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# Common Urology Concerns in the ED: Gross Hematuria and Catheter Issues

Janine Oliver, MD, FPMRS  
Division of Urology  
University of Colorado



# Learning Objectives

- 1) Describe the differential diagnosis of gross hematuria
- 2) Identify what radiographic and diagnostic studies are indicated for patients with hematuria
- 3) Know when urologic consultation and intervention is indicated for hematuria
- 4) Discuss common urinary catheter-related concerns



# Gross Hematuria



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# Hematuria

- One of the most common urologic diagnoses
- 27% of all urologic evaluations
- 35-65% of patients with hematuria are diagnosed with a urologic or renal condition, many of which require treatment

Mariani AJ et al, J Urol 1989;141:350  
Antoniewicz A et al, ISRN Urol 2012; 2012:710734  
Davis R et al, J Urol 2012;188:2473



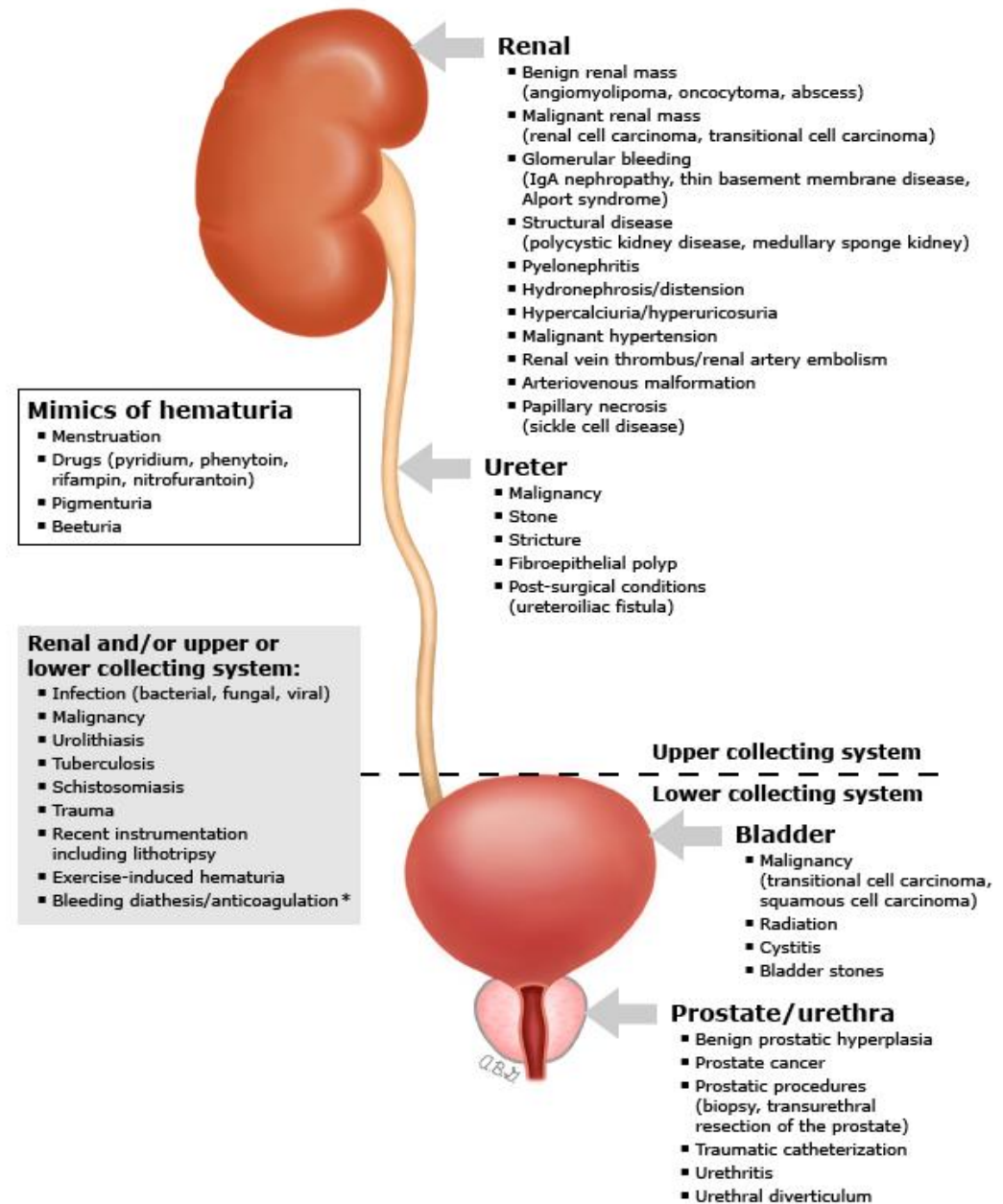
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# Causes of Hematuria

- Nephrological – medical renal disease
- **Urological**
  - Malignancy
  - BPH
  - Infection
  - Stones
  - Other
- Pseudohematuria, aka "mimics")
  - Gynecologic source, ie menstruation, other vaginal/uterine bleeding
  - Certain drugs, ie pyridium



# Why is gross hematuria a concern?

- **Patients referred for hematuria** to 40 hospitals 2016-2017
  - 65% gross hematuria, 35% microhematuria
  - All had cystoscopy+ upper tract urinary tract imaging
  - **Malignancy in 13.8% with gross hematuria**
    - Bladder cancer = 8%; renal parenchymal cancer = 1%
    - Upper tract urothelial carcinoma=0.7%; prostate cancer=0.3%



# What if the patient is taking anti-coagulants or anti-platelet agents?

- Doesn't change the recommendations – follow and work-up per the guidelines

Koo et al (2016): 411 patients with microhematuria

- 5.8% with genitourinary malignancy
- 15.3% on anticoagulation
- No difference in malignancy based on anticoagulation status

(Strong recommendation; Evidence Level C)



## Risk Factors for Urologic Malignancy

- Age
- Male sex
- Smoking
- Degree of microhematuria
- History of gross hematuria

## Risk factors for Urothelial Carcinoma

Everything in column A +

- Irritative urinary tract voiding symptoms
- H/o cyclophosphamide or ifosfamide chemotherapy
- Family history of urothelial carcinoma or Lynch syndrome
- Occupational exposures to benzene chemicals or aromatic amines
- Chronic indwelling foreign body in the urinary tract (foley, SP tube)





# Sex Disparities in Diagnosis of Bladder Cancer After Initial Presentation With Hematuria

A Nationwide Claims-Based Investigation

Joshua A. Cohn, MD<sup>1</sup>; Benjamin Vekhter, PhD<sup>2</sup>; Christopher Lyttle, MS<sup>2</sup>; Gary D. Steinberg, MD<sup>1</sup>; and Michael C. Large, MD<sup>3</sup>

Cancer 2014;120:555-561

- Days from hematuria --> bladder cancer diagnosis is longer in females
- Females are more likely to be (mis) diagnosed with UTI
- Females are less likely to undergo abdominal/pelvic imaging



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# Do differences in clinical symptoms and referral patterns contribute to the gender gap in bladder cancer?

