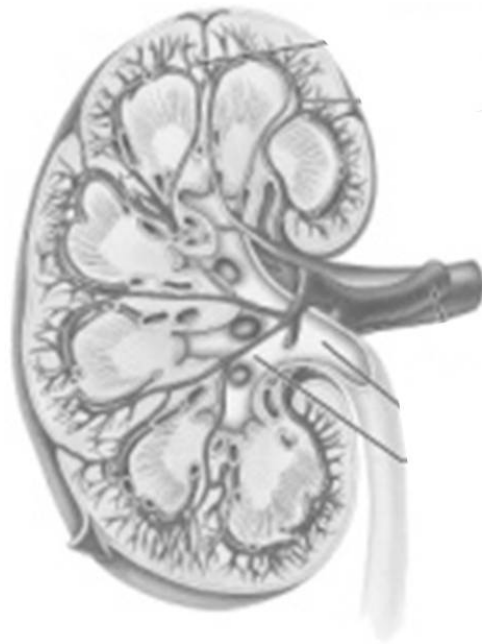




MASSACHUSETTS
GENERAL HOSPITAL

UROLOGY



POCKET GUIDE

for the

INTERN & MEDICAL STUDENT

Table of contents

Welcome	3
Description of urology clinical service	4
Sub-intern goals and responsibilities	4-7
Intern goals and responsibilities	8-9
Overview of residency	10
Research at MGH Department of Urology	11-12
Basic concepts in urology	
<i>Urologic emergencies</i>	
Genitourinary trauma	13-17
Priapism	17-20
Fournier’s gangrene	21-22
<i>General Urology</i>	
Urinary retention	23-27
Acute Renal Colic	27-29
Erectile dysfunction	29-31
Benign prostatic hyperplasia (BPH)	31-33
Evaluation of scrotal masses	33-34
Urinary tract infection	35-38
<i>Urologic Oncology</i>	
Renal Cell Carcinoma & Renal Cysts	39-42
Upper Tract Urothelial Carcinoma	42-44
Bladder Cancer	45-47
Prostate Cancer	48-52
<i>Procedures</i>	
Foley catheter placement/Bladder irrigation	53-57
Bedside cystoscopy	57-59
Priapism – Corporal Irrigation	59-60

Welcome

Dear sub-intern/intern,

We are proud to welcome you to the MGH department of urology. This is a very exciting time in your career and finding a residency that fits you is of utmost importance. The goal of our residency is to train you to be the best urologic surgeon you can be, and expose you to all aspects of urology. In addition, we hope to provide opportunities to help develop your interests and take full advantage of the opportunities for collaboration that come along with training in the city of Boston.

In this guide you will find an introduction to our department and to provide you with basic information that you might find useful during your initial arrival at MGH. More specific to our interns, we provide you a list of the faculty's research interests and guidelines for choosing a mentor and project as you progress through your intern year.

Michael L. Blute, MD
Chairman

Aria F. Olumi, MD
Residency Program Director

Description of urology clinical service

The current clinical service is divided into three separate teams (Leadbetter, O'neil, and Kerr). Average daily patient census is 6-8 patients per service. Each service has a junior resident, chief resident, and occasionally an intermediate resident. We have a wonderful PA, Diane Levis, who usually covers the O'neil and Kerr services while junior residents are in the operating room. The intern usually spends time on Leadbetter during which he/she will carry the emergency department consult pager and cover the patients on that service. Sub-interns will rotate through two of the teams (2 weeks on each team) at the discretion of the chief residents.

Sub-intern rotation details

Accommodations

Please make plans for accommodations early since it can be challenging to find a place close to MGH. If you have any questions or have difficulty obtaining a place to stay please contact Kim Williams (kwilliams40@partners.org) and she will put you in touch with a resident who may be able to assist you. Consider proximity to the public transportation when choosing a place to stay.

Useful websites:

<http://boston.craigslist.org/>

<http://www.massgeneral.org/mao/resources/housing.aspx>

<http://rotatingroom.com/> - sublet website for medical students, by medical students.

Please be advised that these listings are provided simply as a convenience to students and that we do not officially endorse these establishments. Arrangements are made independently between the establishment and the student.

Public transportation

Boston is a city with excellent public transportation. Please check the [MBTA website](http://www.mbt.com/) (<http://www.mbt.com/>) for up to date information. Please note the earliest times that the T opens to properly plan your arrival for rounds during your rotation.

Identification cards

The ID office is located on the second floor of the Wang building. When you exit the elevators make a right and follow the signs to the MGH security office. There you will be able to get your picture ID.

Important locations

Urology resident call room – located in the Gray/Bigelow building on the 11th floor. This is where you will go to print your team lists and where operating room schedules will be posted on the board.

Urology offices/library – Gray/Bigelow 1102. To access the urology library turn right after entering the urology offices and head down the hall towards the room at the end.

Emergency department – located on the first floor close to the Fruit street entrance to the hospital. As a sub-intern you are encouraged to follow the intern/residents to see consults in the emergency department to get an idea of the breadth of consults that we have the opportunity to see at MGH as a result of being a large tertiary and level 1-trauma center.

Cafeteria – located in the basement. There is also a coffee shop outside of the Gray/Bigelow elevators on the first floor and a small cafeteria on the basement floor of the Wang building.

Computers – if there are no available computers in the urology call room you can use the computer in the urology library or you can use the resident lounge on the first floor of the Wang building.

Computer access/Online resources

After obtaining computer access, please double check that you have access to CAS, Mosaic, and Apprentice. You will use these programs to access patient clinical information, operating room schedules, and to help print patient lists for rounds, respectively. If you do not have access to these programs, please email Cindy Murphy (CMURPHY3@mgh.harvard.edu).

Meeting with Chief resident

Each sub-intern should meet with one of the three chief residents during the first few days of the rotation to discuss goals and responsibilities for the month.

Team-work

Sub-interns are expected to work together as a team with their co-residents and medical students. We expect that you will try to incorporate yourself into the team and really try to experience what it may be like to be an MGH resident. Your focus should be on trying to follow your patients throughout the rotation (e.g. volunteer to write the post-op check on the patient who you were in the OR with). At times there may be up to four other medical students on service. Make sure that you are working together to assign each other cases in a way that will allow you to obtain a grasp of the different procedures performed at MGH, but also give you an opportunity to get to know the faculty.

Pre-rounding/rounding

Touch base with the junior resident on your team to find out exact details about how to pre-round and other tasks that may be helpful in the morning. Rounds usually start at 6 AM, but

may be earlier if there are conferences scheduled that morning or the team has a particularly large census (important to take into account when choosing your accommodations). Try to pre-round (obtain vitals) on the patients in your team if time allows. There will be times that the list will be very large. In general, try to at least pre-round on the patients whom you have seen in the OR and examine them before rounds. It will be up to your team chief, but you should try to come up with an assessment and plan for your patient to be presented during rounds. Help follow-up on tasks during the day that may be helpful to other team members.

Operating room

The first day of the rotation make sure to take the scrub class so that you are able to scrub into cases. Once you are done with your scrub class please report to the urology office where Cindy Murphy will give you the information about who to report to next.

The operating room schedule will be posted in the call room several days in advance. Please make sure to discuss which cases you will be scrubbing in on with your fellow medical students a couple of days prior to the operation to allow time for preparation. In general, try to spend the day with one attending rather than trying to bounce around different rooms. This will give you an opportunity to get to know the faculty in the department.

You should have access to the patient's medical record including clinic visits, imaging, and pathology. Make sure you come prepared to discuss the patient's presentation, physical exam findings, and indication for the procedure. In addition, be ready to discuss relevant anatomy for the procedure. You have access to Campbell's urology through the MGH Treadwell library (<http://www2.massgeneral.org/library/> -> ebooks -> search for Campbell's urology -> log in with partners username and password). Alternatively, in CAS you have a tab that is called "handbook" which contains links to pubmed, ebooks, and UptoDate for your review.

Clinic

During your rotation try to spend at least one afternoon per week in clinic to get a sense for what office urology is like (schedule included in the appendix). This will be another way for you to get to know the faculty in the department.

Presentation

Medical students who are applying to urology residency programs are required to give a 10-minute presentation (8 minutes plus 2 minutes for questions) on a topic of their choice. Residents should try to identify a topic early on in the rotation and ask the chief residents for guidance on the specific topic. This should be a focused presentation with a thorough literature review. Students should be able to show mastery in the specific area and try to avoid presenting summaries of chapters in Campbell's. Furthermore, try to stay away from choosing topics that are currently controversial in the field and/or do not have a clear consensus.

Letters of recommendation

Students should try to schedule a meeting with Dr. Blute (please email Cindy Murphy at cmurphy3@mgh.harvard.edu) towards the end of their rotation to discuss the departmental letter of recommendation. Letters will be a compilation of comments received from residents, faculty, and assessment of your presentation. Please bring a copy of an up to date CV to your meeting with Dr. Blute.

Intern goals and responsibilities

Schedule

You will have a total of 3 months of urology during your intern year. Your schedule will usually be Monday through Saturday. During your general surgery rotation you will rotate through surgical oncology, pediatric surgery, SICU, trauma surgery, and general surgery.

Objectives

The objectives of the urology intern rotation:

1. Become familiar with the management of post-operative urologic patients
2. Understand the management of common emergent urological consults
3. Become facile in the placement of difficulty Foley catheters and bladder irrigation
4. Learn the basics of endoscopy in the operating room

Team-work

The intern will usually start on the Leadbetter service as the responding clinician and hold the emergency department consult pager (see details below). The urology intern job comes with great responsibility as you will be the first one assessing patients in the emergency department and in charge of triaging these patients. If our PA is off, the intern will often assist in covering the list of the post-call resident.

Knowledge

Dr. Olumi will be providing you (the Urology categorical interns) with a copy of Smith's Urology that you should read in completion during your intern year. In preparation for the in-service we will have a mock 25-question exam after intern year and 50-question exam after your first year of urology.

Consults

The intern usually holds the consult pager that is usually used to call intra-operative, emergency department, and occasionally floor consults.

- Intra-operative – you will at times be called directly from the operating room for an intra-operative consult. This will range from a difficulty Foley placement to assistance with a potential bladder and/or ureteral injury. If it is the latter, try to get as much information about their primary concern, patient name/MRN, and immediately contact the proper attending with the details of the consult. For the former, ask about what catheters have been tried. Prior to going to the operating room make sure to take a thorough look through the patient's history, labs, and prior imaging to look for a history of BPH, urethral stricture disease, and/or prior urologic surgery.

- Emergency department – the most common emergent consults include symptomatic nephrolithiasis (pain +/- infection) – of which patients may present with urosepsis, urinary retention, epididymoorchitis, Fournier’s gangrene, priapism, and hematuria. Please make sure to read about these conditions prior to the start of your rotation.
- Floor/Inpatient – the consult resident will usually take care of the floor consults, but you will occasionally be called to assist with difficult Foley placements and to assist with bladder irrigations in patients with clot retention. During the weekends you will be in charge of taking all consults with the assistance of the on-call junior resident.

Operating room

During your urology rotation you should become familiar with the instruments used for cystoscopy and basics of common endourologic procedures.

Mentorship

Dr. Olumi will meet with you within the first couple of months of your intern year to assign you a mentor in the department of urology. If you are choosing to take time after intern year to do research it will be important to start thinking about a potential area of interest and projects.

Overview of residency

The MGH residency provides trainees a strong clinical exposure to general urology, urologic oncology, stone disease, infertility, voiding dysfunction, female urology, and pediatric urology. Residents have the opportunity to rotate through Children's Hospital Boston during their senior years. Laparoscopic and robotic skills are solidified during the later years of training.

One unique aspect of this residency is the ability to become a junior attending at the end of residency. All urology interns have the same general surgery and urology rotations. During the PGY-2/URO-1 year, residents are staggered into urology every four months – resident 1 enters his/her PGY-2/URO-1 year immediately, resident 2 four months later, and resident 3 four months after resident 2 enters. This provides those residents who enter urology at a later time the opportunity to do more general surgery rotations or use the time to perform research. At the end of residency trainees remain on staff as the "Cabot attending" during which he/she will have attending privileges at MGH and be in charge of their own clinic, overseeing the resident clinic, and take call for trauma at a level 1 trauma center. This unique experience allows residents to work as attendings under the continued guidance of the MGH faculty.

Conference curriculum

Tuesday morning resident conferences

Residents take turns leading weekly discussions of a particular topic in urology. Each session is led by a faculty member with particular expertise in the topic presented.

Thursday morning indications and grand rounds

Every Thursday morning at 7 AM residents meet to discuss cases scheduled through the urology resident clinic and staffed with the Cabot attending. Grand rounds usually runs from 7:30 to 9:30 AM where we have lectures from faculty within the department of urology, other MGH departments, resident case presentations, or GU oncology conferences.

Oncology fellowship

There are two fellows per year in the combined Brigham and Women's Hospital/MGH urologic oncology fellowship. The fellows rotate through both hospitals and are a tremendous asset to resident education and training. Fellows are also keen to involve residents in ongoing research.

