



Research & Clinical Update

MESSAGE FROM THE CHAIR

Dear Colleagues,

As we begin a new year, I would like to take this opportunity to update you on activities of the Department of Urology at Atrium Health Wake Forest Baptist. When I reviewed last year's message, I realized I could almost recycle it because much is the same – a worldwide pandemic that we are still dealing with remains the dominant factor in how we work and live. While we are still experiencing disruptions, the plus side is that we now have access to vaccines and treatments.

Despite the daily pandemic headlines, we have gotten back to work and experienced some good news, too. Our mission to provide the best patient care to the thousands of patients who come to us annually for urologic care continues. To that end, we have added several outstanding faculty members and expanded our clinical and research activities. And, as you may have heard, Wake Forest Baptist Health and Atrium Health officially joined together. The new enterprise is bringing clinical care together with the research and educational capabilities of both institutions, changing lives for the better for the more than 7 million people across the region who now have access to care from the combined organization.

We hope you enjoy reading about our program activities.

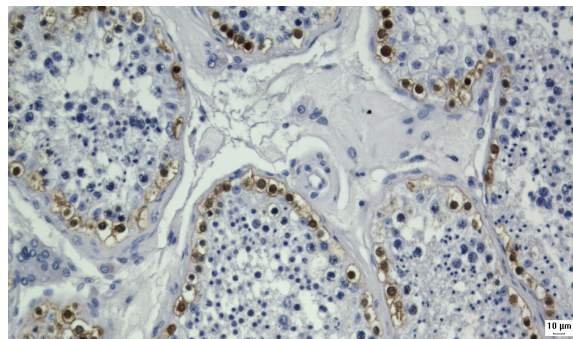
I am looking forward to a more "normalized" year as we all continue to navigate living with COVID. It has been challenging, but rewarding in unexpected ways. Best wishes and a happy and healthy New Year in 2022 for you and your families.

Anthony Atala, MD
William H. Boyce Professor and Chair

Innovations in Urology

Klinefelter syndrome is the most common genetic cause of male infertility, and new fertility preservation strategies are critically important for these patients. Klinefelter syndrome – which affects 1 out of every 650 males born – is characterized by a masculine phenotype, supernumerary sex chromosomes (usually XXY), and spermatogonial stem cell loss in early development.

The Urology Department's Male Fertility Research Group, in cooperation with the Wake Forest Institute for Regenerative Medicine, utilized an XXY mouse model for a recent study of Klinefelter syndrome. Testicular cells from frozen-thawed testes of a prepubertal animal model were used. The data demonstrated that spermatogonial stem cells survived and were able to be propagated with testicular somatic cells in culture for up to 120 days. DNA fluorescent in situ hybridization showed the presence of XXY spermatogonia at the beginning of the culture and a variety of propagated XY, XX, and XXY spermatogonia at the end of the culture.



"We have published the first evidence that an extra sex chromosome was lost during innate spermatogonial stem cells *in vitro* propagation, a crucial finding in treating Klinefelter syndrome patients for preserving and propagating spermatogonial stem cells for future sperm production, either *in vitro* or *in vivo*," said Hooman Sadri, MD, PhD, lead scientist on the paper. "This *in vitro* propagation system can someday be translated to clinical fertility preservation for Klinefelter syndrome patients."

Sadri said the team hoped this latest research will open the door to pursue new cell-based therapies to treat infertility in Klinefelter syndrome patients. The growing mosaicism observed in the cells in culture may lead to a better understanding of the stem cell selection dynamics in the Klinefelter patient's testis.

This study, "In Vitro Propagation of XXY Undifferentiated Mouse Spermatogonia: Model for Fertility Preservation in Klinefelter Syndrome Patients," was recently published in the International Journal of Molecular Sciences, doi.org/10.3390/ijms23010173.

Authors include: Guillermo Galdon, Nicholas A. Deebel, Nima Pourhabibi Zarandi, Mark J. Pettenati, Stanley Kogan, Christina Wang, Ronald S. Swerdloff, Anthony Atala, Yanhe Lue, and Hooman Sadri-Ardekani.