Armin Henning, Marlies Wehrberger, Stephan Madersbacher, Armin Pycha<sup>†</sup>, Thomas Martini<sup>†</sup>, Evi Comploj<sup>†</sup>, Klaus Jeschke\*, Christian Tripolt\* and Michael Rauchenwald

- No significant difference in rates of gross hematuria or irritative LUTS between men and women

HOWEVER...

- 78% of M vs 55% of F consulted a urologist ( $p < 0.05$ )
- *Symptom treatment w/o further eval* given to 19% of M vs 47% of F during year before bladder cancer dx ( $p < 0.05$ )
  - $\geq 3$  tx for UTI given to 3.8% of M vs 15.8% of F ( $p < 0.05$ )

BJU Int 2013;112:68-73



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# Delays in Diagnosis and Bladder Cancer Mortality

Brent K. Hollenbeck, MD, MS<sup>1,2,3</sup>; Rodney L. Dunn, MS<sup>2</sup>; Zaojun Ye, MS<sup>2</sup>; John M. Hollingsworth, MD, MS<sup>2,4</sup>; Ted A. Skolarus, MD<sup>2</sup>; Simon P. Kim, MD, MPH<sup>2</sup>; James E. Montie, MD<sup>1,2</sup>; Cheryl T. Lee, MD<sup>1</sup>; David P. Wood, Jr., MD<sup>1</sup>; and David C. Miller, MD, MPH<sup>1,2,3</sup>

- SEER-Medicare 1992-2002
  - Patients with hematuria within 1 year of bladder cancer
- **Delay in diagnosis --> significantly increased risk of death**

**Table 2.** Relation Between Delays in Diagnosis and Mortality

Model	HR (95%CI)		
	Unadjusted	Adjusted <sup>a</sup>	Adjusted <sup>b</sup>
<b>Cancer-specific mortality</b>			
Delay <3 mo	1.0	1.0	1.0
Delay 3 to <6 mo	1.09 (0.99-1.20)	1.00 (0.89-1.11)	1.05 (0.93-1.18)
Delay 6 to <9 mo	1.19 (1.07-1.33)	1.16 (1.03-1.31)	1.30 (1.15-1.48)
Delay 9-12 mo	1.39 (1.26-1.54)	1.34 (1.20-1.50)	1.29 (1.14-1.45)
<b>All-cause mortality</b>			
Delay <3 mo	1.0	1.0	1.0
Delay 3 to <6 mo	1.13 (1.07-1.19)	1.06 (1.00-1.12)	1.06 (1.00-1.13)
Delay 6 to <9 mo	1.21 (1.14-1.29)	1.15 (1.07-1.23)	1.19 (1.11-1.28)
Delay 9-12 mo	1.28 (1.21-1.36)	1.15 (1.08-1.23)	1.12 (1.04-1.20)

Cancer 2010;116:5235-5242

HR indicates hazard ratio; CI, confidence interval.

<sup>a</sup>Adjusted for age, sex, race, socioeconomic status, and comorbidity.

<sup>b</sup>Adjusted for the same variables stated above plus grade and stage.

# Evaluation of Gross Hematuria



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# Initial questions to evaluate gross hematuria

- **Is the patient hemodynamically stable?**
- **Is the patient able to empty the bladder?**
- **Is the patient experiencing any other physical symptoms like flank pain, nausea, vomiting, dysuria, or fever and chills?**
- **Does the patient have prior urologic history or other relevant history?**



# Initial questions to evaluate hematuria

- **Is the patient on anticoagulation therapy, have a history of bleeding diathesis, or a non-urologic malignancy?**  
Certain medications, such as anti-platelet therapy or other anticoagulants, or systemic illnesses or conditions may result in bleeding of urologic source and require different treatment approaches.
- **Has the patient undergone any recent urologic intervention, procedure, or surgery?**  
Patients may develop gross hematuria following urologic surgery or manipulation of the urinary system. Management of these post-operative or procedural complications will drive patient's management and guide work up formation.
- **Does the patient have a Foley catheter or suprapubic tube in place?**  
Traumatic placement or exchange of a urinary drainage catheter may account for hematuria and require interrogation if the tube improperly positioned.



# Gross Hematuria: Differential Diagnosis

- **Neoplasm/Malignancy**

Urologic malignancies often present with an episode of gross hematuria although they may be self-limited. Often these patients have are male sex, with a smoking history, occupational exposure, and voiding symptoms. Organs of origin include:

- [Bladder](#)
- [Prostate](#)
- [Urethra](#)
- [Upper tract malignancy](#)



# Gross Hematuria: Differential Diagnosis

- **Infection/Inflammation**

This represents a more heterogenous group of causes depending on the patient's risk factors and past medical history

- [Cystitis](#)

Typically, patients with signs and symptoms of urinary tract infection including fever and chills, dysuria, cloudy or malodorous urine, and a urinalysis diagnostic of urinary tract infection.

- [Prostatis](#)

Male patients with signs and symptoms of urinary tract infection but likely more pronounced voiding symptoms or urinary retention

- [Urethritis](#)

Possible causes can include bacterial, viral, chemical, and foreign body

- [Hemorrhagic cystitis](#)

Patients should be questioned for a history (recent or distant) of radiation exposure or therapy for non-urologic malignancy.





# Gross Hematuria: Differential Diagnosis

- **Calculus disease**

**Patients usually present with specific symptoms of nausea, vomiting, flank pain (in upper tract stones), and fever or chills.**



# Gross Hematuria: Differential Diagnosis

- **Benign Prostatic Enlargement (BPH)**

- Patients typically have a longer history of lower [urinary tract symptoms \(LUTS\)](#) and prior therapy. Typically, these are older, male patients.
- Most common cause of prostate-related bleeding
- Most common cause of gross hematuria in men over 60
- Only pathologic condition identified in approximately 20% of hematuria cases

Borth CS et al. Urology 2001; 57: 1082-1085 Lynch TH et al. Br J Urol 1994; 74: 732-732



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# Gross Hematuria: Differential Diagnosis

- **Trauma**

- These patients present following an acute traumatic injury and have specific signs and symptoms. The onset of this type of hematuria is chronologically related to this traumatic event.



