Urine and genital tract infections 
(hitting at or below the belt)

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Case: UTI

- A 28-year-old woman telephones her physician to report dysuria and urinary urgency during the preceding three days. She has had several previous urinary tract infections, including three during the past year. She is otherwise healthy, takes no medications, and is sexually active, using spermicide-coated condoms for contraception. She says she does not have fever, chills, vaginal discharge, or flank pain. How should she be evaluated and treated?

Anatomy & Physiology

- Two kidneys
  - produce urine
- Two ureters (tubes)
  - Carries urine from the kidneys to the bladder
- Bladder
  - Stores urine
- Urethra
  - Carries urine from the bladder out of the body
Pathology

• Males or Females
  – Blockage (a stone) in the ureters, kidneys, or bladder that prevents the flow of urine through the urinary tract
  – Narrowed tube (or a kink) in the urinary tract
  – problems with the pelvic muscles or nerves
  – Catheter insertion or instrumentation
    • 5% / day cumulative risk
Pathology

- Females (11% / year, 60% lifetime)
  - Shorter urethra & proximity to anus
  - Other risk factors
    - Had a UTI before, had several children diabetes, obesity
  - Risk for recurrence
    - Frequent sex or new partner
    - Young age at first UTI
    - Use of spermicide, diaphragm
Pathology

• Asymptomatic Bacteriurea
  – Bugs in bladder w/o infection; colonization / contamination
• Cystitis = bladder & urethra infection only
• Prostatitis = prostate (males)
• Kidneys = Pyelonephritis
• Blood = Bacteremia
• Sepsis = SIRS* due to infection
  – Systemic Inflammatory Response Syndrome

Hospitalize if
• fever, chills, back pain, nausea or vomiting; sepsis
Symptoms - UTI

• Dysuria
  – sharp pain or burning felt in the urethra

• Urgency
  – Strong urge to urinate that cannot be delayed

• Others
  – Soreness in the lower abdomen, in the back, or in the sides
  – Urine may have a strong odor, look cloudy, sometimes be tinged with blood
Diagnostic Testing

• Urine analysis
  – 100,000 cfu bacteria /mL
    • sensitive, not specific
    • Use > 1,000 if symptoms or male
  – Positive Leukocyte Esterase & Nitrite
    • Rapid, inexpensive 75% sensitive, 82%
    – > 8 WBC

• Urine +/- blood culture

• Imaging (IVP, CT, US, Cystoscope)
Etiology

• Simple (uncomplicated) in Females
  – Progress to kidneys, blood
  – 80-90% E. coli with virulence factors (fimbria for binding)
  – Others: Staph. Saprophyticus, Enterococci

• Complicated (catheter, hospital)
  – Gram-negative rods
    • Proteus, Klebsiella, Enterobacter
    • Pseudomonas aeruginosa and others
  – Special bugs
    • Staphylococcus aureus, Candida
Resistance Issues

• Unreliable susceptibility
  – E. Coli Susceptibilities:
    • 60% Amoxicillin
    • 75% Trimethoprim/Sulfamethoxazole (TMP/SMX)
    • 80% Ciprofloxacin
    • > 80% Nitrofurantion
  – Pseudomonas et al nosocomials
    • Ciprofloxacin PO
    • Big Guns IV (cefepime, piperacillin/tazobactam)
Treatment of Uncomplicated

– Single dose of
  • Fosfomycin (Monurol) 3 g PO

– 3 days of
  • Trimethoprim/Sulfamethoxazole 1DS PO BID
  • Fluroquinolone (e.g. ciprofloxacin 250 mg PO BID)

– 7 days of
  • Nitrofurantoin (e.g. 50-100 mg PO QID)
    – Prefered in pregnancy, contraindicated with GFR < 50
  • Beta-lactam if susceptible (cephalexin 250 mg PO QID)
Treatment of Complicated

• Pyelonephritis (Hospitalized) +/- Bacteremia
  – Ceftriaxone (Cefepime if risk of P. aeruginosa) IV
  – Ciprofloxacin (check E. coli susceptibility rates)
  – Treat for at least 10 days (14 if bacteremic)
  – May take 48-72 hours for fever to resolve

• Nosocomial / Catheter associated
  – Remove the catheter!
  – Cefepime, Piperacillin/Tazobactam, Imipenem/Cil.