Research News

Optimal timing of a second postoperative voiding trial in women with incomplete bladder emptying after vaginal reconstructive surgery: a randomized trial

Schachar JS, Ossin D, Plair AR, Hurtado EA, Parker-Autry C, Badlani G, Davila GW, Matthews CA

The optimal length of time for postoperative catheter drainage has not been clearly established. This study aimed to compare the outcomes of a second voiding trial performed 2-4 days (earlier group) vs 7 days (later group) postoperatively in women with incomplete bladder emptying after vaginal prolapse surgery.

Results showed that women with incomplete bladder emptying after multicompartiment prolapse repair had a 7-fold higher risk of an unsuccessful repeat office voiding trial if performed within 4 days of surgery than when performed within 7 days. In addition, requiring additional prescriptions for analgesia increased the risk of an unsuccessful follow-up office voiding trial.

Am J Obstet Gynecol. 2020 Aug; 223(2):260.e1-260.e9.

Pulsed electromagnetic field as an adjunct therapy for pain management in interstitial cystitis/bladder pain syndrome

Ross C, Overholt T, Xu R, Badlani G, Evans RJ, Matthews CA, Walker SJ

Patients with interstitial cystitis/bladder pain syndrome (IC/BPS) often experience chronic pelvic and even systemic pain that can be difficult to clinically manage. Pulsed electromagnetic field (PEMF) therapy, a non-invasive strategy that has shown significant efficacy for pain reduction in other chronic pain conditions, may provide benefit. The recent discovery that a subset of IC/BPS and fibromyalgia patients has underlying small fiber polyneuropathy may suggest a neuropathic component to these chronic pain conditions that PEMF can target. PEMF represents a low-risk high-reward therapeutic.

Int Urogynecol J. 2021 Jun 8.

The role of body mass index on quality indicators following minimally-invasive radical prostatectomy

Pathak RA, Wilson RRA, Craven TE, Matz E, Hemal AK

The National Surgical Quality Improvement Program (NSQIP) database was queried to examine the effect of obesity, defined as BMI >30, on outcomes after minimally invasive radical retropubic prostatectomy (MI-RRP). The CDC classification of obesity was used.

Records of 49,238 patients who have undergone MI-RRP during 2007-2017 were evaluated. Mean yearly BMI rose from 28.5 to 29.2, while the percentage of surgical patients with BMI >30 rose by 5% (33% to 38%; p<0.0001) over the study period. Obese patients demonstrated higher morbidity, prolonged LOS, and increased readmission rates after MI-RRP. Obesity severity correlated negatively with quality indicators in a graded fashion. Obese patients are at increased risk of morbidity, prolonged LOS, and readmission within 30 days, following MI-RRP. These patients should not be excluded from MI-RRP; rather, physicians should discuss these increased risks with their patients and proper weight loss strategies should be instituted preoperatively.

Investig Clin Urol. 2021 May; 62(3):290-297.

Permanent compared with absorbable suture for vaginal mesh fixation during total hysterectomy and sacrocolpopexy: A randomized controlled trial

Matthews CA, Geller EJ, Henley BR, Kenton K, Myers EM, Dieter AA, Parnell B, Lewicky-Gaupp C, Mueller MG, Wu JM

Across five US centers, 204 women were randomized to permanent or delayed absorbable suture for vaginal attachment of a Y-mesh during hysterectomy and sacrocolpopexy for stage II prolapse and worse. The primary outcome was mesh or permanent suture exposure in the first year after surgery. The secondary outcome was to compare a composite measure for success defined as leading edge of prolapse not beyond the hymen and apex not descended more than one third vaginal length, and no subjective bulge and no prolapse retreatment. Results found that suture type attachment did not influence mesh or permanent suture exposure rates.

Obstet Gynecol. 2020 Aug; 136(2):355-364.

Sustained glycemic control observed in diabetic men who improve hemoglobin A1c values to allow for elective penile prosthesis placement

Scarberry KA, Thomas GM, Cowper M, Chouhan JD, Thakker PU, Matz EL, Dutta R, Terlecki RP

This study sought to determine that men with diabetes mellitus whose inflatable penile prosthesis (IPP) implantation is delayed for unacceptably high hemoglobin A1c (HbA1c) will have durable improvements in their glycemic control after achieving acceptable HbA1c levels for surgery. Our results suggest requiring men to meet health-related targets prior to elective IPP surgery may contribute to a durable health benefit. It is conceivable that regaining the potential for penetrative intercourse was associated with improvements in activity (sexual or otherwise), potentially improved confidence/self-image, or an interest in overall health. IPP implantation appears safe in diabetic men with perioperative HbA1c values <9%.