# Gross Hematuria: Differential Diagnosis

- **Medical Renal Disease**

Includes patients with prior renal disease, hypertension or azotemia

**(still perform urologic workup!)**



# Gross Hematuria: Differential Diagnosis

- **Abnormal or Dysfunctional Anatomic Findings**
  - History of renal cystic disease
  - Upper urinary tract obstruction or ureteropelvic junction obstruction
  - Urethral diverticulum
  - Urethral stricture disease



# Gross Hematuria: Differential Diagnosis

- **Miscellaneous**

- Exercise induced hematuria
- Pseudohematuria (Menses)
- Recent urologic surgery or procedural intervention
- Indwelling urinary tract foreign body – ureteral stent, foley catheter, suprapubic catheter, nephrostomy tube (may still warrant evaluation!)



# Gross Hematuria: Evaluation

- **Physical Exam - Key Points**
- **Vital signs:** Due to the potential life threatening nature of a hematuria, physical evaluation should begin with vital signs.
  - Any suggestion of hemodynamic instability (hypotension, tachycardia) should initiate fluid resuscitation and possibly blood transfusion.
  - Any indication of infection or sepsis (tachypnea, tachycardia, fever) should initiate resuscitation, obtaining cultures, and administration of intravenous antibiotics



# Gross Hematuria: Evaluation

- **Laboratory Data**

- **CBC** with differential

- Looking for leukocytosis, thrombocytopenia, anemia

- Serum **creatinine**

- Evaluate for adequate renal function in the face of chronic renal disease, longstanding urinary obstruction, or temporary dehydration
    - Secondarily can guide imaging work-up i.e., if patient can tolerate IV contrast dye for hematuria work-up

- **Coagulation studies (PT/PTT)** to evaluate for coagulopathy as cause of or contributor to hematuria

- **Urinalysis with microscopy and culture** – check for presence of UTI, proteinuria or abnormal RBC morphology which may be indicative of nephrological cause

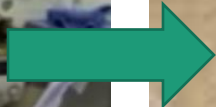
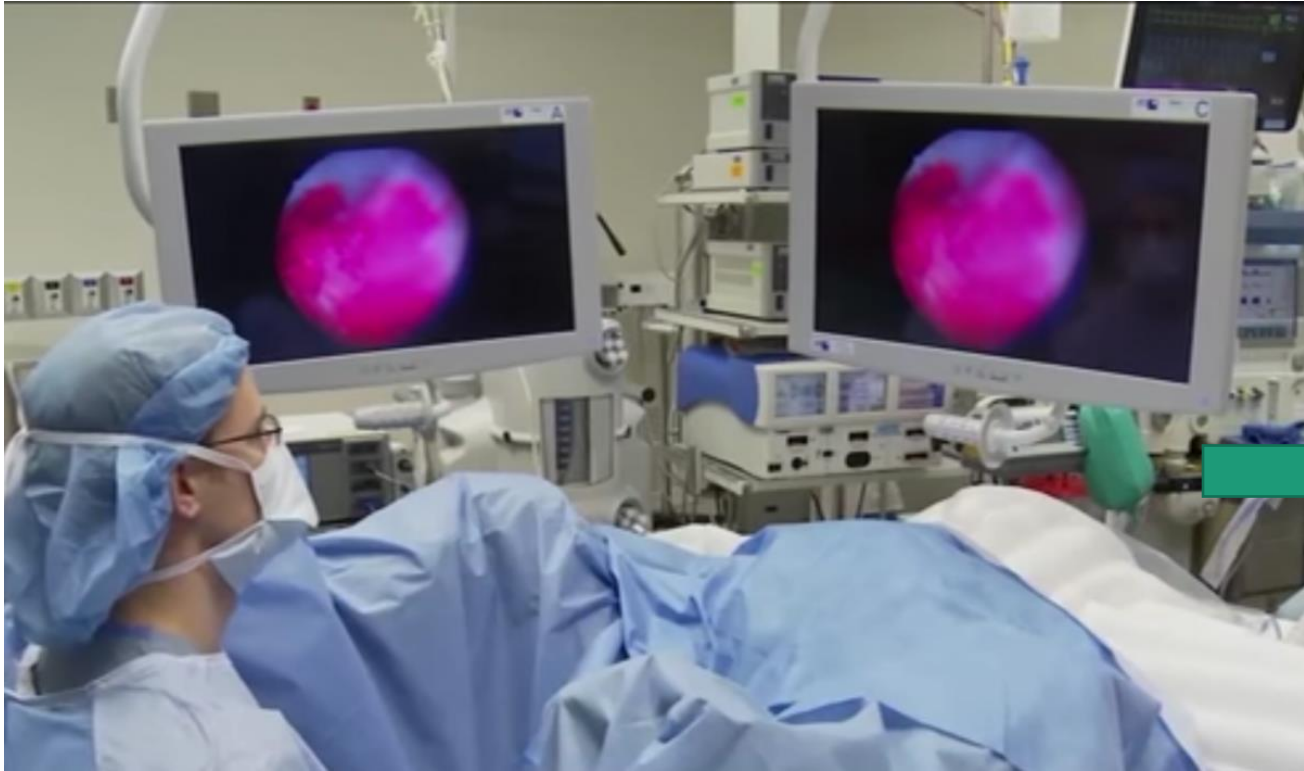




# Gross Hematuria: Evaluation

- **Radiologic / Diagnostic Studies**
  - **CT urogram (3-phase) = preferred**
  - **MR urography – alternative**
  - **Renal ultrasonography +/- retrograde pyelography – less comprehensive imaging (due to lack of cross-sectional imaging) as an option for patients unable to undergo contrast enhanced imaging.**
  - **Endoscopic evaluation with cystoscopy** to visually inspect the prostate and bladder.
    - This has the potential to be therapeutic to evacuate blood clots or eliminate the source of bleeding from the prostate or bladder.
    - Ureteroscopy can be considered if a concern for upper tract bleeding.