Research at MGH Department of Urology

Kidney Cancer

- a. A comparison of nephron sparing techniques: percutaneous radiofrequency ablation (RFA) vs. open and laparoscopic partial nephrectomy (Feldman)
- b. Renal Biopsy for suspicious renal masses: The MGH cohort of 1000 patients (Feldman)
- c. Molecular pathogenesis of angiomyolipoma and other TSC related neoplasms (Wu – funded by NIH/Program Project)

Bladder Cancer

- a. Multi-institutional bladder cancer quality care initiative for non-metastatic muscle invasive transitional cell carcinoma of the bladder (Feldman)
- b. RTOG 0926: Phase II – Management of aggressive forms of stage T1 bladder cancer with trimodality therapy (TURBT, chemotherapy, and radiation) (Dahl)
- c. RTOG 0524: Paclitaxel and radiation therapy with or without Trastuzumab in treating patients who have undergone surgery for bladder cancer (Dahl)
- d. Genetic signatures in T1 G3 bladder cancer (McDougal)

Prostate Cancer

- a. 5-alpha reductase 2 expression in adult prostate tissue (Olumi – funded by NIH/RO1)
- b. Biomarkers for active surveillance in prostate cancer (Feldman – funded by DOD & Prostate Cancer Foundation)
- c. Circulating tumor cell (CTC) analysis in prostate cancer (Dahl)
- d. Molecular mechanisms of resistance to pro-apoptotic therapies (Olumi – funded by New York Academy of Medicine)
- e. Metabolic state of prostate cancer cells determines sensitivity to Metformin in prostate cancer cells (Olumi)
- f. Genetic signatures in prostate cancer (McDougal & Wu)
- g. Template biopsy in patients who are highly suspicious for having prostate cancer but have had negative biopsies (McDougal)
- h. Metabolomics of prostate cancer in prostate biopsy specimens (McDougal & Wu – funded by NIH)

Penile Cancer

- a. Penile conserving surgery for penile cancer (McDougal)

Infertility

- a. Sperm vitrification (Tanrikut)
- b. Clinical outcomes related to testosterone replacement therapy (Tanrikut)
- c. Dietary impacts on semen parameters (Tanrikut)

Nephrolithiasis

- a. Analysis of 24-hour urines and risk factors for recurrent nephrolithiasis (Eisner)
- b. Use of paravertebral nerve block in patients undergoing percutaneous nephrolithotomy (Eisner)
- c. Predictive factors and stone characteristics for patients evaluated in the emergency department with flank pain (Eisner)
- d. Novel MRI applications for the detection of renal stones (Eisner)

Tissue Biobank (Wu & McDougal – Funded by MGH Bertucci Research Fund)

- a. Prostate: 3547
- b. Kidney: 1091
- c. Bladder: 244
- d. Testis: 140
- e. Adrenal: 221

UROLOGIC EMERGENCIES

Genitourinary Trauma

Tim Brown, MD, PhD

- Indications for genitourinary (GU) evaluation in a trauma patient:
 - Traumatic hematuria
 - Gross hematuria
 - Penetrating trauma
 - Pediatric patient and any degree of hematuria
 - Blunt trauma with microscopic hematuria and shock
- Indications for evaluation of GU trauma in the absence of hematuria:
 - Mechanism of injury: rapid deceleration or flank injury
 - Clinical findings (mechanism of injury): flank ecchymosis, flank pain, posterior rib fractures, transverse process fractures near kidney, pelvic fracture, etc
- Radiologic studies:
 - Abdomen/pelvis CT with delays: suspected renal/ureteral injury
 - CT-cystogram: suspected bladder injury
 - RUG (retrograde urethrogram): suspected urethral injury
 - Scrotal ultrasound: testicular injury

Renal trauma

- Facts
 - Most common GU organ injured by trauma
 - Blunt trauma accounts for > 90% of renal injuries
 - Children are more susceptible to renal trauma due to less perirenal fat, underdeveloped rib cage and less muscle
- Evaluation
 - Imaging study of choice: 2-phase contrast renal CT
 - Vascular/cortical phase 30 seconds after IV contrast
 - Delayed phase 10 minutes later to assess for perirenal or ureteral extravasation
 - IVP and Ultrasound are low yield and less reliable
 - Single shot IVP can be used in unstable patient in the OR to confirm presence of a contralateral kidney
- Classification
 - Grade 1: contusion or subcapsular hematoma
 - Grade 2: cortical laceration <1cm, no extravasation
 - Grade 3: cortical laceration >1cm, no extravasation
 - Grade 4: laceration >1 cm deep into collecting system OR vascular injury (thrombosed renal artery or segmental vein injury)
 - Grade 5: shattered kidney OR renal pedicle avulsion
- Management

- Initial observation is appropriate for patient with renal parenchymal injury and urinary extravasation
- The only absolute indication for renal exploration is hemodynamic instability from renal injury (should avoid unnecessary exploration due to risk of releasing perirenal tamponade)
- Urinary drainage via ureteral stent should be performed in the presence of an enlarging urinoma, fever, increasing pain, ileus, fistula or infection. May need to augment with percutaneous drain, percutaneous nephrostomy or both.

Ureteral trauma

- Facts
 - Iatrogenic trauma is most common cause of ureteral injury (during abdominal, pelvic, retroperitoneal or endoscopic surgery)
 - Most non-iatrogenic injuries are due to penetrating trauma
- Evaluation
 - Diagnosis can be challenging- hematuria and retroperitoneal (RP) hematoma are absent in ~ 1/3 of cases
 - Must have high index of suspicion:
 - Clinical scenarios (penetrating wounds in proximity to the ureter, sudden deceleration injury, especially in children, and recent surgery in proximity to ureter)
 - Symptoms (flank abdominal pain, flank mass, prolonged ileus, upper urinary tract obstruction or hydronephrosis, elevated BUN/creatinine, high surgical drain output)
- Evaluation
 - CT with delayed imaging- likely to reveal urinary extravasation
 - Retrograde pyelogram- most accurate imaging test (utilize when CT is inconclusive)
 - Direct inspection during laparoscopy is ideal if ureteral injury is suspected
 - May utilize dyes (methylene blue or indigo carmine) in antegrade or retrograde fashion to identify ureteral injuries
- Principles of Repair
 - Diagnosis within 5 days, consider immediate repair
 - \geq 5 days, sepsis or debilitated patient, drain urinoma percutaneously, place nephrostomy and/or ureteral stent and repair electively
 - Okay to repair in presence of bowel injury, fecal contamination and vascular injury- utilize tissue interposition when possible (e.g. omental flap)
 - Okay to repair ureteral injuries during vascular graft surgery if urine is sterile
 - Repair over stent and leave retroperitoneal drain
 - Post operative management:
 - Leave urethral catheter ~ 24-48 hours and then remove
 - Remove retroperitoneal drain 24 hours after urethral catheter if output remains minimal

- Remove stent in 4-6 weeks
 - Follow imaging (CT urogram or renal scan) 4-8 weeks after stent removal
- Types of Repair
 - Ureteral reimplant (ureteroneocystostomy) +/- psoas hitch +/- Boari flap
 - Preferred repair for ureteral injuries below iliacs and most extensive mid and distal injuries
 - Ureteroureterostomy
 - Preferred repair for abdominal ureteral injury with short defect (< 1 cm)
 - Ileal interposition
 - For use when long segment of ureter is damaged
 - Autotransplant
 - Other repairs: transureteroureterostomy, ureteropyelostomy, ureterocalycostomy

Bladder trauma

- Facts
 - Typically seen with pelvic fracture or blunt trauma with distended bladder
 - Occurs in 6-10% of pelvic fracture cases
- Evaluation
 - Suspect with gross hematuria, pelvic fracture, suprapubic tenderness, MVA
 - Intraperitoneal bladder rupture may present in delayed fashion with ileus/urinary ascites/elevated BUN/Cr or no return of urine with catheter placement
 - Cystogram - must fill to capacity (>350 cc) and obtain drainage films (or do CT cystogram)
- Management
 - Extraperitoneal bladder rupture: catheter drainage alone
 - Exceptions requiring repair: bone fragment in bladder, open pelvic fracture, rectal perforation, bladder neck injury, pt undergoing internal fixation of pelvis
 - Intraperitoneal bladder rupture: immediate operative repair
 - Technique: open bladder and close in 2-3 layers
 - Follow up: cystogram 10-14 days after repair prior to catheter removal

Urethral trauma

- Facts
 - Rare in females (< 2%) or without pelvic fracture
 - Associated with bladder rupture in 10-17%
 - Anterior urethral injuries (distal to membranous urethra, i.e. bulbar, penile and glandular urethra)
 - Usually caused by blunt trauma (straddle injury) or penetrating injury (stab or gunshot)
 - 10% of all urethral injuries

- Posterior urethral injuries (membranous to bladder, i.e. membranous and prostatic urethra)
 - Almost all are from pelvic fracture from blunt trauma
- Evaluation
 - Suspect with blood at meatus, high-riding prostate, penile/scrotal/perineal hematoma, pubic ramus fracture, difficulty voiding and distended bladder
 - Eggplant deformity: anterior urethral injury where blood is contained by Buck's fascia
 - Butterfly hematoma: seen with straddle injury where Buck's fascia is ruptured and hematoma is contained by Colles' fascia
 - All suspected urethral injuries warrant a retrograde urethrogram (RUG)
- Management
 - Posterior urethra injuries
 - Immediate repair: only recommended when there is a concomitant rectal or bladder neck injury (immediate repair has higher rates of incontinence and impotence)
 - Delayed repair: initially treat with bladder drainage (SPT vs urethral catheter) followed by repair in 3-6 months
 - Primary endoscopic realignment is preferable (50% heal without significant urethral stenosis)
 - Methods of placing urethral catheter
 - Blind passage of Foley by urologist
 - Bedside flexible cystoscopy
 - To OR for rigid cystoscopy and/or antegrade flexible cystoscopy through SPT site
 - Anterior urethral injuries
 - Typically managed by bladder drainage by SPT or Foley and deferred repair if necessary

Penile trauma

- Gunshot and penetrating injuries
 - Immediate exploration, copious irrigation, excision of foreign matter, antibiotic prophylaxis and surgical closure
 - Strongly consider retrograde urethrography
 - Repair urethral injuries primarily
- Amputation
 - Reimplant if possible
 - Preserve amputated penis in wet sterile gauze in baggy placed on ice
 - <24 hour cold ischemia time to be viable (~16 hours or 6 hours warm ischemia)
- Fracture
 - Rupture of tunica albuginea of erect penis typically sustained during intercourse
 - Requires immediate surgical repair

- Associated urethral injury in 10-20% of cases: must assess with RUG vs flexible cystoscopy in the OR in suspected cases (hematuria, inability to void)

Testicular trauma

- Facts
 - Most cases secondary to blunt trauma from athletic activity
- Evaluation
 - Ultrasound - can be useful but should not dissuade exploration if physical exam demonstrates significant testicular trauma
 - Should not delay immediate exploration
 - Physical exam and ultrasound cannot reliably distinguish intratesticular hematoma from testicular rupture (tear in tunica albuginea)
 - Therefore surgical exploration is recommended for either
- Management
 - Prompt surgical repair
 - 80-90% of testicles are salvaged with surgery within 72 hours of injury vs. 32-45% when surgery is delayed beyond 72 hours.

Priapism

Dayron Rodriguez, MD, MPH and Michael T. Grant, MD

Definition: Priapism is a persistent penile erection that continues hours beyond, or is unrelated to, sexual stimulation and lasts *greater than four hours duration*.

Ischemic vs. Stuttering vs. Non-ischemic Types

- Ischemic (veno-occlusive, low flow) priapism - caused by decreased venous outflow which causes increased intracavernosal pressure which leads to a non-sexual, persistent erection with decreased arterial inflow, stasis of blood local hypoxia and local acidosis. It is characterized by abnormal cavernous blood gases (hypoxic, hypercarbic, and acidotic). The corpora cavernosa are rigid and tender to palpation, but the glands and corpus spongiosum are soft. Patients typically report pain. A variety of etiologic factors may contribute to the failure of the detumescence mechanism in this condition which include: sickle cell trait and disease, malignant infiltration of the corpora, TPN, medications such as anticoagulants, antihypertensives, antidepressants (trazadone), alpha blockers, methylphenidate, cocaine, treatments for erectile dysfunction, hyperosmolar IV contrast, spinal cord injury and spinal or general anesthesia. Ischemic priapism is an emergency and requires immediate treatment.
- Stuttering (intermittent) priapism - a recurrent form of ischemic priapism in which unwanted painful erections occur repeatedly with intervening periods of detumescence (not rapid recurrence of a single episode). This historical term identifies a patient whose pattern of recurrent ischemic priapism encourages the clinician to seek options for prevention of future episodes. Prevention strategies include the use of LHRH agonists

with an anti-androgen to prevent testosterone flare, or the intracavernosal injection of phenylephrine in men who fail or decline hormone therapy.

- Nonischemic (arterial, high flow) priapism - caused by increased arterial inflow without decreased venous outflow, resulting in high inflow and high outflow producing a prolonged, *non-painful* partially rigid erection (corpora cavernosa) without local hypoxia or acidosis. The most common cause is perineal or penile trauma that causes a fistula between the cavernous artery and the corporal tissue. Doppler U/S can identify a cavernosal artery fistula, however arteriogram is the gold standard for diagnosis. *Treatment is not an emergency.*

Evaluation/Work-Up

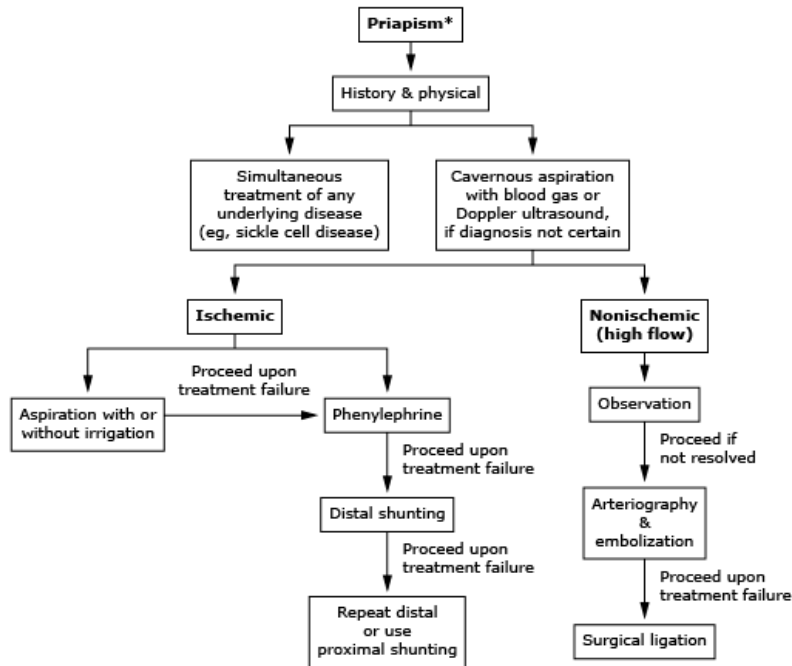
The most important task is to differentiate ischemic from non-ischemic priapism!!!