Urology. 2020 Dec; 146:140-144.

Salvage penile plication is an effective modality for resolving residual curvature after surgery for Peyronie's Disease

Deebel NA, Scarberry K, Dutta R, Matz E, Terlecki RP

Patients with residual or delayed recurrence of curvature after plication can be effectively managed with salvage plication. Care should be taken by providers to help patients set reasonable preoperative expectations and to identify risk factors for surgical failure including severe and/or multiplanar curvature, as well as baseline erectile dysfunction.

Sex Med. 2020 Dec; 8(4):686-690.

Administration of secretome from human placental stem cell-conditioned media improves recovery of erectile function in the pelvic neurovascular injury model

Matz EL, Thakker PU, Gu X, Terlecki RP, Dou L, Walker SJ, Lue T, Lin G, Atala A, Yoo JJ, Zhang Y, Jackson JD

We tested the hypothesis that bioactive factors secreted by human placental stem cells (PSCs) mediate functional recovery and that acellular-conditioned media (CM) from PSC culture (PSC-CM) could be used independently to facilitate functional and histological recovery. To identify factors relative to efficacy of PSC, a comparison of CM from PSC and three additional human stem cell populations was performed. Injection of the secretome isolated from human PSC improves erectile functional recovery and histological structure in a rat model of neurovascular injury-induced ED. Further characterization of the unique protein expression within the PSC-CM may help to identify the potential for a novel injectable cell-free therapeutic.

J Tissue Eng Regen Med. 2020 Oct; 14(10):1394-1402.

Chemokine therapy in cats with experimental renal fibrosis and in a kidney disease pilot study

Bennington J, Lankford S, Magalhaes RS, Shankle D, Fanning J, Kartini C, Suparto I, Kusumawardhani W, Putra MA, Mariya S, Badlani G, Williams JK

The research team set out to test the effects of a cell-derived molecular therapy to treat kidney fibrosis in cats, which, in turn, could someday inform treatment for humans. Current treatments include pharmaceutical therapies and dietary management to slow disease progression and increase longevity, and alternatives are needed. In this study, a cell-signaling chemokine - CXCL12- that is produced by cells and stimulates tissue regeneration was used. Recombinant human CXCL12 is commercially available, inexpensive, and has been shown to reduce fibrosis in rodent models of chronic kidney disease. Bilateral intra-renal injection using ultrasound guidance in cats with CKD was found to be feasible and safe in a general practice clinical setting with no obvious side effects noted during the 9-month follow-up period.

Front Vet Sci. 2021 Mar 4;8:646087.

Pelvic floor muscle function recovery using biofabricated tissue constructs with neuromuscular junctions

Kim JH, Ko IK, Jeon MJ, Kim I, Vanschaayk MM, Atala A, Yoo JJ

Damages in pelvic floor muscles often cause dysfunction of the entire pelvic urogenital system, which is clinically challenging. A bioengineered skeletal muscle construct that mimics structural and functional characteristics of native skeletal muscle could provide a therapeutic option to restore normal muscle function. However, most of the current bioengineered muscle constructs

Offering National Clinical Trials

► Retropubic vs. single-incision mid-urethral sling - PI: Catherine A. Matthews, MD

A single-blinded, multicenter, randomized trial is designed to evaluate 280 women undergoing native tissue vaginal repair that compares a Single Incision Sling to a Retropubic Sling for treatment of stress incontinence.

► Is 10 injections of bladder Botox less painful than 20 injections? - PI: Catherine A. Matthews, MD

A single-blinded, randomized research study to help determine if 10 injections of Botox® 100 units is less painful than 20 injections of Botox® 100 units based on effectiveness in reducing urge incontinence episodes.

► Waterjet ablation therapy for endoscopic resection of prostate tissue II (WATER II) - PI: Gopal Badlani, MD

The investigational procedure called Aquablation is being tested via the AQUABEAM System, a personalized image-guided tissue removal system that utilizes a high-velocity jet of water to cut and remove targeted prostate tissue.