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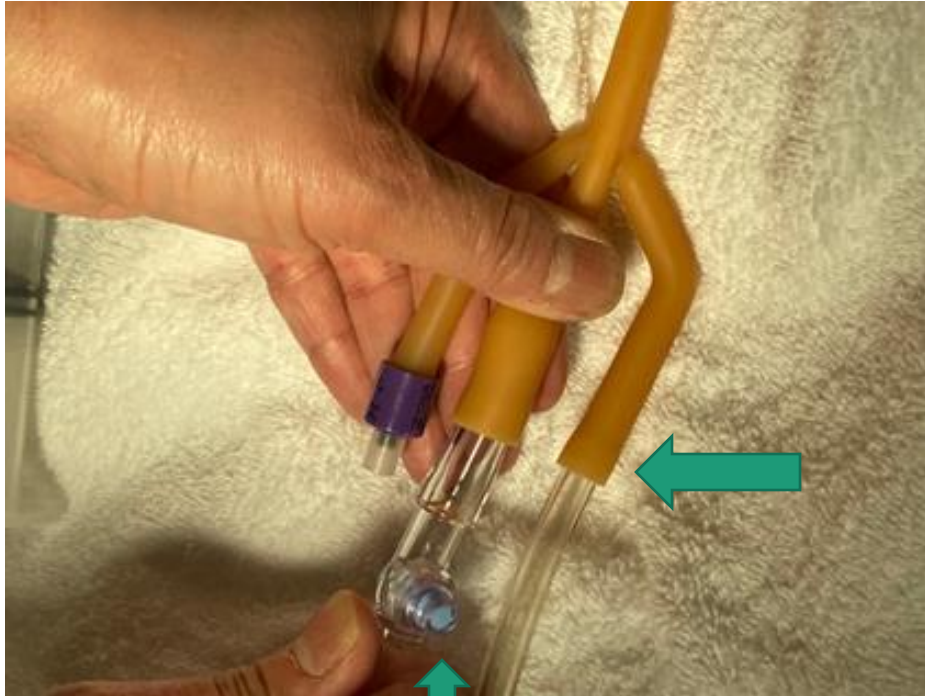
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# Management of Clot Retention: Initial Steps

- Insert large-bore (>22F) 3 way Foley catheter
- Begin manual irrigation
- Identify potential risk factors, reversible causes
- Evaluate hemodynamic stability, CBC



# Set yourself up for success



Irrigate through the main channel.

Get the right equipment. I.e., use a Toomey, not the syringe in the photo. It is better for wound irrigation than for a bladder.

Do not attempt to irrigate from this tiny opening.

CBI channel can be used but not very effective.

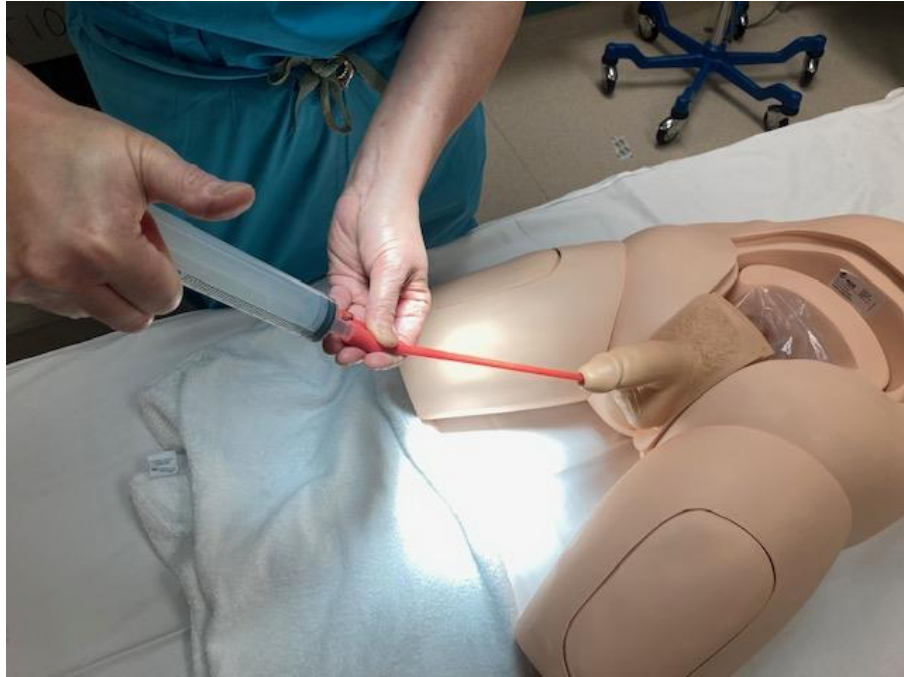


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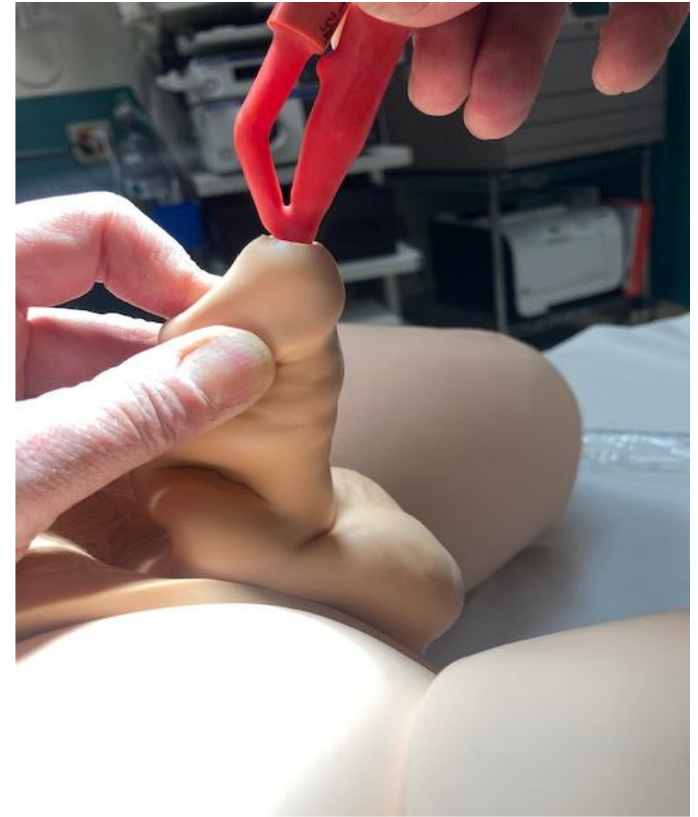
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# Tricks to Find Clot in Bladder



Clot settles  
down by  
gravity

- Pull foley on tension to half way down thigh to place the holes lower in bladder where clots lie. Irrigate in this position and aspirate out clot.