- History - duration of erection, degree of pain (ischemic priapism is painful while nonischemic priapism usually is not), previous history of priapism and its treatment, use of drugs that might have precipitated the episode, drugs that have been associated with priapism, history of pelvic, genital or perineal trauma, history of sickle cell disease or other hematologic abnormality.
- Examination - The genitalia, perineum and abdomen should be carefully examined. In ischemic priapism, the corpora cavernosa are often completely rigid, while in nonischemic priapism, the corpora are typically tumescent but may not be completely rigid. Abdominal, pelvic and perineal examination may reveal evidence of trauma or malignancy.
- Labs/Imaging - CBC, reticulocyte count, hemoglobin electrophoresis, urine toxicology, cavernosal blood gas, color duplex ultrasonography, penile arteriography.

	Cavernosal Blood Gas			Doppler Ultrasound Cavernous Artery & Blood Flow Velocity
	PO ₂	PCO ₂	pH	
Ischemic Priapism	< 30	> 60	< 7.25	Zero or Minimal
Non-Ischemic Priapism*	> 90	< 40	7.40	Normal or High
Normal flaccid penis ⁺⁺	40	50	7.35	-

* Similar to normal arterial blood ** Similar to normal mixed venous blood

Management (based on AUA guideline panel)



* After intra-cavernosal phenylephrine monitor blood pressure and pulse. Cardiac patients should be placed on telemetry

* Resolution of priapism may be confirmed by repeat cavernosal blood gas or Doppler U/S.

- Corporal Aspiration and Irrigation (see instructions below)
- Distal shunts:
 - Winter: Tru-cut biopsy needle (multiple cores) between distal corpora cavernosa and glans.
 - Ebbehoj: stab incision on glans and rotation of blade between distal corpora cavernosa and glans
 - Al-Ghorab: 2 cm transverse incision and excision of tunica albuginea from each corpus
- Proximal shunts:
 - Quackel: corporal- spongiosum shunt
 - Grayhack: corporal-saphenous shunt

*** Proximal shunts have a higher rate of erectile dysfunction than distal shunts.

Other points

- Oral systemic therapies, such as pseudoephedrine, are not recommended by the AUA guidelines. Prostate massage, ice packs to penis and enemas are not effective and not recommended by AUA guidelines.
- The longer the priapism duration, the higher the rate of impotence. 90% of men with priapism > 24 hours develop severe erectile dysfunction. Even with early intervention impotence occurs in up to 50% of patients.

*****Instructions for *Corporal Irrigation* can be found on page 59.**

- Potentially life-threatening form of necrotizing fasciitis involving the (generally male) genitalia.
- Originally reported in 1784 by Baurienne, characterized by Fournier in 1883.
- 95% of cases now have an identifiable source
 - Most commonly from skin, urethra, urine, or rectum
 - Predisposing factors: DM, liver dysfunction, or other immunocompromised state, local trauma, instrumentation (catheter or GU surgery,) paraphimosis, perirectal/perianal infections or fissures, groin/genital surgery (circumcision, herniorrhaphy.)
 - Wound cultures typically multibacterial with both aerobes and anaerobes
 - Infecting bacteria may pass through Buck's fascia, spread along the dartos of scrotum/penis -->may end up involving or spreading to Colles fascia of perineum and Scarpa of anterior abdominal wall. (This is why you must **debride widely!**)

Diagnosis

- Diagnosis is clinical
- Early stages: involved area is swollen, erythematous, and tender; crepitus is an early finding but in early stages can be subtle.
- Late stages: fever, discoloration and necrosis, bullae formation, skin anesthesia over areas of deep pain, marked systemic toxicity out of proportion to local exam
- Labs: Leukocytosis OR leukopenia; elevated creatinine, elevated LFTs, hyponatremia, hypocalcemia (may be secondary to release of free fatty acids from bacterial lipases that destroy triglycerides.)
- Radiology: plain film of scrotum/abdomen, ultrasound of scrotum, may be able to identify air; CT scan more sensitive and specific for extent of air spread along fascial planes (remember that the overlying skin over affected fascia may appear normal.)

Management

- **Surgical and emergent!** These patients can decompensate very quickly.
- Diagnosis made on clinical basis—imaging may not be necessary in some situations.
- Broad-spectrum antibiotic coverage against gram positives and gram negatives (can consider double anaerobe coverage, eg Clindamycin/Flagyl/Zosyn, etc.)
- Extensive debridement, culture, and excision of fascia, subcutaneous tissue, and fat beyond the area of involvement until normal fascia is found (bleeding.)
- May require suprapubic diversion in cases of urethral trauma/urine extravasation
- May require colostomy in cases of colonic/rectal perforation
- May require amputation at level of hip in case of groin and thigh spread—we've seen this twice in the past few years.
- Wounds are left open with wet-to-dry or with VAC placement; generally not closed primarily at initial surgery. Second procedure 24-28 hrs later to assess adequacy of initial debridement, further debridement.

- Orchiectomy almost never required: testes have their own blood supply independent of fascia and skin of scrotum. Possible exception: when source is epididymitis/orchitis.
- In long-term often require flap or graft closure of initial debridement.

Outcomes

- Mortality in early studies approximately 20%, ranging from 7%-20%.
- Higher mortality in diabetics, alcoholics, colorectal sources of infection, delay in diagnosis and management.

GENERAL UROLOGY

Urinary retention

Anton Wintner, MD

- **Acute vs. Chronic** – the failure of the bladder to empty is the result of decreased bladder contractility (duration and magnitude), increased bladder outlet resistance or both. Urinary retention may be **acute** (failure to void with build up of urine in the bladder causing increasing discomfort) or **chronic** (elevated post void residual which can predispose the patient to complications such as bladder stones or urinary tract infection).

Etiology

- Because of the Bladder
 - Neurogenic
 - Myogenic
 - Psychogenic
 - Idiopathic
- Because of the Outlet
 - Anatomic
 - Prostate obstruction
 - Bladder neck contracture
 - Urethral Stricture in the male
 - Urethral Compression (organ prolapse)/fibrosis in the female
 - Functional
 - Smooth sphincter dyssynergia
 - Striated Sphincter dyssynergia
 - Combination

Evaluation

- **History** may provide a clue into the cause the patient's urinary retention. Common symptoms include *hesitancy, straining to void, poor stream, dribbling or overflow incontinence*.
- **Vital sign** abnormalities such as *elevated blood pressure* or *tachycardia* may result from acute distention of the bladder and in certain patients may be the first sign of acute urinary retention.
- A **focused physical exam** should be conducted in cases where there is concern for urinary retention should include of the following:
 - Lower abdomen - *bladder distention* should be noted. The abdomen may have *old scars* indicative of prior surgery. An obstructing *abdominal mass* may be palpable.

- Flanks - *CVA tenderness* may indicate hydronephrosis or infection (pyelonephritis)
- Genitalia - *phimosis, penile mass or urethral stones* may be noted. *Blood* at the meatus may indicate hematuria with resultant clot obstruction.
- Rectum - decreased *sphincter tone* may indicate a spinal cord injury or compression that can also affect bladder contractility. In males the *prostate* should be evaluated for evidence of enlargement.
- Pelvic Exam- in females a pelvic exam should be done to rule out an *adnexal mass* and *pelvic organ prolapse*.
- Neurologic and mental status exam - a basic neurologic exam may unveil *neurologic deficits* which may also affect bladder function.

Common Predisposing Factors

- Spinal cord injury/spinal shock - spinal shock may result in suppression of somatic and autonomic activity resulting in bladder areflexia with a closed bladder neck. Over time however, spinal cord injury may evolve into detrusor overactivity with sphincter dysynergia.
- Cerebrovascular accident - thrombus or hemorrhage results in ischemia and infarction of various areas of the brain. In the acute setting urinary retention from sphincter areflexia may occur (the exact physiology is unclear). Over several weeks to months as the pt recovers from the neurologic lesion a fixed deficit may become apparent.
- Cauda Equina, disc disease, spinal stenosis - back pain, lower extremity pain, cramping, paresthesias related to exercise, and decreased rectal tone are common findings. Urinary symptoms depend on the level of spinal cord compression.
- Radical pelvic surgery - Examples include abdominoperineal resection, proctocolectomy or radical hysterectomy. Voiding dysfunction/urinary retention may occur due to pelvic plexus injury. This usually improves over time, however in some cases may be permanent. The pattern is usually one of impaired voluntary bladder contractility and fixed striated sphincter tone.
- Diabetes - urinary retention in diabetes is usually the result of diabetic cystopathy. Peripheral autonomic neuropathy in diabetes first affects sensory pathways causing impaired bladder sensation. Gradual increase in time interval between voids results. Over time, detrusor distention, overdistention and decompensation classically occur. As a result, detrusor contractility is usually decreased in end stage diabetic bladder.
- Benign Prostatic Hyperplasia - the most common cause of urinary retention in males. As men age, they undergo hyperplasia of benign prostatic tissue leading to gradual narrowing of the bladder outlet and subsequent bladder hypertrophy. See prior chapter on BPH.
- Post-Operative Retention - nociceptive impulses can inhibit initiation of reflex bladder contraction through opioid-mediated mechanism or sympathetic mediated inhibition. Alternatively, transient overdistention of the bladder can occur under anesthesia or due to decreased sensation from the consumption of analgesic medications. Direct

neurologic injury due to disruption of the pelvic plexus can also occur as discussed above.

Management

- Serial Post Void Residuals (PVRs) should always be measured when there is concern for urinary retention. An increasing post void residual with inability of the patient to void indicates acute retention while a stable but elevated post void residual usually indicates chronic urinary retention.
- Other studies including upper tract imaging, cystoscopy, and urodynamics may be indicated but are generally reserved for the outpatient setting and rarely have a role in evaluation of acute urinary retention.
- General Recommendations for uncomplicated postoperative urinary retention
 - Decompress the bladder (intermittent catheterization vs. indwelling Foley catheter)
 - Minimize narcotic and anti-cholinergic medications
 - If any symptoms of BPH based on history and physical exam start tamsulosin 0.4mg QHS (if no contraindications such as hypotension or sulfa allergy)
 - Aggressive bowel regimen to ensure patient is having regular daily bowel movements
 - Prior to removing Foley catheter for a void trial ensure that the above criteria have been met and that the pt is ambulating regularly (or at least at baseline level of activity) is back to baseline mental status and that they do not have an epidural in place
 - If patient fails a void trial despite meeting the above criteria, further workup may be indicated.

In the absence of neurologic injury and with proper decompression, voiding function will generally return to preoperative levels. Return of bladder function may be facilitated with the use of an alpha-blocker (eg. tamsulosin) as well as intermittent catheterization or placement of an indwelling Foley catheter.

Treatment options

- Increasing intravesical pressure
 - External Compression, Valsalva - controversial but best used for patients with atonic bladder and some striated or smooth sphincter denervation.
 - Promotion or initiation of reflex contractions - manual stimulation of certain areas within the sacral and lumbar dermatomes may provoke reflex bladder contraction. The classic method is to apply manual rhythmic suprapubic pressure.
 - Pharmacotherapy
 - Bethanechol chloride

- An acetylcholine-like drug with a relatively selective action on the bladder. Though causes bladder muscle contraction in vitro, results have been difficult to reproduce in vivo
 - Alpha-adrenergic blockers
 - Tamsulosin, Doxazosin, Terazosin, etc. - sympathetic signal inhibition of pelvic parasympathetic ganglia promotes bladder storage. Thus alpha-adrenergic blockers could facilitate transmission through these ganglia to theoretically promote bladder contractility. More commonly used for outlet obstruction (see below)
 - Narcotic Antagonists
 - Naloxone - theoretically prevents tonic inhibitory effect of endogenous opioids on the bladder. Rarely used due to side effect profile.
 - Electrical Stimulation
 - Sacral nerve root stimulation (Interstim). Mechanism of action has not been completely elucidated.
 - Reduction Cystoplasty
 - Leads to myogenic decompression by removing the chronically overstretched muscle fibers of the dome of the bladder. Risk benefit ratio is not well established.
- Decreasing outlet resistance
 - Pharmacotherapy
 - Alpha-adrenergic blockers - promote relaxation of the smooth muscle of the bladder neck and proximal urethra. May also affect striated sphincter tone.
 - Phenoxybenzamine - original drug used for voiding dysfunction. Now rarely used due to high side effect profile
 - Prazosin - first selective alpha-1 AR blocker. "First dose phenomenon" of faintness, dizziness and palpitations thought to be due to acute postural hypotension
 - Terazosin / Doxazosin - highly selective post-synaptic alpha-1 AR blockers. Well tolerated, good bioavailability, but must be dose titrated. Some effect on blood pressure, thus often used in patients with concomitant hypertension
 - Alfuzosin / Tamsulosin / Silodosin - highly selective with preferential action on prostatic rather than vascular smooth muscle. Less hypotensive side effects. Do not need to be titrated.
 - Surgical Management
 - TURP/PVP
 - TUR bladder Neck
 - Transurethral incision of bladder neck
 - Urethral Stricture dilation

- Other
 - Conservative Management
 - Indwelling Foley Catheter
 - Suprapubic Tube
 - Clean intermittent catheterization

Acute Renal Colic

Scott Gabrielsen, M.D., Ph.D. & Brian Eisner, M.D.