► Artificial Urinary Sphincter Clinical Outcomes - PI: Ryan Terlecki, MD

The purpose of this study is to observe how well the AMS 800 Artificial Urinary Sphincter fixes urinary incontinence in men who have a history of radical prostatectomy with severe urinary incontinence.

► Determination of normal range values for testicular stiffness in the healthy pediatric population - PI: Hooman Sadri, MD

The purpose of this research is to utilize sonography to establish normal range values for testicular firmness in healthy pediatric patients. Results could help better diagnose boys with certain other testicle conditions that may affect their testicular development and future fertility.

are unable to provide timely innervation necessary for successful grafting and functional recovery. We previously have demonstrated that post-synaptic acetylcholine receptors (AChR) clusters can be pre-formed on cultured skeletal muscle myofibers with agrin treatment and suggested that implantation of AChR clusters containing myofibers could accelerate innervation and recovery of muscle function. In this study, we develop a 3-dimensional bioprinted human skeletal muscle construct, consisting of multi-layers bundles with aligned and AChR clusters pre-formed human myofibers, and investigate their effect. Implantation of skeletal muscle constructs resulted in functional muscle reconstruction with accelerated construct innervation.

Acta Biomater. 2021 Feb; 121:237-249.

Formation and optimization of 3D organoids generated from urine-derived stem cells for renal function in vitro

Sun G, Ding B, Wan M, Chen L, Jackson J, Atala A

The team aimed to develop novel 3D organoids generated from urine-derived stem cells (USCs) and to explore whether kidney-specific extracellular matrix (kECM) could enable such organoids for renal function in vitro. USCs were isolated and cultured with kECM extraction to generate 3D organoids in vitro. Drug toxicity test was conducted to evaluate the potential application for drug screening. The renal organoids generated from whole adult kidney cells were used as a positive control in multiple assessments. We found that USC-organoids could be developed from USCs via an optimal procedure.

Stem Cell Res Ther. 2020 Jul 22; 11(1):309.

► RARP: Prospective trial evaluating return to continence and potency following radical prostatectomy using umbilical cord allograft - PI: Ashok K. Hemal, MD

The goal is to determine the effectiveness of using human umbilical cord allograft to help improve return to erectile function and bladder control in patients following robot-assisted radical prostatectomy.

► The effect of Tamsulosin on Postoperative Urinary Retention - PI: Majid Mirzazadeh, MD

Postoperative urinary retention is a significant postoperative complication in 14-16% of all surgeries and 21-50% following female pelvic reconstructive surgery. The purpose of this research is to help determine if starting Tamsulosin 5 days prior to addressing pelvic organ prolapse surgically with the native tissue vaginal repair will help decrease the chances of going home with a bladder catheter the same day of surgery, and continuation for 5 more days after surgery to avoid retention of urine in near future.

► The SfAP Study - PI: Candace Parker-Autry, MD

The purpose of this trial is to apply gold-standard randomization to evaluate concomitant perineorrhaphy during a vaginal reconstructive pelvic organ prolapse surgery to understand its impact on female sexual function and the heterosexual sexual relationship accounting for the unique complexity of female and male sexual dysfunctions.

► ROSI - PI: Hooman Sadri, MD

Round Spermatozoa Injection (ROSI) to fertilize oocytes is not a brand-new technology, however, it is plagued with notoriously low efficiency. Despite this limitation, it has been reported that most of these patients still desire to have the ROSI procedure instead of applying directly for other options, i.e. sperm donation or adoption. The study objective is the development of a practical method of viable isolation and injection of round spermatozoa into activated human oocytes.

Female Pelvic Medicine — a Truly Collaborative Effort to Benefit Patients

Wake Forest Baptist was the first medical center to create a combined service unit that brings together both urologists and gynecologists with their primary faculty appointments in the Department of Urology, allowing the team to be fully aligned in terms of its mission and scope, treating patients in the same clinic space- a center of excellence focused on female pelvic medicine and reconstructive surgery.

“Very few departments are set up the way we are, with both urologists and gynecologists together in the same physical space, utilizing the same staff. Each one of us brings something different,” said Gopal Badlani, MD, professor of urology who serves as co-director of the joint service line for Female Pelvic Medicine.