Lubricate the tip of penis and advance catheter deeper so balloon with tip curls in bladder to find a different location to irrigate and aspirate. (trawling until foley straightens down again)

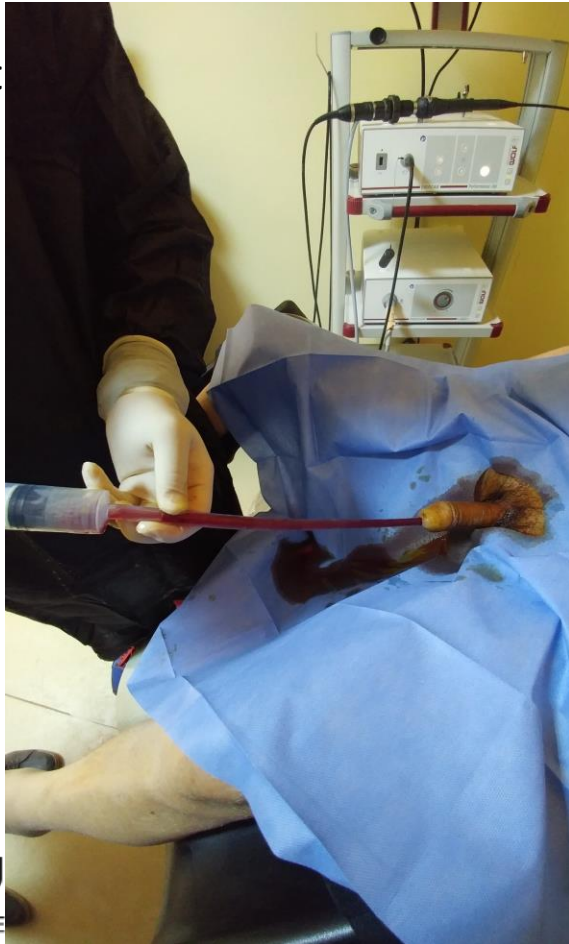
# CBI (Continuous Bladder Irrigation) for clot retention

Always hand irrigate/aspirate out all clots before connecting CBI.

Don't forget to clamp CBI when hand irrigating.

Irrigate through main port.

Drip at rate to give a light or med pink outflow.



It's a good idea to always hang two 3-liter bags to prevent delay and clot obstruction.

Saline is more prudent in case the catheter gets clogged. Sterile water also OK, but make sure outflow does not clog.

**STRICT PRECAUTIONS FOR ANY PATIENT ON CBI – BLADDER PERFORATION CAN OCCUR**



Foley balloon can be used to apply pressure on a bleeding prostate. Inflate balloon with total 20-30 cc water and pull down on traction and tape in place for several hours before loosening up again. Urologist may instruct you.

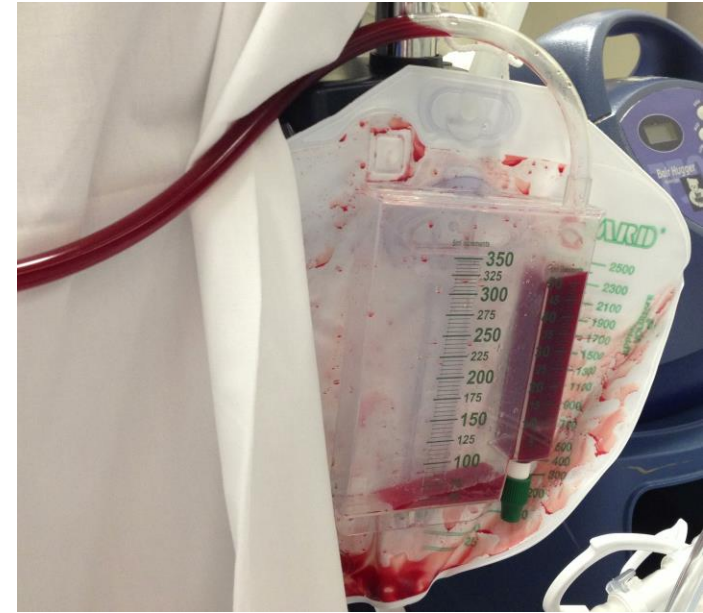
# Management of Clot Retention

- If urine clears with initial manual irrigation:
  - Likely okay for conservative management with hydration
  - Follow-up with urology
  - Needs further evaluation
    - Cystoscopy
    - CT Urogram (CT IVP)



# Management of Clot Retention

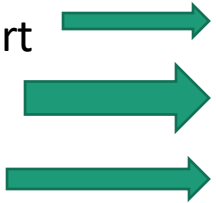
- If hematuria persists (and/or hemodynamic instability, including significant anemia):
  - Abdominal/pelvic imaging
    - Evaluate for contributing etiologies and residual clot burden
  - If no residual clot burden, consider initiation of CBI
  - If residual clot burden, may require clot evacuation under anesthesia and further evaluation of potential etiologies





# Use the proper tool for the job

Balloon Port  
Main Port  
CBI Port



The more ports, the **narrower** the channel of the Main Port!  
So 3-Way catheters must be wide to allow sufficient drainage of bloody urine/clots.  
Do not use a 16 French or 18 French 3-Way with bloody urine!  
Use 22 French or 24 French for 3-Way catheters for hematuria. Wider channels.



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# Common Catheter-Related Concerns



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How often do catheters need to be changed? Why?



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# All GU drainage catheters need to be changed periodically

- Nephrostomy tubes/catheters changed by Interventional Radiology every 1-3 months depending on IR plan.
- Foley catheters changed every 4-6 weeks by nurse.
- Suprapubic tubes changed every 4-6 weeks by nurse.

## Goal is GOOD DRAINAGE

- Catheters are **not** changed to prevent “infection”. Catheters are colonized.
- Catheters **are** changed periodically to prevent clogging and maintain drainage.



“I think I have a UTI”



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# CAUTI – Diagnostic Criteria

**The Infectious Disease Society of America (IDSA) definition of CAUTI requires *all* of the following components:**

- (1) Culture growth of at least 1,000 colony-forming units per ml of a uropathological bacteria (or >100,000)
- (2) Symptoms or signs of a urinary tract infection (e.g., fever, costovertebral angle tenderness, hypotension).
- (3) No alternative explanation of these symptoms, despite adequate evaluation.
- (4) Patient is catheterized or has had a urinary catheter removed within <48 hours.