Definition: Acute onset, severe flank pain. Often intermittent in nature, may radiate toward groin.

Etiology: Usually secondary to acute obstruction of the urinary tract, most frequently from nephrolithiasis. Acute urinary obstruction and ureteral dilation activates receptors in the urothelium (stretch and inflammation). Slow dilation of the system is often asymptomatic. Thus, the degree of obstruction is not necessarily correlated with pain severity.

Evaluation: Goal is to rule out other causes of pain and determine if intervention is needed.

History: Location, onset, duration, nature of pain, associated symptoms

History of stones (#/frequency of episodes, composition, prior interventions)

Other GU problems/surgeries

Risk factors for complicated stones: DM, diversion, solitary kidney, pregnancy, immunocompromised

Prior GU/abdominal procedures

History of malignancy

Exam: Vitals, general appearance, abdominal/GU exam

Labs: CBC, chemistry, UA (culture if positive)

Imaging: RUS/KUB or stone protocol CT (start with KUB and RUS but consider CT if diagnosis of stone is not made on initial imaging studies. Also can start with CT scan if patient demonstrates hemodynamic instability or is toxic-appearing)

Treatment Options (ureteral stones):

Medical Expulsive Therapy (MET)

Indications: ureteral stone <10 mm, pain/nausea well controlled on PO meds, patient tolerating POs, no clinical evidence of sepsis, adequate renal function

Recommendations: alpha receptor antagonist, NSAIDs, prn narcotic pain medication pain medication, stool softeners. Can use pyridium for dysuria and anticholinergics for bothersome urinary frequency.

Follow up: Renal ultrasound/KUB within 4 weeks

Indications for Intervention: worsening colic, persistent obstruction, infection

Surgical Intervention

Indications: **Emergent ureteral stent or nephrostomy tube** – hemodynamic instability with infection, anuric renal failure due to obstruction with electrolyte abnormalities (e.g. solitary kidney, bilateral obstruction)
Urgent ureteral stent or nephrostomy tube– fever without signs of hemodynamic instability, obstruction with rising creatinine
Non-urgent – may do primary ureteroscopy or stent followed by ureteroscopy in these cases – cannot take adequate PO intake due to nausea, stone > 10 mm, stone < 10 mm that fails to pass with MET within 4-6 weeks

Definitive Treatment: shockwave lithotripsy (SWL), ureteroscopy with stone extraction or laser lithotripsy, percutaneous nephrolithotomy

Patients with bacteriuria or other signs of infection should be treated with an appropriate course of antibiotics (usually 5-7 days) prior to treatment of the stone.

Management of patients with fever and ureteral obstruction (risk for sepsis)

- Notify Senior resident/attending immediately
- Make NPO
- Two large bore, peripheral IVs, foley catheter, telemetry
- STAT urine culture, blood cultures, CBC, chemistry, PT/PTT, HCG

-Emergent/urgent OR for ureteral stent placement vs. IR for percutaneous nephrostomy tube.
Patient may need ICU bed following procedure.

-Consent and mark patient if going to OR

*If patient is very unstable, ureteral catheters can be placed at the bedside via flexible cystoscopy (rare).

Erectile Dysfunction

Joseph W. McQuaid, MD

As defined by the 1993 NIH Consensus Development Panel on Impotence, erectile dysfunction (ED) is defined as: “The inability of the male to achieve and maintain erection of the penis to permit satisfactory sexual intercourse”. According to the Massachusetts Male Aging Study, 50% of men aged 40-70 demonstrated some degree of ED. While this study has been criticized for overestimating these numbers, this is a disease that is commonly encountered in any medical practice and warrants a basic working knowledge, regardless of the medical specialty one eventually chooses.

Physiology of Erection and Ejaculation

Sexual activity is initiated by the central nervous system at the level of the hypothalamus. Descending parasympathetic and sympathetic pathways exit the brain, traveling through the spinal cord to exit at the level of S2-4 (parasympathetic) and T10-L3 (sympathetic) respectively. In order to initiate an erection, i.e. to generate tumescence of the two corpora cavernosa and single corpus spongiosum, two major processes must occur. In the first, blood supply to the penis actively increases roughly 20-40 fold compared with baseline. Penile blood volume increases, the penis grows, and intercavernosal pressures rise. As a consequence of this, a second more passive process occurs, as venous outflow from the corpora is limited by compression of venules that typically allow for egress of blood in the flaccid state. The rapidly expanding corpora cavernosa occlude these venules during erection, thereby limiting such egress, trapping blood, and maintaining an erection. The aforementioned parasympathetic nerves provide the inciting stimulant in this cascade, as they release nitric oxide from their nerve endings. This in turn results in cavernosal arterial smooth muscle relaxation through a cascade dependent upon increased cyclic GMP, decreased intracellular calcium, and decreased muscular tone. Notably after a coordination of psychic and physical coordination, climax and ejaculation are achieved. Sympathetic tone increases, resulting in a contraction of the bladder neck (preventing retrograde ejaculation) and rhythmic muscular contraction of the bulbocavernosus and bulbospongiosus muscles with resulting emission of semen.

Etiology of Erectile Dysfunction

As can be deduced from the physiology, there are multiple etiologies that must be considered in a patient with ED. These include *psychogenic*, *drug induced* (pay attention to antihypertensives and antidepressants including SSRIs), *anatomic* (including Peyronie’s

disease), *hormonal* (i.e. hypogonadism), *neurogenic* (secondary to any injury of peripheral nerves not limited to prior prostatectomy, diabetes mellitus, multiple sclerosis, or spinal cord injury), *veno-occlusive dysfunction a.k.a. venous leak* (an inability to trap blood within the corpus cavernosa), and *arteriogenic* (secondary to inadequate arterial relaxation or pressures as a result of atherosclerotic disease or trauma).

Evaluation and Work-Up

Treatment must be goal-oriented, with emphasis on restoring “satisfactory” sexual activity. Therefore, evaluation should be tailored accordingly; however, there are several basic studies that should be considered in most patients. This includes a thorough medical history (including surgical, psychological, social, trauma, and medication history) as well a thorough sexual history (including onset and duration of ED, maximal rigidity, sustaining and penetrating capabilities, morning erections, erections with masturbation, frequency of intercourse, libido, ejaculatory dysfunction, orgasmic dysfunction, ability to achieve satisfactory sexual activity, penile curvature, performance anxiety, depression, and stress). An IIEF questionnaire may be helpful to documenting and quantifying some of these components. Special mention should be made to cardiovascular risk. Not all patients presenting to a urology practice may not have adequate primary care. At the very least a discussion and referral to a PCP is in order for a patient with multiple risk factors for CAD. Ideally, a work-up can be initiated by the urologist including a CBC, lipid panel, and fasting blood sugar. Similarly for patients previously diagnosed with CAD, attention should be paid to whether the patient can tolerate the physical rigor (3-5 MET) of sexual intercourse after his ED is addressed. There are several questionnaires available to answer this question.

Routinely, patients undergo a basic endocrine evaluation during evaluation for ED including a morning testosterone (to account for diurnal variations). If this is low, further tests may be initiated including a prolactin level, LH, FSH, and repeat T. At this point, depending upon the suspected etiology of a patient’s complaints, several specialized tests may be considered including nocturnal penile tumescence and rigidity (NPTR, to distinguish between psychogenic ED from organic causes), intravascular injection with papaverine or prostaglandin E1 (to rule out veno-occlusive disease), cavernosometry and cavernosography (to detect a cavernosal leak and resulting veno-occlusive disease), and penile arteriography (to detect arteriogenic causes).

Treatment for ED

Remember, prior to recommending therapy and sexual intercourse, patients must be cleared from a cardiovascular perspective. Once this has been completed, several therapies may be discussed. Note that this includes generalized therapy. Hormonal, severe arteriogenic, veno-occlusive, and anatomic etiologies require specialized treatments unto themselves that are beyond the scope of this introduction.

Therapy	Comments
General Recommendations	Avoid smoking, maintain an ideal body weight, stop alcohol abuse, discontinue offending

	medications, optimize CAD risks.
Sex Therapy	Organic therapies may be trialed in combination with a sex therapist's recommendations.
Phosphodiesterase Inhibitors (PDE5-I)	First line therapy unless contraindicated (i.e. taking nitrates or nitric oxide donors). Inhibit the breakdown of cGMP and thereby maintain low levels of intracellular calcium, relaxed arterial tone, and improved arterial inflow. Success rates are 70-80% however do require stimulation i.e. these drugs sustain an erection but do not stimulate.
Intracavernosal Injections	Patients will inject Aloprostadiol, a.k.a. PGE1, into the cavernosa, resulting in increased cAMP levels and decreased calcium in the smooth muscle. This may be packaged with other agents in a so-called "Tri-mix".
Intraurethral Aloprostadiol (MUSE)	Similar in action to the intracavernosal injections however this is less invasive. Downside is decreased efficacy.
Vacuum Constriction Devices	Instead of increasing arterial inflow, a pump is placed over the penis and actually draws blood retrograde into the corpora via the venous sinuses. Thereafter, a clamp is placed around the base of the penis to maintain rigidity during intercourse. This is very safe but has a high drop-out rate.
Penile Implants	Definitive surgical management with high efficacy but potential complications and need for general anesthesia.

Benign Prostatic Hyperplasia (BPH)

Scott Gabrielsen MD/PhD

AUA guideline available at: <https://www.auanet.org/education/guidelines/benign-prostatic-hyperplasia.cfm>

Definition

BPH is enlargement of the prostate due to hyperplasia of smooth muscle and epithelial cells within the transition zone. Prostate growth is driven primarily by dihydrotestosterone (DHT) and less by testosterone. Tone of the prostatic smooth muscle is regulated by α_{1A} -adrenergic receptors. Lower urinary tract symptoms (LUTS) secondary to BPH can be related to storage (frequency, urgency, incontinence and nocturia) or voiding (hesitancy, straining, intermittency/weak stream, dysuria and incomplete emptying). Note, however, that prostate

size does not correlate well with symptoms. Bladder outlet obstruction secondary to BPH can lead to gross hematuria, acute/chronic urinary retention, renal insufficiency, recurrent UTI and bladder stones.

Evaluation

Evaluation and treatment of BPH is generally reserved for patients with bothersome LUTS. Diagnostic evaluation is primarily to rule out other less benign causes (e.g., prostate or bladder cancer, neurologic disease, urethral stricture, etc.). Basic evaluation includes relevant medical history including assessment of LUTS and severity and bother of the LUTS. Physical examination should include a DRE. Laboratory evaluation should include a urinalysis and serum PSA. Further evaluation is reserved for complicated LUTS (hematuria, elevated PSA, pain, infection, palpable bladder and neurologic disease).

Treatment

Treatment of LUTS consists of conservative therapy, medical therapy and surgical therapy.

- Conservative therapy includes adjusting medications (avoiding, α -adrenergic agonists, anticholinergics, diuretics), adjusting fluid intake, lifestyle changes (weight loss, exercise), dietary changes (avoiding caffeine, alcohol).
- Medical therapy is the main first line treatment of LUTS secondary to BPH. Medications include α -adrenergic receptor blockers, 5 α reductase inhibitors, anticholinergics, PDE5 inhibitors, and combinations of these medications. Note, the AUA does not recommend any complementary or alternative medicines.
 - α -adrenergic receptor blockers decrease smooth muscle tone in the prostate. The onset is rapid (24-48 hours). Side effects include orthostatic hypotension, dizziness and retrograde ejaculation. Newer agents (e.g., tamsulosin, silodosin) are more selective and have lower risks of orthostatic hypotension.
 - 5 α reductase inhibitors block conversion of testosterone to DHT and result in decrease in prostate size. Full effect takes several months up to 1 year. Side effects include gynecomastia, erectile dysfunction and decreased libido. Note that these medications will decrease PSA by around 50%, so it is important to get a baseline PSA prior to initiating therapy.
 - Anticholinergics decrease LUTS (particularly irritative LUTS) secondary to overactive bladder. Low risk of urinary retention if PVRs are low prior to initiating therapy. Full effect takes up to 12 weeks. Side effects include constipation, dry mouth, blurry vision and urinary retention.

Indications for surgical intervention

- Renal insufficiency secondary to BPH
- Recurrent UTIs, bladder stones or gross hematuria due to BPH
- LUTS refractory to other therapies

Options for surgical intervention

- Minimally invasive techniques (Transurethral needle ablation (TUNA), Transurethral microwave thermotherapy (TUMT))
- Laser therapies (Photoselective vaporization of the prostate (PVP)*, holmium laser resection (HoLRP)/enucleation (HoLEP)/ablation (HoLAP), holmium laser ablation (HoLAP))
- Transurethral incision (TUIP)/vaporization (TUVP)/resection (TURP) of the prostate
- Open, laparoscopic or robotic prostatectomy*

Commonly Used α -Adrenergic Receptor Antagonists				
Name	Selectivity	Requires Titration	Adult Starting Dose	Maximum Daily Dose
Terazosin	Non-selective	Yes	1 mg PO qHS	10 mg
Doxazosin IR	Non-selective	Yes	1 mg PO qD	8 mg
Doxazosin ER	Non-selective	Maybe	4 mg PO qD (before breakfast)	8 mg
Alfuzosin	Non-selective	No	10 mg PO qD (after meal)	10 mg
Tamsulosin	α -1A selective	Maybe	0.4 mg PO qD (after meal)	0.8 mg
Silodosin	α -1A selective	No	8 mg PO qD (w/ meal)	8 mg
Commonly Used 5 α -Reductase Inhibitors				
Finasteride	Type 2 5 α -reductase	No	5 mg PO qD	5 mg
Dutasteride	Type 1 & 2 5 α -reductase	No	0.5 mg PO qD	0.5 mg

Evaluation of Scrotal Masses

Russell Hayden, MD

Focused History

- Onset/Duration – When was the mass first noticed? Has any work-up been done already by an outside provider? Check for prior scrotal ultrasounds in the medical record.
- Infectious – Epididymo-orchitis is common. Ask about pain, redness, and warmth. Any history of fevers or UTI symptoms (dysuria, frequency, urgency)? Risk factors include high risk sexual practices, recent instrumentation, or prior history of epididymo-orchitis.
- Trauma – Be wary of any history of trauma. Many patients first notice their chronic scrotal mass after a strike to the groin. Usually there is some component of denial.