The clinical infrastructure of Female Pelvic Medicine is made up by two board certified urogynecologists from ob/gyn, two board certified urologists in female pelvic medicine – one of whom had expertise in in neuro-urology and one in bladder pain syndrome – and a urologist with expertise in recurrent urinary tract infections. The team provides coverage in all breadths of disease states, as well as different aspects of surgery – vaginal, robotic, open, and endoscopic. Major conditions treated include:

- Incontinence
- Fecal incontinence/bowel incontinence
- Pelvic organ prolapse
- Painful bladder syndrome
- Overactive bladder
- Recurrent urinary tract infection
- Voiding dysfunction
- Vaginal mesh complications
- Pelvic pain
- Vesicovaginal fistula
- Rectal vaginal fistula

The team of providers, who have different areas of sub specialty expertise, is uniquely qualified to manage female pelvic health for patients who need true multidisciplinary care. The team performs a full array of diagnostic and therapeutic interventions including video urodynamics testing, anorectal manometry, pelvic floor ultrasound, flexible cystoscopy, intravesical injections and installations, vaginal laser therapy and pelvic floor physical therapy.

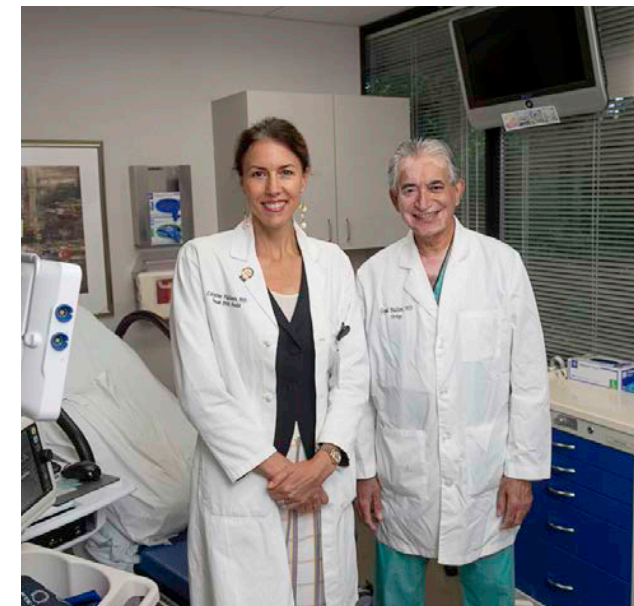


Laura Foster, MD, Gopal Badlani, MD, FACS, Erin Kelly, NP, Catherine A. Matthews, MD, Candace Parker-Autry, MD, Steve Walker, PhD, Robert J. Evans III, MD, FACS, (left to right)

“While our structure is unusual, it is beneficial to patients,” said Catherine A. Matthews, MD, professor of urology and gynecology, who serves as director of the joint service line. “We are able to really push the envelope in terms of clinical care of stress incontinence, bladder pain syndrome and recurrent urinary tract infection. Because of our strengths in these areas and the attraction of patients, we have also been able to build a robust clinical trial division where we’re able to study the success of different surgical procedures.”

Female Pelvic Medicine is expanding its clinical operations across the region and continued growth will be supported with the addition of providers in neurourology and female reconstruction with urinary diversion. Matthews and Badlani are intent on strengthening Wake Forest Baptist as the premier referral site in the south Atlantic for complex patients with pelvic floor disorders.

The collaborative structure of the unit has also enhanced the general urology residency training program in regards to female urology, said Candace Parker-Autry, MD, assistant professor of urology. “We feel it’s a huge strength that urologists are graduating with significant expertise in robotic pelvic floor reconstruction, female incontinence management, and in transvaginal prolapse repair. The program provides a unique opportunity to expand their knowledge of these important procedures that are so needed.”



Catherine A. Matthews, MD, and Gopal Badlani, MD, FACS

The program also offers a fellowship program. The Female Pelvic Medicine and Reconstructive Surgery Fellowship is a three-year subspecialty-training program for obstetrics and gynecology physicians and a two-year program for urology physicians who wish to specialize in urogynecology and reconstructive pelvic surgery. The program offers unprecedented training experiences for complex pelvic floor reconstruction – under the guidance of faculty experts in female urology, urogynecology, and colorectal surgery – and opportunities to conduct cutting edge translational research. The program includes 12 months of research at the Wake Forest Institute for Regenerative Medicine, a leader in translating scientific discovery into clinical therapies.

