developed by Hodges have been licensed to startup companies, including drug-coated catheters and stents designed to prevent or treat urethral strictures. A clinical trial to evaluate the technology is currently under way. He has co-authored a book for consumers on toilet training and voiding dysfunction as well as a book for children. He developed a disposable wipe designed to prevent vulvitis and urinary tract infections in girls.



Stuart Howards, MD, FACS, professor, is a nationally recognized expert in male infertility. He specializes in microsurgery for varicocele repair, vasectomy reversal and sperm retrieval. Howards has edited four editions of *Infertility in the Male* and has performed more than 1,500 vasectomy reversals. He serves on the executive committee of the American Society of Reproductive Medicine. Howards served as executive secretary of the American Board of Urology for 15 years, and at the NIH as the urologic advisor to the director of the National Institute of Diabetes and Digestive and Kidney Diseases. He is the recipient of the American Association of Genitourinary Surgeons Keyes Medal for "outstanding contributions in the advancement of urology."



Stanley Kogan, MD, FACS, clinical professor, is a nationally recognized expert in pediatric conditions that can subsequently affect fertility. He directs a program for patients with Klinefelter syndrome that focuses on early identification and fertility restoration. He also developed several surgical procedures for children with disorders of sex development, including various modifications of feminizing genitoplasty techniques. During his career, he served on the executive committee of the urology section of the American Academy of Pediatrics and on the editorial board of the *Journal of Urology*.



Catherine A. Matthews, MD, professor of Obstetrics/Gynecology and Urology, co-directs Women's Pelvic Health Services at Wake Forest Baptist Medical Center. She specializes in conditions such as urinary and bowel incontinence, pelvic organ prolapse, fistulae, sexual dysfunction and post-obstetric perineal injury. She is internationally recognized for her expertise in robotic surgery and vaginal surgery. On the national level, she serves as a Board Examiner for the American Board of Obstetrics and Gynecology. Matthews is board certified in Female Pelvic Medicine and Reconstructive Surgery by the American Board of Obstetrics & Gynecology. She has received numerous awards for her research and for excellence in surgery and patient care. In 2015, she was co-author of the "Best Surgical Paper," at the American Urogynecology Society Annual Meeting.



John D. McConnell, MD, FACS, chief executive officer of Wake Forest Baptist Medical Center, is a noted urologist and international authority on prostate disease who remains clinically active. He received the American Association of Genitourinary Surgeons' Barringer Medal for his contributions to the field of urology and is a member of the Institute of Medicine. As CEO, a noted achievement has been leading Wake Forest Baptist to a legally integrated governance and management structure, the first time in the institution's history that its components operated under a legally integrated structure.



Majid Mirzazadeh, MD, assistant professor, focuses on female urology and incontinence, stone disease, infections, prostate diseases and kidney cancer. He is also a referral surgeon for a wide variety of complicated urologic reconstructive surgeries. He is director of the urology teaching clinic. He joined the faculty after completing a postdoctoral fellowship in female urology and pelvic reconstructive surgery at Wake Forest Baptist Urology. He is the inventor of an incremental syringe designed to deliver multiple-injection products without requiring close visual monitoring of volume. Mirzazadeh is a reviewer for the *Journal of Urology* and is a member of the Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction.



Robert G. Moore, MD, clinical associate professor, specializes in endourology and minimally invasive techniques to treat urologic cancers and kidney stones at the Veterans Affairs Medical Center in Salisbury, N.C. He is also the urology resident site director at the VA. Moore is a worldwide expert in minimally invasive urologic procedures. He has authored more than 200 published articles, book chapters and books.



Daniel Rukstalis, MD, professor, directs the urology residency program at Wake Forest Baptist and specializes in novel therapeutics in urologic diseases. He is an international authority on minimally invasive surgery, having described the first laparoscopic retroperitoneal lymph node dissection for testicular cancer. He is also a leader in the field of tissue ablation, having participated in the first kidney cryoablation in the United States. He is active in evaluating novel approaches in the use of urologic ultrasound and endoscopic therapy for prostate cancer and BPH. He represents the AUA on the American Medical Association's Relative Value Scale Update Committee and led an AUA committee that prepared a position statement on the use of MRI for prostate cancer diagnosis.