- Neoplastic – Risk factors for testis cancer include cryptorchidism (patients sometimes don't realize they had this as an infant), family or personal history of testis cancer (lymphoma as well), and infertility.
- Social history – Ask about marijuana use, as this may increase beta-HCG levels (which you may ultimately send if testis cancer is suspected)
- Surgical history – Any scrotal surgeries in the past (vasectomy, orchidopexy, hydrocelectomy)?

Focused Exam

- Non-scrotal findings – Check for gynecomastia, abdominal masses (retroperitoneal masses), flank pain (ureteral obstruction), and lymph nodes (supraclavicular, groin). Very large retroperitoneal masses may obstruct venous/lymphatic return from the lower extremities.
- Scrotal findings (a warming pack may help loosen the scrotum to facilitate the exam) – Is there overlying erythema or warmth? Any hydrocele (use transillumination)? Palpate the cord and epididymis (check for induration, tenderness). Carefully palpate the testis for any masses. Note that the epididymis will feel like a “worm” over the posterior aspect, and can sometimes be confused for a mass by patients. Examine the scrotum with the patient standing as well – varicoceles will become more apparent. Also have the patient bear down in order to increase vascular pressure. RIGHT varicoceles should raise concern for a retroperitoneal mass (compression of venous return) and mandates retroperitoneal imaging. Examine for surgical scars keeping in mind that these can be hard to see.
- Careful hernia exam: Sometimes people will mistake an inguinal hernia for a “testicular mass”.

Work-up

- Scrotal ultrasound – The testis is best studied with ultrasound. Be sure to order doppler studies to assess for low blood flow (torsion), or hyperemia (infection).
- CT abdomen/pelvis – The lymphatic drainage of the testis follows its embryologic descent. Thus, metastases and lymphadenopathy will first occur in the retroperitoneum. However, if the patient has a history of scrotal surgery the lymphatic drainage may be aberrant with a theoretical risk of spread to the external inguinal nodes (and should be palpated). Remember, patients with a RIGHT varicocele should have retroperitoneal imaging.
- Biomarkers – If testis cancer is of concern, send biomarkers to begin the work-up (beta-HCG, AFP, and LDH). Common factors that may increase biomarkers artificially: marijuana use, other malignancies (liver, pancreatic, gastric, and lung), or liver dysfunction

Urinary tract infection (UTI) refers to an infection of the urinary system. There are an estimate 150 million UTIs yearly worldwide, the majority of which manifest as uncomplicated bacterial cystitis and occur mainly in females.

Definitions

Uncomplicated UTI – a non-complicated UTI in a female with a normal GU tract

Complicated UTI – a UTI in a patient with any of the following criteria:

- Immunocompromised (e.g., diabetes mellitus, HIV, on steroids or chemotherapy)
- Pregnant
- Male
- Pediatric
- Indwelling urinary catheter, stent, or drain
- Abnormal GU tract (BPH, stone, bladder diverticulum, neurogenic bladder, vesicoureteral reflux)
- Renal insufficiency

Risk factors for UTIs

- Reduced urine flow: outflow obstruction, BPH, prostatic carcinoma, urethral stricture, foreign body (calculus); neurogenic bladder; inadequate fluid uptake
- Promote colonization: sexual activity (increased inoculation), spermicide (increased binding), estrogen depletion (increased binding), antimicrobial agents (decreased indigenous flora)
- Facilitate Ascent: catheterization, urinary incontinence, residual urine with ischemia of bladder wall

Common causative pathogens in adult UTIs: *E. Coli* (80% of outpatient UTIs), *Klebsiella*; *Enterobacter*, *Proteus*, *Pseudomonas*, *Staphylococcus saprophyticus* (5 - 15%), *Enterococcus*, *Candida*, *Adenovirus type 11*

Diagnosis of UTI

- *Clinical symptoms.* The most common form of UTI is cystitis (bladder infection) characterized by irritative symptoms such as urinary urgency, frequency, dysuria, as well as hematuria, foul-smelling urine, and suprapubic pain. These symptoms are also typical for urethritis and prostatitis in addition to cystitis. Symptoms associated with "upper urinary tract" infections, exemplified by pyelonephritis, may include those typical of cystitis, as well as fever, rigors, flank or abdominal pain, and nausea and vomiting.
- *Collection method.* Analysis of the urine is critical in determining the likelihood of infection. The method of urine collection is important to distinguish between

contamination and true infection. There are 3 commonly used methods of collection: a) clean catch midstream voided urine, b) catheterized urine and c) suprapubically aspirated urine. The most variable of these three is the midstream voided urine, especially in females, where contamination of urine by vaginal or perineal organisms is common during collection. Voided urines that are sterile or contain high colony counts (>100,000) of a single bacteria correlate well with urine obtained by other methods.

- *Urinalysis.* A positive chemical (dipstick) leukocyte esterase is 64 - 90% specific and has a similar level of sensitivity for UTI. The finding of nitrite positivity on urine dipstick, indicating the conversion of nitrate to nitrite by gram negative bacteria (not gram positive), is very specific but only about 50% sensitive for a urinary tract infection. The finding of elevated white blood cells in the urine (pyuria) is the most sensitive indicator of infection (>10 WBC/hpf on spun specimen is 95% sensitive but much less specific for a UTI).
- *Quantitative urine culture.* In general, > 100K colonies/mL on urine culture is diagnostic for UTI. However, the probability of a UTI does depends on the method of collection. In general, lower colony counts obtained by sterile urethral catheterization or by suprapubic aspiration can represent true infection, but clean catch, mid-stream urine that harbors < 100K colonies/mL in a female requires further verification or repeat sampling to confirm a UTI.
- *Imaging.* Patients with uncomplicated cystitis or uncomplicated pyelonephritis generally do not benefit from imaging studies to look for anatomic abnormalities. In patients who do not respond to treatment, or in patients with predisposing factors, imaging with kidney and bladder ultrasound, or a non-contrast CT scan of the abdomen and pelvis may be useful. Cystoscopic or ureteroscopic evaluation of the urinary tract is not typically performed with uncomplicated UTI or pyelonephritis.
- *Differential Diagnosis.* Other pathogens, processes and conditions that can cause symptoms that mimic UTI include:
Herpes genitalis (HSV), Urethritis, N. Gonorrhoeae, Chlamydia, Trichomonas, Vaginitis, Prostatitis, Nephrolithiasis, Trauma, GU tuberculosis, GU neoplasm, Intra-abdominal abscess, Sepsis from non-GU source

Management of UTI

- Treatment is based upon pathogen identification and the type and degree of clinical illness, and presence or absence of other predisposing host factors. In general, the treatment consists of hydration, relief of urinary tract obstruction, removal of foreign body or catheter if feasible, and judicious use of antibiotics.
- The type and duration of antibiotic treatment is dependent on site of infection (if known), host factors and severity of illness. Most antibiotics are highly concentrated in the urine and therefore are very effective at clearing bacteria from the urinary tract.

When considering treatment, first determine whether the UTI is complicated or uncomplicated in nature.

Uncomplicated UTI (cystitis, some pyelonephritis):

- 3 day course of oral TMP/SMX is 95% effective; 7 days is no more effective.
- If TMP/SMX resistance is > 10 - 20% (U.S. West coast, Europe), use fluoroquinolones.
- Higher percentages of resistance to TMP/SMX also implies possible resistance to ampicillin, cephalosporins, tetracycline.

Other uncomplicated UTI:

- A full 7 - 10 day antibiotic course should be used in patients with: diabetes, symptom duration before treatment of > 7 days, pregnancy, age >65 years, or past history of pyelonephritis or UTI with resistant organisms

Complicated UTI (acute pyelonephritis):

- Empiric parenteral treatment after culture with:
Ampicillin plus aminoglycoside or Ampicillin/ Vancomycin (for beta-lactam allergy) plus aminoglycoside or third-generation cephalosporin (if no enterococcus)
- Adjust antibiotics according to culture results
- Blood cultures positive in 20 - 40% of patients
- Switch from parenteral to oral therapy at 48 hours after clinically well
- Treat for 14 days.

Acute pyelonephritis with intrarenal, perirenal or pararenal abscess

- Treatment for complicated UTI and add appropriate drainage.

Epididymitis

- TMP/SMX or fluoroquinolones for at least 3 weeks to obtain adequate tissue levels.

Acute bacterial prostatitis

- TMP/SMX or fluoroquinolones for at least 4 weeks to obtain adequate tissue levels

Chronic bacterial prostatitis

- TMP/SMX or fluoroquinolones for 6 - 12 weeks.

Re-infection

- A test of cure should be undertaken by repeat culture in pregnancy, pyelonephritis, and complicated or relapsing UTI.
- Re-infection is the relatively rapid recurrence of a UTI with the same or different organism after cure has been documented.
- Each infectious episode should be treated separately.
- Consider 6 - 12 months of antibiotic prophylaxis (once a day oral intake of TMP/SMX or nitrofurantoin at 1/3 to 1/2 of a daily treatment dose)
- For patients with recurrent cystitis related to coitus, consider self-administered single-dose antibiotics post-coital treatment.

Relapsing infection

- Failure to clear or completely eradicate the pathogen despite a reasonable treatment course

- Should trigger a urologic investigation that includes imaging to define possible anatomical causes and prolonged therapy in the meantime.

Asymptomatic bacteriuria

- Generally, does not need treatment, except in pregnancy.
- Treatment is not indicated in the elderly (20 - 40% incidence) and patients on catheterization (90% incidence).

UROLOGIC ONCOLOGY

Epidemiology, risk factors, and clinical presentation

- Approximately 64,000 people are diagnosed with kidney tumors on an annual basis: 39,140 cases in men and 24,780 cases in women, resulting in about 13,860 deaths annually according to the American Cancer Society.
- Renal-Cell Carcinoma is the most common malignant kidney cancer in the adult population, while Wilms Tumor is the most common kidney malignancy in the pediatric age group.
- Renal-Cell Carcinoma represents 2% of adult cancers. Despite new treatments for advanced (metastatic) kidney cancer, approximately 40% of patients may eventually die from this disease.
- The average age at diagnosis is 64 years old. The lifetime risk of developing a kidney cancer is 1.6% or 1 out of 63 people.
- Risk factors for developing kidney cancer include smoking, obesity as well as genetic syndromes such as VHL or hereditary papillary RCC.
- Symptoms may include hematuria, flank pain or palpable mass; although the majority present asymptomatic.
- Prior to the development of cross-sectional imaging, the majority of patients were diagnosed by symptoms of flank pain or hematuria or mass on clinical examination. Now the majority are diagnosed as incidental findings during imaging.

Diagnosis

- With the widespread use of radiologic imaging, CAT scan, MRI and ultrasound, the detection of kidney lesions has risen significantly. I prefer the word lesion as this includes both solid masses and cysts.
- The diagnostic challenge for the physicians is to determine whether a lesion is a malignant vs. benign anatomic structure (i.e. simple cyst) vs. benign tumor (i.e. AML) vs. an inflammatory lesion that gives the appearance of a malignant tumor. The role of needle biopsy for renal masses is currently not well defined.
- The evaluation of a patient with a kidney mass usually includes a Renal Mass Protocol/ Abd CAT scan. If a solid mass is detected further, imaging of the chest with CXR or chest CAT scan is performed to evaluate for metastatic disease to the lungs. Brain imaging is limited to patients with new CNS symptoms/findings. New focal bone pain is evaluated with MRI as bone scans are often not helpful as the metastasis are usually lytic and do not show up well on a bone scan.

Consideration for renal mass biopsy

- Small renal masses ≤ 3 cm due as 25% may be benign

- Renal mass in setting of other primary malignancy
- Suspected lymphoma
- Confirm malignancy prior to nephrectomy in patients with poor renal function
- Confirm malignancy in patients that are high risk surgical candidates
- Atypical/inflammatory masses which may be secondary to systemic process

Stages of kidney cancer

- Stage I: Malignant mass ≤ 7 cm, confined to the kidney
- Stage II: Masses >7 cm, confined to the kidney
- Stage III: Mass any size in kidney and
 - 1 or more regional lymph nodes or
 - Invasion into perinephric fat or
 - Involvement of venous system
- Stage IV: Mass any size in kidney and
 - Spread to other organs
 - Invasion beyond perinephric fat

Management options for malignant renal masses:

Size	Surveillance	Biopsy prior to Treatment	Thermal Ablation	Surgery: Partial Nephrectomy	Surgery: Total Nephrectomy
1 cm	✓	✓	✓	✓	
2 cm	✓	✓	✓	✓	
3 cm	✓*	✓	✓	✓	
4 cm		+ / -	✓	✓	+ / -
5 cm				✓	✓
6 cm				✓	✓
7 cm				✓	✓
8 cm					✓
9 cm					✓
10 cm					✓

*If serious comorbidities

Basic facts regarding the size of renal masses

- Solid Masses ≤ 3 cm:
 - 75% malignant
 - 25% benign
- Solid Masses > 4 cm:
 - 90% malignant
 - 10% benign
- Risk of metastasis small for masses ≤ 3 cm

- Risk of metastasis increases with increasing size of renal mass
- Solid Masses that contain fat are most likely to be an AML (Angiomyolipoma)

Surgical management

Surgery is the primary treatment modality for RCC. The following are the types of surgery that can be performed depending on size, location, and extension of the tumor.