# CAUTI –

- Often *over-diagnosed*
  - *Finding* bacteria in the urine is easy; the challenging issue is determining whether they are causing disease.
- Do not anchor onto the diagnosis of UTI/CAUTI prematurely
  - Do thorough evaluation for other causes



# Distinguishing bacteriuria from UTI

- Over time, most patients with a urinary catheter will develop *bacterial colonization* of their bladders.
  - Commonly seen in normal elderly people as well, even without having urinary catheters
  - Occurs at a rate of 3-10% per day, so nearly all patients catheterized for a month will have bacteriuria.





# Distinguishing symptoms of UTI from non-UTI related lower urinary tract symptoms

- Can be a challenge but important to take careful history
- Odor and/or appearance changes (“cloudy”) alone are insufficient to diagnose UTI and not indicative of a UTI
- Often not a UTI:
  - Urgency, frequency
    - These are nonspecific and common symptoms related to catheter or urologic condition
  - Urinary incontinence
    - Can be tricky, but often related to the catheter and/or underlying condition leading to the need for the catheter (ie, overactive bladder and urge incontinence in patient with a neurologic condition)



# CAUTI – Diagnostic Criteria

- Symptoms and Signs of UTI
  - Fever, chills, or altered mental status without alternative explanation
  - Flank pain/CVAT
  - Suprapubic/pelvic pain (sometimes w/ low back pain)
  - Gross hematuria
  - Dysreflexia in the patient with SCI

No alternative explanation (think of CAUTI as a diagnosis of exclusion)



# CAUTI – Diagnostic Criteria

- Urinalysis and Urine Culture
  - Remember - colonization (bacteriuria) is essentially universal in patients with indwelling catheters!
  - “positive” UA and urine culture by itself does NOT indicate CAUTI
  - Pyuria
    - The presence of pyuria is nonspecific (this can be CAUTI vs other)
    - The *absence* of pyuria argues against a diagnosis of CAUTI



# CAUTI – Diagnostic Pathway

1. Assess hemodynamic stability
  - For patients with clinical signs of septic shock or neutropenic fever, antibiotic initiation should not be delayed.
2. Assess for urinary tract obstruction
  - Ensure no catheter dysfunction
    - Check POC bladder ultrasound and/or flush catheter
  - If concern for pyelonephritis/sepsis, have low threshold to rule out upper tract obstruction (renal ultrasound or CT)
3. Assess for signs/symptoms, and evidence of CAUTI, r/o other causes



“My catheter isn’t working. I’m leaking around the catheter”



# CC: Urine leaking around the catheter

- Causes:
  - Mechanical
    - Kinks in the tubing
  - Positional
    - Not allowing for flow with gravity
  - Clogged catheter (causing overflow around the catheter)
    - Sediment, stones, blood clots
  - Malpositioned catheter
  - Bladder spasms
    - Catheter is draining fine, but patient will complain of leaking around catheter intermittently, associated with intermittent suprapubic pain, penile pain



# Bladder spasm management

- Anticholinergics or b3 agonist
  - Oxybutynin (XL preferred), solifenacin, mirabegron, etc
  - Bladder “relaxing” medications
- Avoid/treat constipation



# How to troubleshoot a clogged catheter

- Irrigate
- Sometimes need “two in” first
- POC Ultrasound can be helpful to assess catheter position, residual volume, screen for stones, clot, etc in bladder





# Get your supplies for hand irrigating



Sterile water for hand irrigation in bladder.  
Breaks up clots better.



Catheter tipped syringe (Toomey).



Graduated cylinder for drawing up water



A male urinal for dumping out bloody fluid and clots. It can lay on side on bed and prevents splashing messes.



Chux



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# Set up for success

Urinal near for dumping



Catheter disconnected and ready for irrigation.



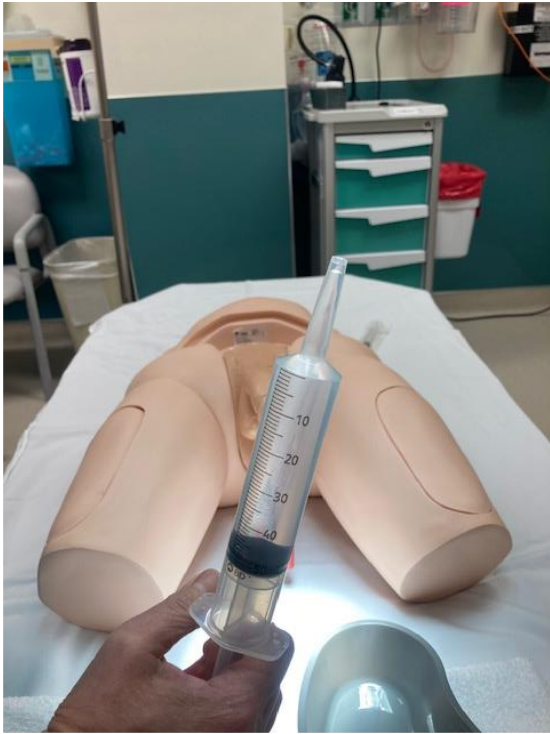
Chucks or towel



Draw up from graduated cylinder

Extra lube nearby

If the bladder is full, flush slowly in the first few times and aspirate out clot/debris to make space.



Remove air from syringe after filling.



Normal bladder capacity:  
300-400 mL



- Once the bladder is emptier, you can flush in at a medium speed.
- You may need to flush in 2 syringes to aspirate out 1 syringe.
- Aspirate out clot (feels like thick Jello thru a straw).
- **If it doesn't aspirate out, stop. Time to think why.**







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# Why a Catheter Will Not Aspirate Out

- You did not place enough fluid in bladder to aspirate out.  Flush in another full syringe gently and then aspirate.
- You're sucking on the bladder wall when aspirating.  Flush back in a little to undo the suction, move the catheter a little in or out or twirl to change position of holes, place another syringe of water in before aspirating.
- You are getting some clot.  Keep gently flushing in and aspirating out to start breaking the clot. Once it starts breaking down, it will be easier to aspirate out.
- Your foley balloon is inflated in the prostate.  Deflate the balloon, lube the meatus, hold penis up straight, advance foley, and accordion the penis to the pubic bone. Inflate balloon gently. Then retract foley