The construction of the fellowship is complimentary to the mission of the medical center – to advance knowledge, promote secondary education, and develop new treatments and cures.

“One of the benefits of a fellowship training program is that we can advance the knowledge of the next generation of physicians who are going to be taking care of these highly specialized patients,” said Matthews, who directs the fellowship program. “We can provide a very comprehensive training experience, as well as a unique research opportunity. These two experiences together give the fellows the opportunity to help advance the science with us and provide excellent patient care.”

Clinical Expertise + Translational Research + Interstitial Cystitis (IC)

Long before there was a Female Pelvic Health service unit, there was a pelvic health research group. Dr. Badlani represented the clinical side and worked with faculty researchers at the Wake Forest Institute for Regenerative Medicine (WFIRM) on a number of pelvic health projects. Following the arrival of Dr. Robert Evans, one of the country’s leading clinical experts for IC, the group won a small grant from the Interstitial Cystitis Association, and from there, the IC research activities have expanded even further as more substantive grants have been awarded from the National Institutes of Health and the Veterans Administration.

“IC is an interesting disease to study because it’s very complex. It is not well defined,” said Dr. Robert Evans, professor of urology and gynecology. “You rule out everything else and you end up with a diagnosis of IC, which unfortunately is a lifelong, chronic condition that varies in severity depending on the person.”



Dr. Robert Evans

Evans’ IC expertise results in Wake Forest Baptist’s Female Pelvic Medicine program being a tertiary referral center with a very large database and patient tissue bank with more than 550 bio samples and database. This resource enables the team to conduct a variety of analyses on the patients they already have. From basic science projects to clinical trials, the IC research is looking for answers on how to treat the disease and perhaps cure it.

“Conditions such as peripheral neuropathy and cryptic bacteria embedded in the bladder wall may be triggers of some sort,” Evans explained. “We are trying a wide range of treatments, from aloe vera formulations to the use of pulsed electromagnetic field therapy to reduce pain.” (see study summary on pg 2).

Meet Our Faculty



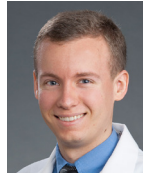
Anthony Atala, MD, FACS, professor and chair, is section editor for Urological Survey, for the Journal of Urology, and editor of Stem Cells Translational Medicine. He is a recipient of the Gold Cystoscope Award, the Ramon Guiteras Award from the AUA, and the Barringer Medal from the American Association of Genitourinary Surgeons for his contributions to the field of urology. He is a member

of the National Academy of Medicine and is one of 98 innovators named a charter fellow of the National Academy of Inventors. He is editor of 30 books and has published over 800 journal articles. Atala directs a team of more than 450 researchers and staff at the Wake Forest Institute for Regenerative Medicine which works to engineer replacement tissues and organs for more than 40 different areas of the body. He serves on the American College of Surgeons Board of Regents.



Gopal Badlani, MD, FACS, professor of urology and gynecology, and vice chair for urology clinical affairs, is co-director of the Female Pelvic Health unit. He is director of urology at the Salisbury VA Medical Center and is secretary of the Urology Care Foundation as well as the American Association of Genitourinary Surgeons. He is the editor of several textbooks and has authored more than

350 publications and book chapters. He is a recipient of the Karl Storz Lifetime Achievement Award from the Endourological Society and has been recognized by the AUA for extraordinary service and dedication in enhancing global urologic education and international membership. Badlani has been named an honorary member of the Brazilian, Japanese, Indian and Peruvian Urological societies as well as the EAU & CAU and has received the B.C. Roy Medal from the President of India for humanitarian service. He and his team, at the Wake Forest Institute for Regenerative Medicine, are recipients of a number of NIH research grants in the field of female urology as well as a merit grant from the Veteran's Administration.



Keith Ballentine, MD, clinical adjunct faculty, joined the Urology department in 2021. Ballentine earned his medical degree from the University of North Carolina School of Medicine in Chapel Hill; and earned his undergraduate degree from the University of North Carolina. He is also a graduate of our urology residency program.



Mark Colaco, MD, assistant professor, joined the department in 2021 as a pediatric urologist following completion of a two-year fellowship at the Children's Hospital of Pittsburgh. He is a graduate of the Robert Wood Johnson Medical School in New Brunswick, NJ, and is a graduate of Wake's urology residency program.