- Radical Nephrectomy - Done for large tumors. Surgical techniques include open, laparoscopic, hand assisted laparoscopic, robotic.
- Partial Nephrectomy: Done for smaller tumors. Depends on size and location of the tumor.
 - Benefit - renal preservation
 - Risks - delayed bleeding, urinary fistula/leaks
- Percutaneous thermal ablation: heat RFA or cold cryoablation. Done for small tumors < 4 cm. Peripheral location, away from ureter. Elderly patients, high risk surgical candidates, serious comorbidities.

Facts regarding benign renal tumors

Benign renal tumors are also quite prevalent and often detected incidentally on imaging. Approximately 25% of solid masses under 3 cm are benign. Benign renal masses are often followed with imaging by yearly renal ultra sound

- Angiomyolipomas (AML) – these lesions are very common. These tumors are composed of vascular, muscle and fatty components. 80% are sporadic. Average age of diagnosis is early 40's and female: male ratio of 4:1. 20% occur with the genetic syndromes most commonly tuberous sclerosis. When associated with tuberous sclerosis the tumors are diagnosed at a young age often large and multiple. AML's may present as an imaging finding of fat within a renal mass. Some present clinically secondary to renal hemorrhage secondary to their predisposition to bleeding.
 - Management of asymptomatic AML's < 4cm is now usually active surveillance. I obtain annual renal U/S after initial diagnosis. AML's greater than 4 cm or AML's which have had a bleed are usually managed with angioembolization.
 - Percutaneous Ablation or surgeries are being utilized much less in the management of AML as both imaging and angioembolization has improved.
- Renal adenoma - small benign growths
- Oncocytoma - may grow to large size, some have a central scar others are indistinguishable from RCC.
- Fibroma - originate from fibrous capsule more common in females.
- Lipoma - originate from fat within the kidney
- Metanephric Adenoma: occasionally seen in association with polycythemia

Renal Cysts

Renal Cysts are the most common kidney lesions.

- Fluid density on CAT scan
- Occur in approximately 50% of adults over age 50
- Usually asymptomatic
- Most do not require treatment as the majority of renal cysts are benign
- Very large cysts may be symptomatic
- Dr. Bosniak developed a classification system based on anatomic appearance of the cyst that has been used clinically to determine risk of malignancy.

Type	Characteristics	Risk of malignancy	Management
I	Simple thin wall no enhancement	< 2%	Observation
II	Above plus may have a few thin wall septa which do not enhance fine calcifications are okay	14%	Observation
IIIF	Above plus multiple non-enhancing septa some septa are thickened but do not enhance calcifications ok	14-24%	Active surveillance w/ repeat imaging
III	Thick walls/ septa which enhance	50%	Surgical or Thermal Ablation
IV	Above plus enhancing masses	90%	Surgical or Thermal Ablation

Upper tract urothelial carcinoma

Aria F. Olumi, MD

Introduction

Upper tract urothelial carcinoma (UTUC) is a rare disease with approximately 3000 new cases per year in the United States. Much like urothelial cancer of the bladder (UCB), UTUC is heterogeneous with significant variability in disease characteristics and patient outcomes. Approximately 90% of tumors originating from the upper urinary tract are urothelial in origin while the majority of the remaining 10% are squamous cell carcinomas.

Epidemiology/risk factors

The incidence of UTUC is rising, and there is a concurrent shift towards earlier stage disease. UTUC is more common in men, whites and at older ages with a mean age at diagnosis in the mid-70s. Approximately 50% of patients with UTUC will develop UCB in their lifetime, whether these bladder tumors represent 'drop metastases' from the upper urinary tract or develop *de novo* from a pan-urothelial field defect is unclear. In contrast, patients with an initial diagnosis of UCB have about a 5-20% lifetime chance of developing UTUC. Both UCB and UTUC patients require periodic surveillance of both their upper urinary tract (kidneys and ureters) and lower urinary tract (bladder and urethra). Smoking is the most significant modifiable risk factor.

Clinical presentation/evaluation

Most patients present with hematuria and/or flank pain. Rarely, a flank mass is palpable on physical exam. Frequently, a CT urogram (with delayed films to evaluate the renal pelvis and ureters) is performed to identify the tumor. Ureteroscopic biopsy is required to obtain a tissue diagnosis. The location of the tumor (distal ureter is the most common site), tumor grade, tumor stage, focality and the presence of concomitant bladder tumors all have a dramatic impact on treatment strategies. Local primary tumor stage is difficult to accurately assess both radiographically and endoscopically. If the tumor is high grade, large or locally advanced, a full metastatic workup including chest and abdomen/pelvis imaging as well as possibly a bone scan are required.

Staging

Primary Tumor (T)	
Tx	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma in situ
Ta	Papillary non-invasive carcinoma
T1	Tumor invades subepithelial connective tissue
T2	Tumor invades the muscularis
T3	Tumor invades the periureteric fat, peripelvic fat or renal parenchyma
T4	Tumor invades adjacent organs or into the perinephric fat
Regional Lymph Nodes (N)	
Nx	Regional nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single lymph node, <2cm in greatest diameter
N2	Metastasis in a single lymph node between 2-5cm in diameter, or multiple lymph nodes < 5cm in diameter
N3	Metastasis in a lymph node > 5cm in diameter

Distant Metastasis (M)	
Mx	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

Treatment of localized disease

Surgical excision is the standard of care in localized UTUC. Nephroureterectomy (excision of the entire kidney and ipsilateral ureter with a cuff of bladder mucosa) is the gold standard for most UTUC patients. Distal ureterectomy with ureteral reimplantation can be considered for some distal ureteral tumors, especially locally confined, low grade carcinomas. Endoscopic ablation/resection, either ureteroscopic for ureteral tumors or percutaneous ureteropyeloscopic resection for large renal pelvis or proximal ureteral tumors, can be considered in either small, low grade tumors or when nephroureterectomy would cause significant renal dysfunction such as patients with a solitary kidney, bilateral UTUC or severe pre-existing chronic renal disease.

The integration of systemic chemotherapy, and the role of lymphadenectomy are two ongoing clinical dilemmas in the treatment of locally advanced UTUC. Many patients are ineligible for cis-platinum based chemotherapy after nephroureterectomy which favors neoadjuvant chemotherapy administration⁷. However, the lack of clinical trials supporting the use of neoadjuvant chemotherapy for UTUC limits its use, as does the ability to properly 'stage' UTUC prior to surgery. Lymphadenectomy plays an important role in assessing the extent of disease but there is limited data to suggest that this offers a survival advantage⁸. Further the lymphatic drainage of UTUC has not been rigorously defined.

Treatment of metastatic disease

Metastatic disease is treated with systemic chemotherapy. First line therapies include GC (gemcitabine and cis-platinum) or MVAC (methotrexate, vinblastine, adriamycin and cis-platinum)

Prognosis

Metastatic disease is almost uniformly fatal. In the non-metastatic setting, the extent of local disease has dramatic impact on survival. The 5 year cancer specific survival after nephroureterectomy for locally confined disease is >90% for T0-T1, ~75% for T2, ~50% for T3 and ~10% for T4. There does not appear to be a significant difference in outcomes based on the location of the primary tumor (renal pelvis vs ureter).

Epidemiology/risk factors/clinical presentation

The epithelial lining comprising the renal pelvis, ureter, bladder and proximal urethra is from transitional cell epithelium. Transitional cell carcinomas (TCC) comprises more than 90% of all urothelial cancers in the United States. Adenocarcinoma (2%), squamous cell carcinoma (5-10%), undifferentiated carcinomas (2%) and mixed carcinomas (4-6%) are other types of urothelial malignancies. TCC commonly appear as papillary and exophytic lesions.

Cancer of the bladder is the fourth most common cancer in men and the tenth in women. More than 56,000 people (41,500 males and 15,000 females) develop bladder cancer each year in the United States, and 12,600 die from the disease.

The surface epithelium (urothelium) that lines the mucosal surfaces of the entire urinary tract is exposed to potential carcinogens that may be excreted in the urine, or activated in the urine by hydrolyzing enzymes. Environmental exposures are thought to account for most cases of bladder cancer. For example, a link between environmental factors and TCC of the urothelium was first suggested in industrialized societies and urban dwellers. Secondly, increased incidence of renal pelvis and bladder cancer has been reported in aniline dye workers.

Exposure to chemicals used in the aluminum, dye, paint, petroleum, rubber, and textile industries have been estimated to account for up to 20 percent of all bladder cancer cases. Hairdressers and barbers have an excess risk of bladder cancer that is thought to be related to long-term exposure to permanent hair dyes. In most cases, the suspect carcinogens are arylamines or their derivatives that take several years to accumulate, thus accounting for the long latency period before the development of bladder cancer.

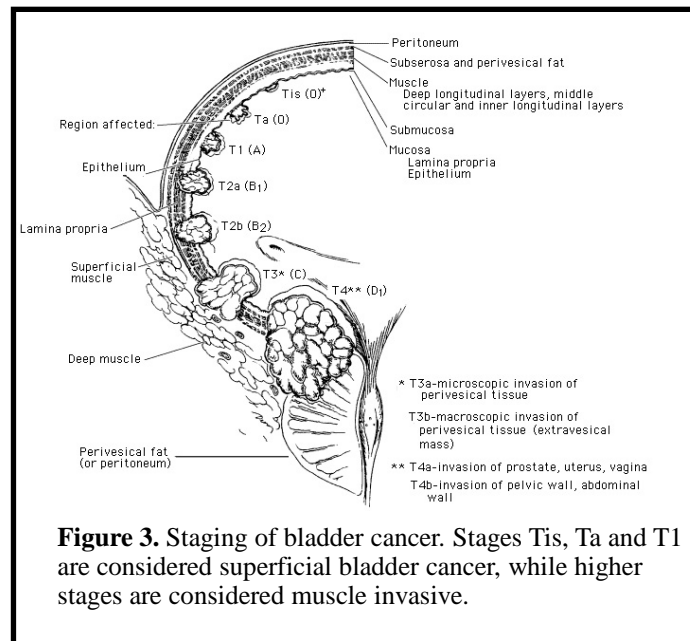


Figure 3. Staging of bladder cancer. Stages Tis, Ta and T1 are considered superficial bladder cancer, while higher stages are considered muscle invasive.

Clinical manifestation of urothelial carcinoma includes gross or microscopic hematuria, which is the most common symptom at the time of presentation, occurring in 70 to 95 percent of patients. For renal pelvis and ureteral malignancies flank pain occurs in 8 to 40 percent, may be precipitated by obstruction of the ureter or ureteropelvic junction due to the tumor mass.

Bladder irritation, or constitutional symptoms, occurs in less than 10 percent urothelial malignancies.

In patients with renal pelvis or ureteral tumor diagnosis is commonly made by radiologic modalities that may include CT scan, IVP, or retrograde pyelography. Ureteroscopy has been used for confirming any upper urinary tract malignancies when radiologic modalities are not confirmatory. Cystoscopy is the main procedure used for diagnosing bladder carcinoma (Fig. 2).

Staging of urothelial malignancy is dependent on the depth of invasion of the tumor through the submucosal musculature or adjacent organs. Figure 3 demonstrates the staging system most commonly used for bladder carcinoma. More than 70% of all newly diagnosed bladder cancers are superficial, approximately 50-70% are Ta, 20-30% are T1, and 10% are carcinoma in situ (CIS).

The standard treatment for renal pelvis and upper ureteral urothelial carcinomas includes complete nephroureterectomy with excision of the distal ureteral cuff from the bladder. Distal ureteral tumors can be treated with segmental resection followed by reimplantation of the remainder of the ureter into the bladder. The initial treatment options for bladder carcinoma are dictated by the tumor stage, grade, size and number of tumors detected. In general, low grade, superficial tumors are treated by transurethral resection of bladder tumor (TURBT) – an endoscopic minimally invasive procedure. In some cases, intravesical agents may be used to treat patients with bladder cancer. A commonly used intravesical agent is Bacille Calmette Guérin (BCG), an attenuated strain of *Mycobacterium bovis*, rendered completely avirulent by long-term cultivation on bile-glycero-potato medium, used in BCG vaccine for immunization against tuberculosis. Often used for management of recurrent superficial bladder cancer or multifocal bladder cancer, BCG is introduced intravesically approximately 4 weeks after TURBT allowing for the urothelial lining to heal and minimizing the risk of BCG dissemination, which can lead to severe sepsis. BCG has been shown to induce an MHC-mediated immuno-response against bladder cancer thus reducing the recurrence rate of bladder cancer.

Muscle invasive tumors (stage T2 or higher) are usually treated with radical cystectomy, pelvic node dissection and urinary diversion. In certain circumstances, systemic chemotherapy may be used in the neoadjuvant setting (prior to surgery) or in the adjuvant setting (after surgery).