• Prostatitis
  – Fluoroquinolone or TMP/SMX for 28 + days
Other Issues

• Treatment failure or relapse
  – Referral for further workup
  – Longer course of a different drug

• Recurrence (2 or more in 6 month, 3 in 12 month)
  – Self-initiated treatment
  – Prophylactic therapy (reduce risk 95%)
    • Low dose continuous or post-coital
    • Once daily Ciprofloxacin, TMP/SMX, Nitrofurantoin
    • 6-12 months then re-assess
Case: UTI - Conclusion

• Three-day course of trimethoprim–sulfamethoxazole
• Fluoroquinolones if resistance to trimethoprim–sulfamethoxazole is common.
• Frequent recurrences
  – avoid exposure to vaginal spermicides
• Imaging studies reserved for women with complicated infections
Cases: STD

• Richard, a 19 year old male, comes back from Mardi Gras with lots of beads, along with urethral discharge and a penile ulcer.

• Jane, a 16 year old resident of Memphis, resorts to prostitution to support her addiction to Elvis memorabilia. Two years latter, Jane presents to her physician complaining of, fever and abdominal tenderness. On pelvic examination she is found to have cervical motion tenderness.
Risk factors for STD’s = Exposure

• Sexually active (abstinence, “safe-sex”, testing)
  – Unprotected sex
  – Multiple sex partners
    • < 25 years old, Single > Married, Prostitution/Solicitation
  – Special populations
    • Women, adolescents
    • IVDA, Inmates, Homosexuals
    • Ethnicity / Socioeconomic / Regional

• Congenital or Perinatal (testing & treatment)
Overview of STD’s by symptoms

- Ulcers
  - Genital Herpes
  - Syphilis
  - Chancroid
  - Granuloma Inguinale

- Urethritis & Cervicitis
  - NGU +/- Chlamydial
  - Mucopurulent +/- Gonoccal
  - PID

- Vaginal Discharge
  - Bacterial Vaginosis
  - Trichomoniasis
  - Vulvovaginal Candidiasis

- Others
  - HPV
  - Hep A & B
  - Ectoparasitic
  - Proctitis Proctocolitis & Enteritis
  - Epididymitis
  - Sexual Assault

Genital Herpes (HSV)

• **Herpes simplex virus (HSV)**
  – HSV type 1 oral, labial, encephalitis
  – HSV type 2 genital

Epithelial involvement --> spread to sensory nerve ganglia
--> latency --> reactivation (stress or immunosuppression)

• **Clinical Features**
  – 1st episode-fever, malaise, **painful** ulcerated lesions (2-3wks)
  – Subsequent episodes-prodrome and ulceration (8-12 days)

*Highest risk of transmission with active lesions but also possible at other times (asymptomatic viral shedding)*
HSV

- 25% sero-prevalance
- Diagnosis by clinical presentation +/- culture
  - Multiple painful ulcers
- Treatment is palliative not curative
  - Decrease severity, duration
  - 1st episode, episodic & suppression
  - HIV
Herpes