# Concerned for malpositioned foley?

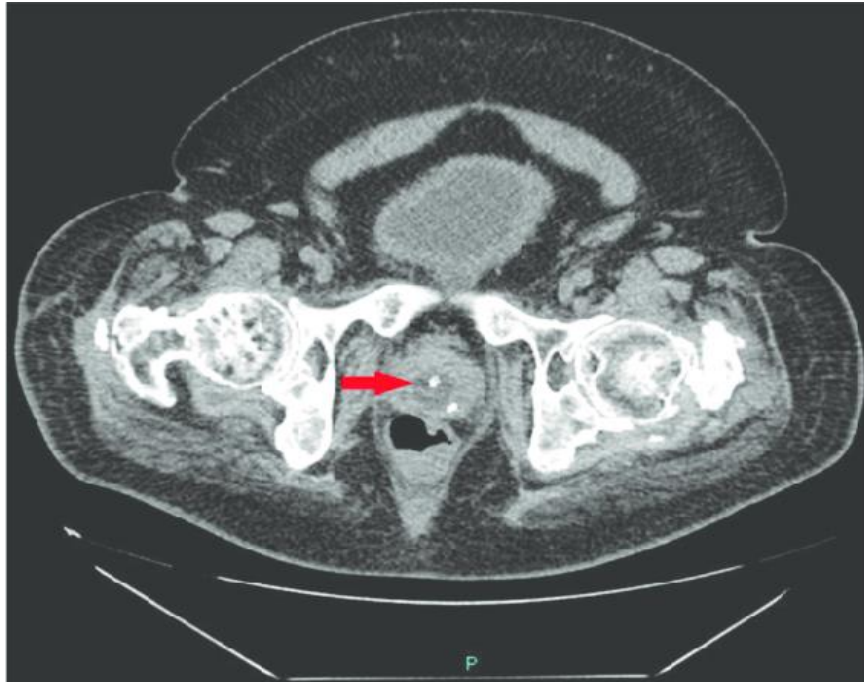


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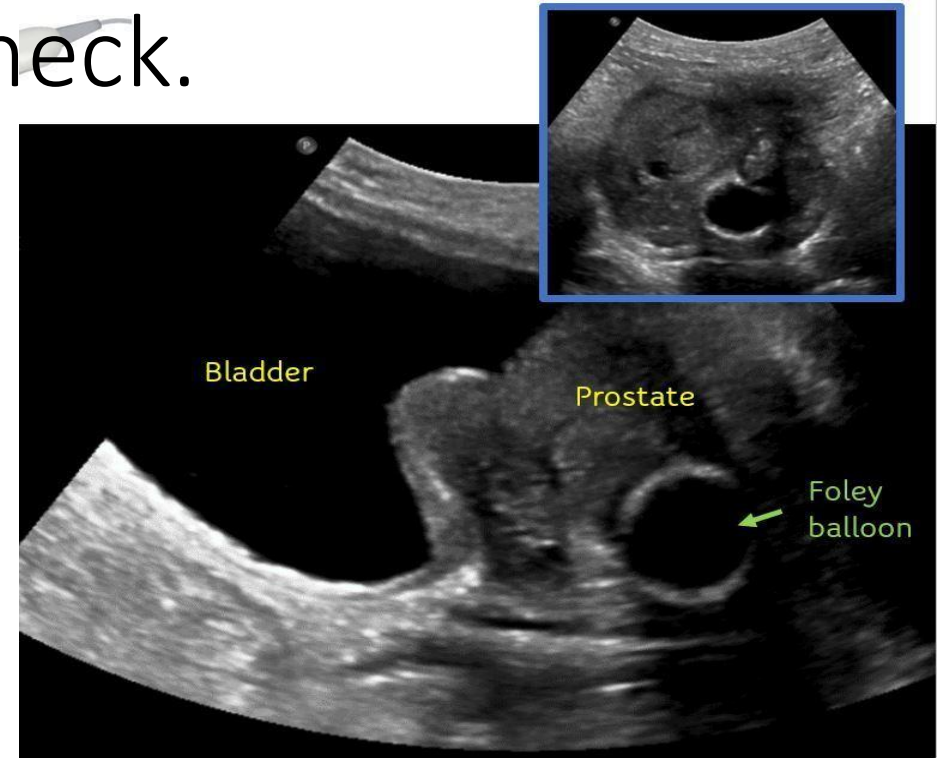
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If you are not sure the foley is in the right place, may irrigate and/or image to check.



Balloon in prostate can flush in, but it will not aspirate out because vacuum will lead to balloon compressing channel shut due to surrounding prostate tissue pressure.



- If you can aspirate some fluid (20-40 mL or more) freely out, it is in the right place.
- If you can't aspirate out and you suspect foley balloon in prostate, deflate balloon and advance/hub before reinflating balloon.



# A “potpourri” of other tips



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# Iatrogenic (Foley catheter-related) hypospadias



- Pressure injury to the urethra causes “hypospadias”
- Seen in long term indwelling foleys.
  - Happens more quickly in women → severe incontinence

Prevent by:

- Ensure proper foley care and slack in the catheter
- **Suprapubic catheter is often ideal when patients need a long-term indwelling catheter → Refer to Urology**



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# Urethral strictures and bladder neck contractures

- Relatively uncommon to rare
- Foley does not advance in past the shaft area of penis.
- Needs a straight foley catheter and smaller diameter silicone.
- Usually in men younger than 40. Can also occur in women but rare.
- Possibly a bladder neck contracture in older men if they have had prostate surgery before.



Call Urology for further instructions.