For urinary diversion, a portion of small and/or large bowel is often used for creation of a urinary reservoir. The most commonly utilized form of urinary diversion is an ileal loop urinary diversion (Fig. 4) – a 15-20 cm segment of the distal ileum is separated from the gastrointestinal tract while keeping the mesenteric blood supply intact. Continuity of GI tract is re-established. The end of the ileal loop is closed and the two ureters are

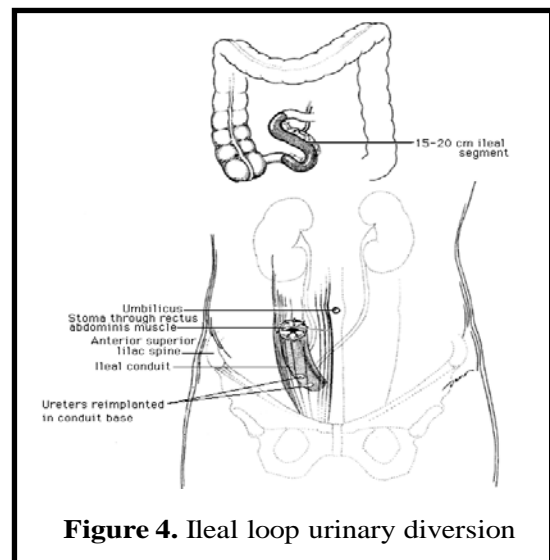


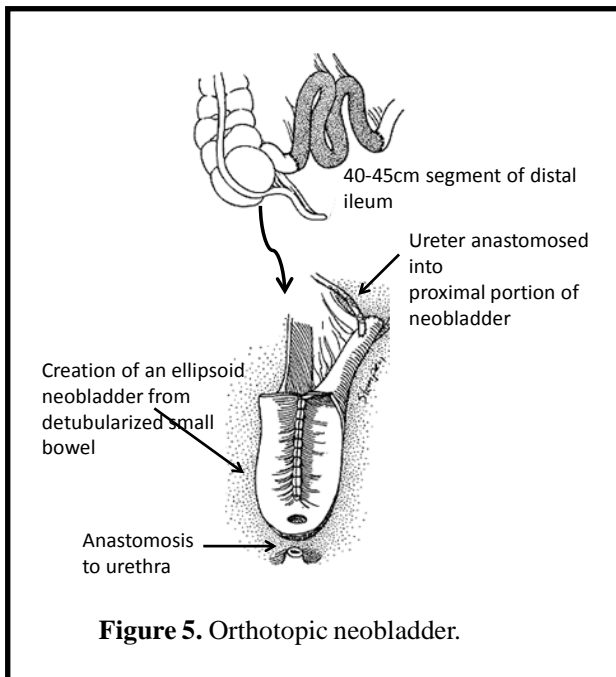
Figure 4. Ileal loop urinary diversion

anastomosed into the proximal portion of the ileal loop. The distal end of the ileal loop is externalized through the abdominal wall and a urinary stoma bag is used to collect the urine.

In contrast to the ileal loop urinary diversion that requires constant drainage of urine into a stoma bag, continent cutaneous urinary reservoirs, which partly utilize the ileo-cecal valve for their continent mechanism, are catheterized four to six times per day to drain the urine and do not require appliance of an abdominal urinary stoma.

Another form of urinary diversion is an orthotopic neobladder (Fig. 5). For this type of urinary diversion, a 40-45 cm segment of bowel is detubularized and restructured in an elliptical form which resembles the shape of a native bladder. The two ureters are anastomosed into the proximal portion of the pouch, while the most dependent portion of the pouch is anastomosed to the urethra in order to create a neobladder. The biggest advantage of a neobladder is the absence of an abdominal urinary stoma for an ileal loop urinary reservoir or the need for

catheterization and drainage for a continent reservoir.



ications after urinary diversion
 excessive bleeding, intestinal
 , urinary extravasation and infection.
 complications include metabolic disorders,
 osteoporosis, pyelonephritis and formation of
 calculi. Metabolic abnormalities associated with
 urinary diversions are dependent on the
 segment of bowel used in the urinary
 diversion. In general when ileum and/or large
 intestine is used for urinary diversion,
 hypochloremic metabolic acidosis may
 occur. The potential complication of chronic
 hypochloremic metabolic acidosis may be decreased
 calcium content and osteomalacia.

D'Amico Prostate Cancer Risk Categories

- | | | | |
|--------|-----|---------------|-----------|
| • Risk | PSA | Gleason Score | TNM Stage |
| • Low | ≤10 | ≤6 | ≤T2a |
| • Int. | 7 | T2b | 10-20 |
| • High | ≥8 | ≥T2c | >20 |

Prostate Cancer: Treatment Options for Localized Disease (T1-2, N0, M0)

- Include radical prostatectomy (RP), external beam radiation (XRT), brachytherapy (+/- XRT), active surveillance, cryotherapy, high frequency ultrasound

Active Surveillance

- Patient-driven form of delayed treatment with active monitoring for disease progression (As opposed to watchful waiting, which does not involve monitoring and is palliative only) -- unclear who is optimal candidate; consider patients with <10 yr life expectancy, organ confined disease, low grade disease, low volume cancer (<3 + biopsy cores, <50% of each core)

Pros: decrease overtreatment of insignificant prostate cancer and avoid side effects of treatment

Cons: may miss window to cure, requires multiple prostate biopsies, no guarantee that tumor is indolent

- *Surveillance protocol:* DRE/PSA every 6 months, prostate biopsy every year, possible prostate MRI
- **When to progress to treatment: Gleason ≥4, ≥3 positive biopsy cores, >50% of a biopsy core is positive**

Radical Prostatectomy

Gold standard for localized prostate cancer for men <75yrs

Common surgical options: open, laparoscopic, robotic assisted

- Pros: potential cure, more accurate staging (direct specimen for pathology)
- Cons: potential side effects (ie, urinary incontinence that usually resolves after 3-6 months, erectile dysfunction early postop if nerves affected), major surgery
- Postop: expect PSA to drop to <0.2 ng/mL
 - If PSA>0.2ng/mL will need to consider radiation therapy and/or androgen deprivation therapy (ADT)
 - If 33% will have biochemical recurrence
 - 50% of post-radical prostatectomy patients with biochemical recurrence will die from prostate cancer
 - median time from post-prostatectomy PSA failure to metastases: 8 years
 - median time from metastases to death: 5 years

Pelvic Lymph Node Dissection

Indicated for patients in the intermediate to high risk categories

External Beam Radiation Therapy (EBRT)

- Treated 5 days per week for approx. 8 weeks
- Intensity Modulated Radiotherapy (IMRT): advanced form of 3D therapy. Uses a computer-driven machine that shapes the beams at different angles.
- Proton Beam: focuses beams of protons instead of XRays. XRays release energy both before and after they hit their target, whereas protons cause little damage to tissues they pass through and release their energy only after traveling a certain distance. Proton beam can, in theory, delivery more radiation to the prostate while doing less damage to nearby normal tissues. Studies have not shown that proton beam is any better in the long run than any other types of radiation.
- Consider adding ADT for intermediate risk (6 months of ADT) or high risk (2-3 years)
- Pros: no surgery needed. Daily radiation treatment is fast.
- Cons: daily treatments for 8 weeks.
- Side Effects: Bowel problems (radiation proctitis) with diarrhea, blood in stool, rectal leakage (usually resolve with time). Bladder problems (radiation cystitis) with frequency, urgency, dysuria, and hematuria (1 in 3 men has longterm urgency or frequency). Urinary incontinence (less common than after prostatectomy). Erection problems and impotence slowly worsens over time and is equivalent to surgery after 3-4 years. Fatigue. Urethral stricture. Lymphedema.
- Post-radiation Recurrence: defined as PSA rise to [PSA nadir +2] (Phoenix criteria)

Brachytherapy

- Permanent seeds (each the size of a grain of rice) implanted in the prostate. Used in men with early stage prostate cancer that is slow growing. Iodine-125 (half-life 60 days) or palladium-103 (half-life 17 days) are used
- Avoid in men with prostate size >60g, history of previous TURP or significant voiding symptoms (they have a higher risk of post-treatment urinary side effects)
- Side effects: lower urinary tract voiding symptoms is common for 4-5 half-lives. Urinary retention. Bowel problems. Erection problems (comparable to EBRT).

Cryoablation

- Active, rapid freeze cycle via Argon and active thaw cycle via Helium. Requires 2 cycles.
- Freezes the entire prostate to -40 degrees C
- Useful for low risk, localized prostate cancer
- Side effects: very high erectile dysfunction rate

High Intensity Focused Ultrasound (HIFU)

- Not yet FDA approved for prostate cancer

Which is Best?

- For men <50yrs old, RP is the treatment of choice (higher 15 yr cancer specific and overall survival)
- For low risk PCA in men ≥ 50 , RP, XRT brachytherapy and cryotherapy appear to have similar cure rates
- For high risk cancer in men ≥ 50 , no significant differences in cure rates between RP alone or XRT alone

Prostate Cancer: Treatment Options for Locally Advanced Disease (T3-4, N0-1, M0)

Include radical prostatectomy (RP), external beam radiation (XRT), androgen deprivation therapy (ADT)

Radical Prostatectomy

- Select patients with clinically, local, advanced prostate cancer (T3) but will likely need adjuvant treatment
- post-prostatectomy findings on pathology of local spread: positive surgical margin, seminal vesical involvement (SVI), extracapsular extension (ECE), lymph node involvement
- adjuvant radiation treatment (immediately after surgery when PSA is < 0.2) is superior to salvage (wait for PSA to rise to > 0.2) if specimen had positive surgical margin, SVI or ECE

Radiotherapy (EBRT)

- Clinically used for T3 disease, although now offering radical prostatectomy as well

Androgen Deprivation Therapy (ADT)

- Not a curative treatment but may offer long term remission
- Early ADT may be beneficial in high risk patients with pT3 disease
- *Intermittent ADT* may be an option in some patients and improve quality of life
- important to prevent osteoporosis when treating with ADT
 - baseline DEXA scan, then every 1-2 years
 - vitamin D, calcium supplementation
 - behavioral changes: smoking cessation, weight bearing exercise
- ADT methods:
 - Gonadotropin-releasing hormone (GnRH) agonist (Leuprolide, Goserelin) - Initial transient androgen elevation, then suppression in 21-28 days. Transient testosterone flare due to initial stimulation of LH. Suppress flare with non-steroidal antiandrogen such as bicalutamide or flutamide). *Side effects*: decreased libido, erectile dysfunction, fatigue, weight gain, hot flashes, loss of muscle mass, gynecomastia, testicular atrophy, diabetes, cardiovascular disease, metabolic syndrome, anemia, bone demineralization
 - GnRH antagonist (Degarelix, Abarelix) - No early flare phenomenon
 - Non-steroidal antiandrogen (bicalutamide, flutamide) - competitively inhibits androgens from binding androgen receptors. Not adequate on their own for

treatment of prostate cancer. Good to suppress the initial 28-day flare phenomenon when starting GnRH agonists. *Side effects:* hepatotoxicity, gynecomastia, breast pain, glucose intolerance, diarrhea, night vision blindness

- Bilateral orchiectomy - castrate levels within 24 hours

Prostate Cancer: Treatment Options for Castrate-Resistant Prostate Cancer (CPRC)

Definition: prostate cancer progression despite adequate testosterone suppression
--continue ADT indefinitely at this point

Prechemotherapy

Sipuleucel-T

- Immunotherapy; autologous CD54+ dendritic cells are activated with recombinant prostate acid phosphatase to stimulate T cell production of cytokines
- Three doses given at 2 week intervals
- *Indication:* asymptomatic or minimally symptomatic CRPC
- *Side Effects:* flu-like symptoms due to cytokine release; acute infusion reactions
- IMPACT Trial: Overall survival 25.8 months (Sipuleucel-T group) vs 21.7 months (control group)

Abiraterone acetate

- CYP 17 inhibitor-->prevents biosynthesis of testosterone (in adrenals, testes and prostate cancer cells)-->decreases overall body androgen levels
- leads to excess aldosterone, which can cause hypokalemia and fluid retention
- also inhibits cortisone synthesis, so need to give prednisone PO daily
- give with prednisone PO daily to supplement
- *Indication:* pre- or post-chemotherapy for metastatic CRPC
- *Side Effects:* HTN, hypokalemia and fluid retention (due to aldosterone excess), adrenal insufficiency, fatigue, edema, hot flashes, GI upset, hepatotoxicity (monitor ALT, AST, bilirubin every 2-4 weeks)

Chemotherapy

Docetaxel

- Taxane; stabilizes microtubules and allows apoptosis that was lost in prostate cancer
- *Drug of choice for metastatic CRPC*
- TAX327 study: superior to mitoxantrone (18.9 months vs 16.4 months overall survival)
- *Side Effects:* myelosuppression, fatigue, neurotoxicity, hyperlacrimation, edema, liver dysfunction

Cabazitaxel

- Taxane
- 2nd line chemotherapy for metastatic CRPC if progresses or fails docetaxel
- TROPIC trial: 15.1 months vs 12.7 months mitoxantrone overall survival
- *Side Effects:* myelosuppression, diarrhea, fatigue, peripheral neuropathy

Mitoxantrone

- chemotherapy to treat symptoms from metastasis; palliative therapy only

Post-chemotherapy

Abiraterone acetate

- Overall survival benefit post chemotherapy vs placebo

Enzalutamide

- Androgen receptor modulator: inhibits androgen binding to androgen receptors, inhibits androgen nuclear receptor translocation, and inhibits DNA binding and activation of androgen receptors
- AFFIRM trial: improved overall survival vs placebo (18.4 vs 13.6 mos)
- *Side effects*: fatigue, hot flashes, diarrhea, seizures (1%)

Emergency: Epidural Cord Compression

- Symptoms: lower extremity weakness, sensory loss, loss of control of urination or bowel movements, loss of anal sphincter tone on exam
- Treatment:
 - immediate IV dexamethasone (10mg loading dose, then 4-10mg q6hrs)
 - MRI to evaluate for cord compression
 - radiation therapy: definitive treatment
 - surgical decompression before radiation may improve outcomes
 - **Ketoconazole** high dose inhibits 17-alpha-hydroxylase and CYP17, stopping androgen production in the testes and adrenal glands. Fast acting—works as quickly as 4 hours. Bilateral orchiectomy is another option to castrate.