- Different doses (usually higher) needed in HIV

<table>
<thead>
<tr>
<th>GENITAL HERPES</th>
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<tbody>
<tr>
<td><strong>First Episode</strong></td>
<td>Acyclovir</td>
<td>400 mg PO tid x 7-10d</td>
</tr>
<tr>
<td></td>
<td>OR Famciclovir$^{28}$</td>
<td>250 mg PO tid x 7-10d</td>
</tr>
<tr>
<td></td>
<td>OR Valacyclovir</td>
<td>1g PO bid x 7-10d</td>
</tr>
<tr>
<td><strong>Severe</strong> (hospitalized patients)</td>
<td>Acyclovir</td>
<td>5-10 mg/kg IV q8h x 5-7d</td>
</tr>
<tr>
<td><strong>Suppression$^{29}$</strong></td>
<td>Acyclovir</td>
<td>400 mg PO bid</td>
</tr>
<tr>
<td></td>
<td>OR Famciclovir</td>
<td>250 mg PO bid</td>
</tr>
<tr>
<td></td>
<td>OR Valacyclovir</td>
<td>500 mg-1g PO once/d$^{30}$</td>
</tr>
<tr>
<td><strong>Episodic Treatment$^{31}$</strong></td>
<td>Acyclovir</td>
<td>800 mg PO tid x 2d or 400 mg PO tid x 3-5d$^{32}$</td>
</tr>
<tr>
<td></td>
<td>OR Famciclovir</td>
<td>1 g PO bid x 1d$^{33}$</td>
</tr>
<tr>
<td></td>
<td>OR Valacyclovir</td>
<td>500 mg PO bid x 3d</td>
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</table>
Syphilis

*Treponema pallidum*

Acquired by sexual contact with infected mucous membranes, cutaneous lesions, blood transfusions, or perinatally

**Clinical Features**

- **Primary**
  - painless, non-exudative lesion (chancre) at site of spirochete penetration

- **Secondary**
  - 2-6 weeks after primary; mucocutaneous eruptions secondary to hematological spread (commonly on palms & soles; last 4-10 weeks)

- **Late**
  - **Latent** (early < 1 year, late >1yr)  *asymptomatic*
  - **Tertiary** (2-30 years after onset)  *symptomatic*
    - Cardiovascular, skin/bone lesions (gummas)

- **Neurosyphilis** at any stage
Syphilis: Diagnosis

**Definitive**
- Darkfield examination for spirochetes
- Direct fluorescent antibody testing

**Presumptive** Serology (most commonly used tests)
- **Non-treponemal**  
  - VDRL and RPR  
  - False positives; provide titers to follow disease activity
- **Treponemal:**  
  - FTA-ABS and TP-PA  
  - Specific but will always be positive after infection

*One test insufficient to make diagnosis*

**Neurosyphilis** - serology and abnormal CSF; + VDRL-CSF
Syphilis: Treatment

Primary, Secondary, and Early Latent
Benzathine penicillin G 2.4 million units IM x 1 dose
alt: Doxycycline 100mg PO BID x 14 days (not pregnancy)
Ceftriaxone 1g IM/IV daily for 8-10 days

Late Latent or Tertiary (cardiovascular or gumma)
Benzathine penicillin G 7.2 million units IM total
given as 2.4 million units IM Q week x 3 doses
alt: Doxycycline 100mg PO BID x 28 days (not pregnancy)
Response: four-fold decrease in non-treponemal titers
Syphilis: Treatment

**Neurosyphilis**

- Penicillin G 3-4 million units IV Q4hrs for 10-14 days
- or Procaine Penicillin 2.4 million units IM Q Day
- Plus probenecid 500mg PO QID both for 10-14 days

**Pregnancy or neurosyphilis with penicillin allergy**

- Desensitization!!! MMWR 2006;55 (No.RR-11:pp 33-35)

**Congenital** - test mom, test and often treat baby

**HIV** - close follow-up of titers

**Jarisch-Herxheimer reaction**: acute febrile reaction often with headache, myalgia within first 24hrs of treatment
Nongonococcal urethritis (NGU)

Urethritis w/o identification of Gonorrhoeae, Chlamydia
C. trachomatis, Ureaplasma urealyticum, Mycoplasma genitalium, trichomonas vaginalis, & HSV?
Causes epididymitis & Reiter’s in males

**Treatment**
- Azithromycin 1g PO x 1 dose
- or Doxycycline 100mg PO BID for 7 days

**Alternatives**
- Erythromycin

**Recurrence**
- Metronidazole 2g PO x 1 dose
- PLUS Erythromycin x 7days
Chlamydia 

*Chlamydia trachomatis*

Atypical Gram-Negative Bacilli

Sexual contact, autoinoculation (mother to child)