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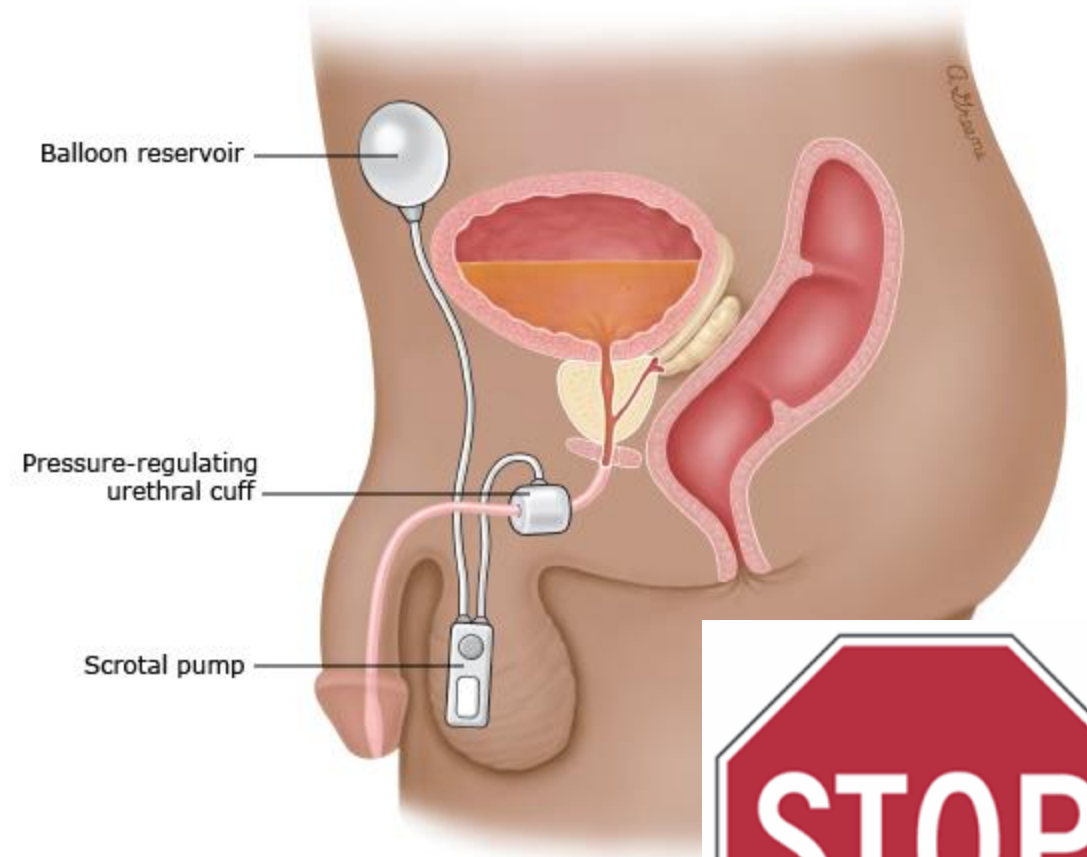
# Other “Call urology” situations

- Recent reconstructive lower urinary tract surgery
  - Urethroplasty (repair of urethra for urethral stricture or trauma)
  - Prostatectomy (urethra is anastomosed to bladder neck after prostate removed)
  - Artificial urinary sphincter
  - Removal of urethral lesion (such as urethral diverticulum) – this is rare
  - Other complex reconstruction



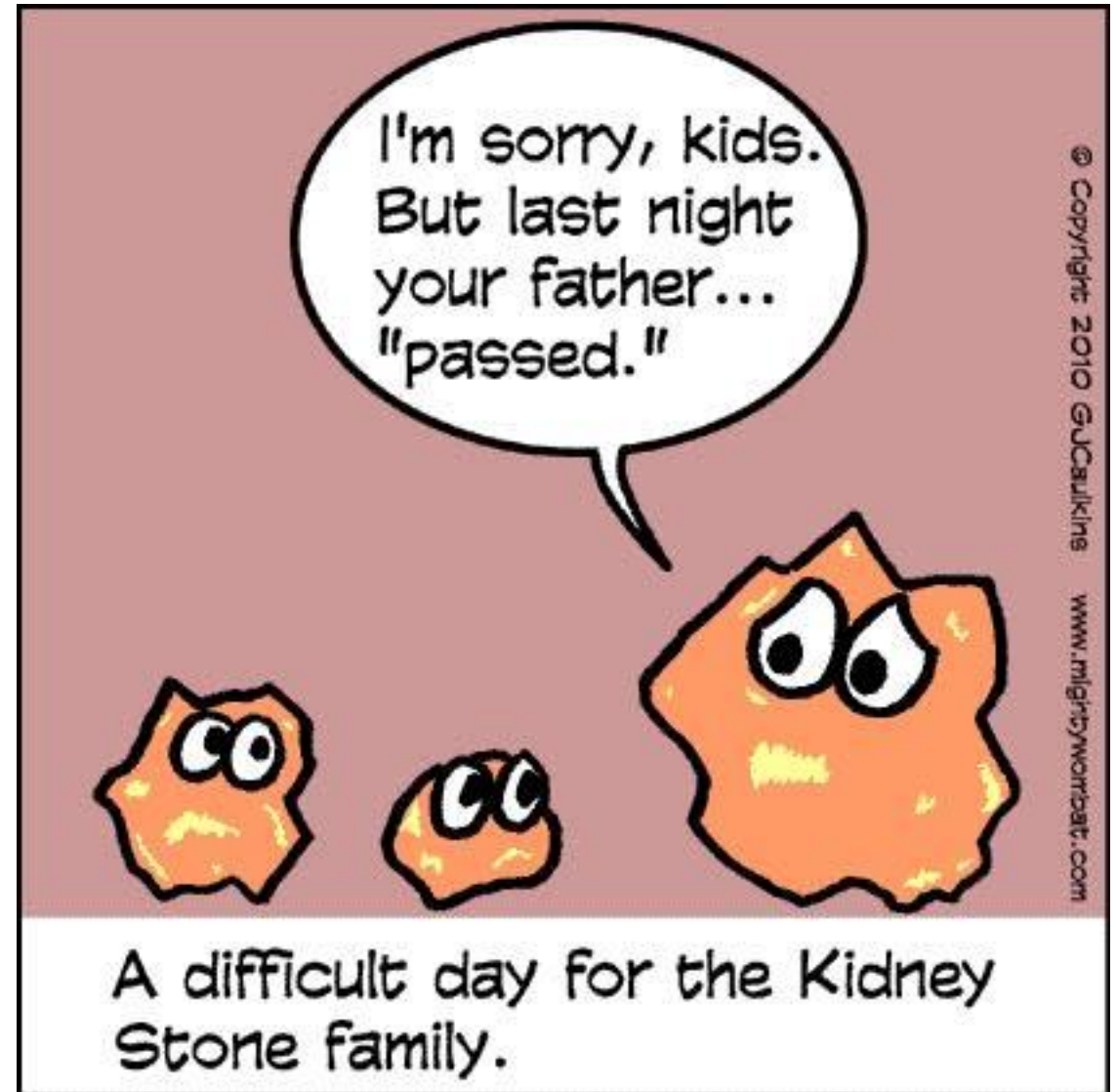
# Artificial Urinary Sphincter

- Implant placed around the urethra for urinary incontinence after prostatectomy (such as for prostate cancer)
- Placement of a catheter without first deflating the cuff can lead to severe complications (erosion of implant into urethra, sepsis)
- Always ask about surgical history. Some patients may have an ID card or tag/bracelet. Pump is palpable in the scrotum.



# Thank you!

janine.oliver@cuanschutz.edu



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