Hooman Sadri-Ardekani, MD, PhD, assistant professor, specializes in male reproductive medicine and has been a fellowship trained clinician in male infertility since 2003. He is an active member of the American Society of Andrology and the American Society for Reproductive Medicine. Sadri-Ardekani's expertise involves clarifying the importance of genetics and endocrine studies in the evaluation of men with infertility and in the interface of male factor treatment with novel assisted reproductive technology. He directs a national comprehensive referral program that aims to prevent infertility in patients of all ages due to cancer, Klinefelter syndrome, spinal cord injury, diabetes and multiple sclerosis. He also directs a male fertility research program at the Wake Forest Institute for Regenerative Medicine.



Allston J. Stubbs, MD, clinical associate professor, specializes in urinary incontinence, voiding dysfunction and benign prostatic hyperplasia. He directs the urodynamics lab at the Veterans Affairs Medical Center in Salisbury, N.C. Certified by both the American Board of Urology and the American Board of Surgery, Stubbs is a Wake Forest alumni and has been practicing urology for 35 years.



Ryan Terlecki, MD, FACS, associate professor, is director of the Men's Health Clinic, the Urologic Cancer Survivorship Program and the department's fellowship in urologic reconstruction, prosthetic urology and male infertility. He is a recognized leader in urethral reconstruction, Peyronie's disease and prosthetic surgery for erectile dysfunction and male stress urinary incontinence. Additionally, he is an investigator in novel therapeutics that use cell-based and tissue-based technologies to treat urethral stricture, sexual dysfunction, and urinary incontinence. Terlecki is associate editor of *BMC Urology* and is a reviewer for numerous journals and national guidelines. He is the Young Fellows Association liaison representative to the American College of Surgeons' Health Policy Advisory Council.

Urology

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Offering Four Fellowship Programs

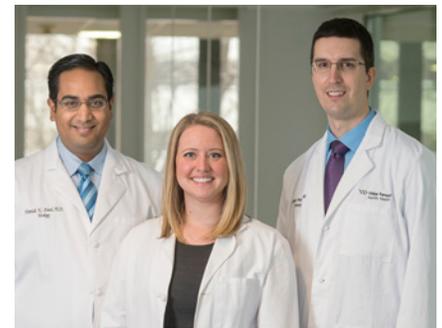
Wake Forest Baptist Urology offers four fellowship programs rich in both clinical care and academic research. As part of a high-volume tertiary referral center, the department is a leading program for index cases for both adult and pediatric urology. Training advantages also include a surgical skills learning center with mock ORs and simulated patients.

Endourology/Robotic Surgery: Two-year program offering an intensive clinical and research experience to prepare fellows for a career in academic medicine. Fellows obtain advanced experience in all aspects of endourologic, laparoscopic and robotic surgery, and gain research experience, including the option for a master's degree. Accredited by the Endourological Society.

Laparoscopic/Robotic Surgery: One-year fellowship designed to prepare fellows for a career in robotic urologic surgery, laparoscopic and urology and urologic oncology. Fellows participate in a wide range of urologic procedures, from radical prostatectomy and cystectomy to partial nephrectomy and reconstructive procedures. A variety of research opportunities are available. Accredited by the Endourological Society.

Female Pelvic Medicine and Reconstructive Surgery: Two-year program for urology physicians versus a three-year program for Ob/Gyn graduates. The program includes 12 months of research. The curriculum is designed to comprehensively train pelvic surgeons to develop clinical independence through mastery of a broad range of diagnostic and surgical techniques. Accredited by ACGME.

Genitourinary Reconstructive Surgery: One-year clinical program in male genitourinary reconstructive surgery, prosthetic urology, and infertility. Fellows are exposed to the most up-to-date surgical techniques to equip them to serve as an educator and leader in the field. Fellows can participate in research at the Wake Forest Institute for Regenerative Medicine. Verified by the Society of Genitourinary Reconstructive Surgeons.



Manish Patel, MD,
Endourology/Robotic Surgery;

Alison Rasper, MD,
Genitourinary Reconstructive Surgery;

Christopher Reynolds,
Laparoscopic/Robotic Surgery