**Clinical Features**

Similar to GC (urethritis, epididymitis, endometritis, proctitis, pharyngitis, conjunctivitis)

**Females:** often asymptomatic

**Males:** mucoid, watery discharge, dysuria, frequency

**Diagnosis**

Culture, Nucleic acid amplification
# Chamydia: Treatment

<table>
<thead>
<tr>
<th>CHLAMYDIAL INFECTION AND RELATED CLINICAL SYNDROMES(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urethritis, cervicitis, conjunctivitis, or proctitis (except lymphogranuloma venereum)</td>
</tr>
<tr>
<td>Azithromycin(^2)</td>
</tr>
<tr>
<td>OR Doxycycline(^2,4-6)</td>
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<tr>
<td>Infection in Pregnancy</td>
</tr>
<tr>
<td>OR Azithromycin</td>
</tr>
<tr>
<td>OR Amoxicillin</td>
</tr>
<tr>
<td>Neonatal Ophthalmia or Pneumonia</td>
</tr>
<tr>
<td>Azithromycin</td>
</tr>
<tr>
<td>Lymphogranuloma venereum</td>
</tr>
<tr>
<td>Doxycycline(^4,5)</td>
</tr>
</tbody>
</table>
Gonorrhea

*Neisseria gonorrhoeae*

Gram-Negative diplococci

Sexual contact, autoinoculation (mother to child)

**Clinical Features**

**Females:** cervicitis, urethritis, vaginal discharge (slightly purulent) intermittent bleeding, lower abdominal pain, dysuria, also may be asymptomatic

**Males:** Urethritis, proctitis, pharyngitis, profuse purulent discharge, may have dysuria or frequency

**Dissemination**

bacteremia, arthritis, skin lesions, meningitis, & endocarditis
Gonorrhea  

*Neisseria gonorrhoeae*

**Diagnosis by Gram-Stain or Culture**

- Urethral, cervical, rectal or pharyngeal
  - Ceftriaxone 125 mg IM once
  - Cefixime 400 mg PO once
  - Alternatives  Cefpodoxime 400 mg PO once
    - Pregnant & beta-lactam allergic
      - Azithromycin 2g PO once
      - Gentamicin 300 mg IM/IV once

- Bacteremia, Septic Arthritis
  - Ceftriaxone 1 gram IV Q24h x 24-48h
    - then Cefixime or Cefpodoxime 400 mg PO BID x > 1 week

- Also cover Chlamydia
Pelvic Inflammatory Disease (PID)

Inflammatory infection of upper female genital tract
  endometritis, salpingitis, tubo-ovarian abscess & pelvic peritonitis

Usually polymicrobial:
  STD’s: *N gonorrhoeae, C. trachomatis*
  & vaginal flora:
    anaerobes, *G. vaginalis, H. influenzae*,
    enteric Gram-negative rods & *Strep. Agalactiae*

Leading Cause of Infertility & Ectopic Pregnancy
  8% risk w/ one episode - 40% risk w/ 3 episodes
Pelvic Inflammatory Disease (PID)

**Clinical features**
Lower abdominal tenderness, adnexal tenderness & cervical motion tenderness

**Additional Criteria**: Fever (oral temp >101 F), abnormal cervical or vaginal discharge, increased ESR, Elevated C-reactive protein, documented infection with N. gonorrhoeae or C.trachomatis

**Diagnosis**
Clinical features +/- laparoscopy, ultrasound

**Hospitalization**
Pregnancy, NPO, severe, abscess, immunodeficient
Pelvic Inflammatory Disease (PID)

- Parenteral
  - Cefotetan 2g IV Q12h
    AND  Doxycycline 100 mg PO/IV Q12h
  - Clindamycin 900 mg IV Q8h
    AND  Gentamicin 2 mg /kg once
    then 1.5 mg/kg IV Q8h
  - Alternative
    • Ampicillin/Sulbactam 3g IV Q6h
      AND  Doxy 100 mg PO/IV Q12h