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 serves on the boards of the N.C. Urological Society and the Association of American Colleges and Universities and is a representative to the Urology Advisory Council of the American College of Surgeons.



Robert J. Evans III, MD, FACS, professor of urology and gynecology, directs the department's clinic operations. He specializes in pelvic pain syndrome and serves on the medical advisory boards of the Interstitial Cystitis Association and the Interstitial Cystitis Network. He is involved in several clinical trials and NIH-funded studies evaluating new treatments for painful bladder syndrome. In addition, he is part of a genomics study

looking at differences in subsets of IC patients. The American Urological Care Foundation selected him to provide oversight on patient education materials related to bladder pain, and he's been named the IC/BPS Doctor of the Year multiple times.



Laura Foster, MD, practices general urology and has special interests in treating voiding dysfunction/incontinence, urinary tract infections and kidney stones. She earned her medical degree from the University of North Carolina School of Medicine, Chapel Hill, and completed her residency in General Surgery and also Urology at UNC.



Ashok K. Hemal, MD, MCh, FACS, professor, serves as director of the Robotics and Minimally Invasive Surgery Program and chief of uro-oncology. He is internationally known for his pioneering work in the field of uro-oncology, robotic and pure laparoscopic surgeries, developing several surgical techniques. He is principal or co-investigator on several research projects at the

Wake Forest Comprehensive Cancer Center and the Institute for Regenerative Medicine. He has published more than 400 scientific papers in peer-reviewed journals and edited seven books, including the second edition of Robotics in Genitourinary Surgery. He is the recipient of many academic distinctions and awards. He currently serves as associate editor of the Journal of Endourology, the editorial board of several urological journals, and is a past 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 dysfunctional elimination. He has developed several new treatments, including drug-coated catheters and stents designed to prevent or treat urethral strictures, and disposable wipes designed to prevent vulvitis and urinary tract infections in females. He

has co-authored

10 books on toilet training and voiding dysfunction.



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 the textbook Infertility in the Male and has performed more than 1,500 vasectomy reversals. 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 AAGUS Keyes Medal for outstanding contributions in the advancement of urology.



David Kunkle, MD, assistant professor, specializes in men's health, urological cancers, kidney stones, urinary problems and vasectomy. He serves as chief of urology for Atrium Health Wake Forest Baptist – Wilkes Medical Center. He earned his medical degree from the University of Virginia Medical School in Charlottesville after completing his undergraduate study at Wake Forest University. He completed his residency at Temple University Hospital in General Surgery and Urology.



Catherine A. Matthews, MD, professor of urology and obstetrics/gynecology, is the Director of Female Pelvic Health Services and Director of the Female Pelvic Medicine and Reconstructive Surgery Fellowship. She specializes in conditions such as urinary and bowel incontinence, pelvic organ prolapse, fistulae, sexual dysfunction and post-obstetric perineal injury. Dr. Matthews is board-certified in Female Pelvic Medicine

and Reconstructive Surgery by the American Board of Obstetrics and Gynecology and is internationally recognized for her expertise in robotic and vaginal surgery. She has received numerous awards for her research, teaching and for excellence in surgery and patient care, and is extensively published in outcomes of pelvic organ prolapse repair, fecal incontinence, and bladder pain syndrome.



John D. McConnell, MD, FACS, is the Gordon Hanes Professor and Residency Program Director. He is a recipient of the AUA's Gold Cystoscope Award and the American Association of Genitourinary Surgeon's Barringer Medal for his contributions to the urology field. McConnell's research in the field of prostate disease and related health policy contributions led to his 2004 election to the National Academy of Medicine. He has served on the board of directors of the

American Urological Association and as a Council member of the National Institute of Diabetes and Digestive and Kidney Diseases of the NIH.



Vance Merhoff, MD, clinical adjunct faculty, is a University of Tennessee Medical School graduate, and completed his General Surgery and Urology residency at Wake Forest. He was in private practice for 18 years in Salisbury before becoming a practicing urologist at the VA Medical Centers in Salisbury and Kernersville, NC.