PROCEDURES

Types of urinary catheters

- Foley catheter
 - Comes in a variety of materials (latex) and diameters (most common sizes are 10 F to 28 F. 1 F is equivalent to 0.33 mm = .013" = 1/77" and balloon sizes are measured in cc's.
- Coudé catheter
 - Coudé is French for "elbowed"
 - Has a stiffer tip and a 45° bend at the tip to allow easier passage through an enlarged prostate
- Council tip catheter
 - Has a hole at the tip that allows it to be passed over a wire
- 3-way catheter
 - Has a third channel, which is used to infuse sterile saline or another irrigating solution
 - Used primarily after surgery on the bladder or prostate to wash away urokinase and dilute any ongoing bleeding to prevent obstruction of the catheter with clots
- Hematuria catheter
 - A combination catheter used in select cases of more significant bleeding from the urinary tract
 - Has 3 channels, a stiffer shaft, an elbowed tip and larger openings at the tip
 - Easier to manually irrigate larger blood clots through which may obstruct other catheters
- Whistle tip catheter
 - A single lumen catheter which is optimal for removing blood clots from the bladder with hand irrigation
 - Should always be used prior to placement of a 3-way catheter to ensure the bladder is free of clots

How to Place a Urinary Catheter in a Male patient

1. Position the patient supine, in bed, and uncover the genitalia.
2. Open the catheter tray and place it on the bed between the patient's legs; use the sterile package as an extended sterile field.
3. Open the iodine prep solution and pour it onto the sterile cotton balls. Open two 10-mL syringe and sterile 2% lidocaine gel (Urojets) and place them on the sterile field.

4. Use the sterile drapes that are provided with the catheter tray to create a sterile field around the penis.
 5. Put on the sterile gloves and use the nondominant hand to hold the penis and retract the foreskin (if present). This hand is the nonsterile hand and holds the penis throughout the procedure.
 6. Use the sterile hand and sterile forceps to prep the urethra and glans in circular motions with at least 3 different cotton balls.
 7. Instill 20 mL of lidocaine gel into the urethra. Place a finger on the meatus to help prevent spillage of the anesthetic lubricant. Hold the catheter with the sterile hand.
 8. While holding the penis perpendicular (90°) to floor stretching it upward to straighten the penile urethra, slowly and gently introduce the catheter into the urethra. Continue to advance the catheter until the proximal Y-shaped ports are at the meatus
 9. Wait for urine to drain from the larger port to ensure that the distal end of the catheter is in the urethra. The lubricant jelly-filled distal catheter openings may delay urine return. If no spontaneous return of urine occurs, try attaching a 60-mL syringe to aspirate urine. If urine return is still not visible, withdraw the catheter and reattempt the procedure.
 10. After visualization of urine return (and while the proximal ports are at the level of the meatus), inflate the distal balloon by injecting 10 mL of sterile water (for a 10ml balloon, or 30mL for a 30mL balloon) through the cuff inflation port.
 11. Gently withdraw the catheter from the urethra until resistance is met. Secure the catheter to the patient's thigh with a wide tape. Creating a gutter to elevate the catheter from the thigh may increase the patient's comfort. If the patient is uncircumcised, make sure to reduce the foreskin, as failure to do so can cause paraphimosis.
- Insertion of a Coudé catheter
 - The Coudé catheter, which is stiffer and has a curved tip, was designed to overcome urethral obstruction that a straight more flexible catheter cannot negotiate (eg, in patients with benign prostatic hypertrophy). To place a Coudé catheter, follow the procedure described above. The tip of the catheter and the balloon port should face the patient's cephalad when perpendicular to the floor (ceiling when parallel to the floor).
 - Perineal pressure assistance
 - The distal tip of the catheter might become caught in the posterior fold between the urethra and the urogenital diaphragm. An assistant can apply upward

pressure to the perineum while the catheter is advanced to direct the catheter tip upward through the urogenital diaphragm.

- Removal of urinary catheter
 - Use a syringe to empty the balloon, and then apply gentle traction. Pain, severe discomfort, resistance to withdrawal of the catheter, or failure to aspirate normal saline through the inflation valve should alert the practitioner to the possibility of a nondeflating urethral catheter.
 - The most common cause of a nondeflating urethral catheter is obstruction of the inflation channel, caused by a failed inflation valve or crystallization of the inflation fluid (this is why water should be used instead of saline).
 - The first step in managing the nondeflating Foley balloon is to advance the catheter to ensure that it is actually in the bladder.
 - If this does not work, cut the balloon port proximal to the inflation valve. This removes the valve and should allow the water to spontaneously drain.
 - If this does not work, run a lubricated fine-gauge guidewire through the inflation channel. The guidewire or stylet should allow fluid to drain along the wire itself.
 - If this does not work, a 22-gauge central venous catheter can be passed over the guidewire. When the catheter tip is in the balloon, the wire can be removed, and the balloon should drain.
 - If the above techniques are unsuccessful, 10 mL of mineral oil may be injected through the inflation port and will dissolve the balloon within 15 minutes. If this does not occur, an additional 10 mL can be instilled.
 - If none of the above techniques are successful, a urologist or interventional radiologist should be consulted to rupture the Foley balloon with a sharp instrument.

Common scenarios leading to difficult catheter placement

PATIENT	COMMON PROBLEM	SOLUTION
Female with challenging anatomy	Difficulty locating the urethral meatus	Place two fingers in the vagina (finger pads pointing ventrally) and run catheter along fingers until it engages the urethral meatus
h/o BPH with resistance met at the level of the prostate	Difficult for a catheter to navigate the prostatic urethra due to prostatic	Try a larger gauge (18 or 20fr) Coudé catheter

	obstruction	
h/o Prostate surgery with resistance met at the level of the prostate	Catheter becomes lodged in a TURP defect, high bladder neck, or bladder neck contracture	Try a smaller gauge Coudé catheter (12 or 14fr). If resistance continues to be met, cystoscopy may be required
Phimosis/ obesity	Difficulty visualizing the meatus	Place a finger between the foreskin and the glans and blindly slide a catheter into the meatus.
Meatal stenosis	Opening of the meatus is too small to pass a catheter	Serially dilate with progressively larger catheters. May start with a pediatric feeding tube. If the pt is in acute urinary retention a flexitip catheter can usually be passed into the bladder for temporary drainage.
Hypospadias	True meatus is located ventral to its expected location	Locate the true meatus and place a catheter as usual
Blood at the meatus/ catheter coils in the perineum	False pass	Try a Coudé catheter. A significant false pass however may require cystoscopy. If the prostate is actively oozing from the false pass, try a 30mL balloon to provide some tamponade.

Other useful tips

- Always use a minimum of 2 urojets to stent the urethra open
- 18Fr coude is default based on stiffness; work your way down in size if this doesn't work (12Fr is smallest). Rotate catheter and attempt advancement in case stricture is offset.
- Try 14Fr->12Fr silicone catheters next; stiff so won't coil and small if stricture
- Then try 10Fr->8Fr pedi feeding tubes (located in Jackson supply room) – in cases of emergencies can use these to temporarily drain the bladder while getting ready for cystoscopy.
- Cystoscopy cart if the above doesn't work

Bladder irrigation

- From Foley cabinet outside OR 30:
 - Whistle tip catheters (24Fr is good default size but grab 22 and 20 as well; 18 is kind of small to irrigate but may be needed if stricture as well). **these are latex; see below if latex allergic
 - 3-way catheters in same sizes as whistle tip; if likely prostate bleed – grab ones with 30cc balloons
- From prep-room between OR 30 and 31:
 1. Sterile OR basin
 2. Pack of sterile OR towels
 3. Half sheet
 4. 3x 60cc GU Guns (non-leur lock)
 5. 30cc syringe if 30cc balloon on 3-way
 6. NON-REFLUXING drainage bag – DO NOT use any other kind
 7. Cysto irrigation tubing carton
 8. Sterile 4x4 box
- From OR 30 or 31 cabinets
 1. Betadine bottle
 2. 2x 1L normal saline bottles
 3. Sterile gloves
 4. Safety glasses
 5. 2x bags of 2L NS (ED/E6/OR)

**If latex allergic:

- Grab assortment of 2-way silicone catheters and sterile scissors. Cut off the end so outlet is much bigger.
- 18Fr 3-way catheter is largest in the silicone variety which is unfortunate (make sure you get all the clot out)
- Non-latex gloves

Bedside cystoscopy

Michelle Kim, MD, PhD

Transurethral cystoscopy is a method of direct visualization of the bladder and urethra. It is performed using a lighted fiberoptic tube called a cystoscope. The cystoscope has a self-contained optical lens system that provides a magnified, illuminated view of the urethra, the section of the urethra surrounded by the prostate gland (prostatic urethra), the bladder, and the openings of the ureters into the bladder (ureteral orifices). Cystoscopes are either rigid or flexible. Rigid cystoscopes are long, straight, and stiff instruments. Flexible cystoscopes are also long, but they can be gently bent and curved. Flexible cystoscopes cause less discomfort to the individual and can be used at the bedside, in an office setting, or in an operating room. Flexible cystoscopes are also used when the individual cannot be positioned with the legs up in stirrups (lithotomy position), is positioned flat on the back (supine).

Indications for bedside cystoscopy

- Trauma while inserting a catheter per urethra leading to significant bleeding, false passages, perforations, edema
- Difficulty in passing a catheter per urethra due to urethral strictures, bladder neck contractures, prostate cancer
- Stent removal
- Hematuria workup

How to set up a flexible cystoscopy cart

- From the Endoscopy Room
 1. The cart
 2. Flexible cystoscopy (Storz say so on the lab)
 3. Both light cords, just in case - ACMI and Storz
 4. Light source - blue box with an adapter for standard wall outlets
- From the OR or closet
 5. Urojets x 2
 6. Sureseal – make sure you have a back-up
 7. Large bore irrigation tubing
 8. Sponges - unclipped
 9. Betadine in a bottle
 10. NS 2L bag x1, from the warmer
 11. PTFE Glidewire .038 inches
 12. Amplatz extra stiff guide wire 0.38 inches
- From the Linen closet
 13. One bundle of towels
 14. Half sheets
 15. Foleys. Council tips are built for this. Grab a 16, 18, 20, and 22 Fr. They're in the closet in a row. You can also get a small clamp that amputates the tips of catheters to make any catheter into a council tip. Use this if you suspect stricture, and then bring normal 2-way Foley's in small sizes - i.e. 8, 10, 12

Performing the procedure

- Details of the procedure are explained to the patient, and then informed consent is obtained.
- Position the patient supine on his/her bed, uncover genitalia. Soak betadine solution in pack of unclipped 4x4 sponges. Prep patient with solution in sterile fashion. Use a sterile towel to prop up penis (male) to keep sterile.
- Use sterile half sheet/drape/gown to drape the patient from the pubic symphysis down to feet. Use sterile area to connect cystoscope to NS irrigation tubing. Connect cystoscope to light box. Open two 10-mL syringe and sterile 2% lidocaine gel (Urojets)

and place them on the sterile field.

- Instill 20 mL of lidocaine gel into the urethra. Place a finger on the meatus to help prevent spillage of the anesthetic lubricant.
- Turn on NS irrigation and insert cystoscope into urethra. Keeping the lumen of the urethra in the middle at all times, continue to advance the cystoscope until you enter the bladder. If there is lot of bleeding, which obscures the vision, or if there is an area of resistance, the bag of irrigating fluid (0.9% sodium chloride solution) is squeezed for a few seconds to achieve clear vision and, thereby, enable safe passage of cystoscope through the urethra.
- If access needs to be obtained, a flexible guidewire is inserted through flexible cystoscope. The tip of guide wire should be seen inside the bladder. The cystoscope is then withdrawn while advancing the guide wire further thus ensuring that the tip of guide wire stays inside the bladder. Then a Foley catheter, which has open proximal end, is threaded over the guide wire. When the Foley catheter is inserted into the urinary bladder, urine will start draining from the Foley catheter. After inflating the balloon of Foley catheter, the guide wire is removed. Thus flexible cystoscopy ensures safe insertion of a Foley catheter into the urinary bladder in patients with urethral trauma or false passages.

Priapism – Corporal Irrigation

Michael T. Grant, MD

Supplies needed for corporal irrigation

1. ABG kit
2. Consent form
3. 1% Lidocaine (no epinephrine)
4. Blunt tip or < 18g needle (to draw up lidocaine)
5. Long 22g or 23g needle (for penile block)
6. 1% Phenylephrine 10mg/mL
7. 6 – 60mL Luer lock syringes
8. 1 - 30mL Luer lock syringe
9. 14 gauge angiocath
10. IV extender
11. 3-way stop-cock valve
12. 1L worth of NS (e.g. 250mL bottle x4)
13. 2 blue sterile bowls (mark one of them as “phenylephrine solution”)
14. Coban wrap

Corporal Irrigation Steps

1. Get consent for irrigation
2. IV pain medication
3. Send cavernosal blood gas STAT...if ischemic, then continue
4. Have patient put on telemetry
5. Penile block - inject 5mL of lidocaine at 10 o'clock and 2 o'clock just under pubic bone.
You can also do a circumferential block using another 10mL of lidocaine
6. Mix 1mL of Phenylephrine with 50mL of NS in a sterile blue bowl to create concentration of 200mcg / mL (acceptable rate = 100-500 mcg / mL). Draw up into 30mL syringe.
7. Insert 14-gauge angiocath laterally into the corpora. Hook up IV extender and 3-way stop-cock valve.
8. Irrigate with NS using 60cc syringes. Repeat until irrigant moves in and out more easily
9. Using 30cc syringe of phenylephrine solution, inject 5-15cc depending on resistance.
10. Repeat steps 8 & 9 until detumescence is achieved. Otherwise move on to shunt procedures
11. Mummy wrap penis at conclusion with Coban