Majid Mirzazadeh, MD, associate professor, is a referral surgeon for complicated urologic conditions including urinary stones. He has held fellowships at UCLA, at the Institute of Urology and Nephrology, London, and at Wake Forest Urology. He is director of the urology teaching clinic. His primary research focuses on urinary tract infections as well as improving the design and safety of clinical and surgical instruments. A leader in device development, he invented a syringe capable of safely delivering multiple doses of injection products to patients.



Candace Parker-Autry, MD, assistant professor, is a graduate of the Wake Forest School of Medicine and specializes in urogynecology and female pelvic medicine and reconstructive surgery. She did her residency in Obstetrics and Gynecology at the hospital of the University of Pennsylvania in Philadelphia, and her fellowship in Female Pelvic Health and Reconstructive Surgery at the University of Alabama in Birmingham. She is involved in clinical care and

research related to the role of functional impairment and sarcopenia on the non-surgical management of urinary incontinence in older women as well as bowel incontinence, and prolapse of the vagina and other pelvic organs.



Ram A. Pathak, MD, assistant professor, specializes in the oncologic management of kidney, bladder and prostate cancers. He completed his fellowship in minimally-invasive robotic surgery at Wake Forest University. He leads the GU oncologic initiative at the Salisbury VA and takes an active role in clinical trials at the Comprehensive Cancer Center. Pathak serves as reviewer of various major urologic journals. His research interests lie in the minimally invasive treatment of

kidney, ureteral, bladder and prostate cancers. He has first-authored over 30+ publications and been an invited speaker at national/international meetings. With the partnership of Dr. Ashok K. Hemal, he has developed novel robotic surgery techniques for the treatment of prostate cancer, benign prostatic hypertrophy, and upper tract urothelial cancer.



Hooman Sadri, MD, PhD, assistant professor, specializes in male reproductive medicine and is a fellowship-trained male infertility clinician. Currently, he serves as an MD director for the American Society of Andrology board of directors. He is also an active member of the American Society for Reproductive Medicine, the American Urological Association, and the Association for

X and Y Chromosome Variations. His clinic is the national referral for Klinefelter syndrome, other genetic causes of hypogonadism, and spinal cord injury infertility. His expertise includes electro ejaculation, vas reversal, and microsurgical testicular sperm extractions. As a former Research Scholar of the AUA and principal investigator in regenerative medicine and stem cell therapy, Dr. Sadri is directing the male fertility research program at the Wake Forest School of Medicine. Since 2014, he has established and directed the spermatogonia stem cell bank for fertility preservation of high-risk boys and men, which has rapidly become one the largest worldwide bio-banking systems in this field.



Marshall Z. Schwartz, MD, FACS, FRCS-Eng (Hon), professor, is a pediatric surgeon whose clinical/surgical care has included general, urologic, and minimally invasive surgery in children. He has held leadership positions at many universities and teaching children's hospitals including Children's National Medical Center in Washington, D.C., and at St. Christopher's Hospital for Children in Philadelphia as well as at national and international

surgery organizations. His research and other academic activities have led to more than 155 publications, over 235 presentations at national and international meetings, including several named lectureships, and four patents on specific intestinal growth factors.



Sigmund Tannenbaum, MD, FACS, clinical adjunct faculty, joined the Urology department in 2021. He earned his undergraduate and medical degrees at Duke University and completed his residency at Duke University Medical Center. He was previously an attending physician at the Durham Veteran's Administration Medical Center. He has served as a clinical instructor and lecturer and conducted a variety of clinical research projects.



Ryan Terlecki, MD, FACS, professor and vice chair of urology research, is the director of Men's Health and directs a GURS fellowship in urologic reconstruction. He is a recognized leader in urological reconstruction, Peyronie's disease, and prosthetic surgery for erectile dysfunction. Additionally, he is an investigator in novel therapeutics for treatment of urethral strictures, and sexual dysfunction. Terlecki serves on the editorial board of the Journal for Sexual Medicine, AUA guideline panels, and is the immediate past-president of the NC Urological Association and is the NC representative to the Southeastern Section of the AUA.



Matvey Tsivian, MD, assistant professor, specializes in urologic malignancies. His research interest is in clinical trials and cancer outcomes research. He completed his urology residency at Duke University and a urologic oncology fellowship at the Mayo Clinic. He serves as a reviewer of multiple journals, including the Journal of Clinical Oncology, and has authored more than 120 papers.



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