- All followed by doxycycline 100 mg PO Q12h to complete 14 days of treatment
Pelvic Inflammatory Disease (PID)

• Outpatient
  – Ceftriaxone 250 mg IM once
    AND doxycycline 100 mg PO Q12h x 14 days
    +/‐ metronidazole 500 mg PO Q12h x 14 days

• If low FQRNG
  – Oflox or Levoflox
    AND metronidazole
  ?Moxifloxacin?
Vaginitis / Vaginal Discharge

Trichomoniasis, Bacterial Vaginosis, and Vulvovaginal Candidiasis

Clinical Features
vaginal discharge or vulvar itching & irritation +/- odor

Diagnosis
- pH > 4.5: BV or Trichomoniasis
- Amine odor w/ KOH: BV ( + “whiff” test)
- Microscopic exam:
  - yeast/pseudohyphae: Candida sps, seen best w/KOH
  - Motile protozoa: Trichomoniasis
  - “Clue Cells”: BV
Bacterial Vaginosis

Replacement of normal $\text{H}_2\text{O}_2$ producing lactobacillus with high concentrations of anaerobes, $G. \text{vaginalis}$, & $M. \text{hominis}$

Clinical Features

most prevalent cause of vaginal discharge or malodor but up to 50% asymptomatic

Associated with multiple sex partners but not clearly STD

Treatment of male sex partner not beneficial

Diagnosis

Three of the following: homogeneous white, noninflammatory discharge, clue cells on microscopy, pH $>4.5$, + whiff test
Bacterial Vaginosis

- Metronidazole 500 mg PO BID x 7 days
  - Preferred regimen in pregnancy
  - MTN ER 750 mg PO once daily x 7 days
- Tinidazole 2 g PO once daily x 2 days
  - Tinidazole 1 g PO once daily x 5 days
- Metronidazole gel 0.75% 5 g InVag
  once or twice daily x 5 days
- Clindamycin 2 % cream 5 g InVag QHS x 3-7 days
  - Clindamycin 300 mg PO BID x 7 days
  - Clindamycin ovules 100 mg InVag QHS x 3 days
Bacterial Vaginosis

**Treatment in pregnancy**

Infection-adverse outcome: Screen & treat

- Metronidazole 500mg BID or 250mg PO TID for 7 days
- or Clinda 300mg PO BID for 7 days

Multiple studies & meta-analyses have not demonstrated an association between metronidazole use during pregnancy & teratogenic or mutagenic effects in newborns

Unclear if you should treat asymptomatic low risk patients
Trichomoniasis

Clinical Features
Males: usually asymptomatic, some NGU
Females: Often symptomatic - diffuse, malodorous, yellow-green discharge with vulvar irritation
Adverse pregnancy outcomes (PROM & preterm delivery)

Diagnosis
pH>4.5 and protozoa on microscopy

Treatment
Metronidazole 2g PO x 1 dose (even if pregnant)
Tinidazole 2g PO once
Metronidazole 375 - 500mg PO BID for 7 days
Vulvovaginal Candidiasis

*C. albicans*, occasionally other *Candida* sp or *Torulopsis* sp
75% - at least 1 episode, 40-45% - 2 or more episodes, <5% recurrent

**Clinical Features**
vulvovaginal pruritus & erythema +/- white discharge

**Diagnosis**
Yeast or pseudohyphae on microscopy; culture. pH ≤4.5

**Treatment**
Intravaginal azoles with 1, 3 7 day treatments available OTC
  - oil based creams & suppositories might weaken condoms/diaphragms
Fluconazole 150mg PO x 1 dose (Rx) *not in pregnancy*
Human Papillomavirus (HPV)

Most HPV asymptomatic, subclinical, unrecognized

Visible genital warts with HPV 6 or 11 (rarely causes carcinoma)

Cervical dysplasia with HPV 16, 18, 31, 33, 35 & occasionally warts

PREVENT: Gardasil (types 6, 11, 16, 18)

Routine for girls 11-12 (9 – 26)
**HPV**

**Treatment**
(removal or reduction) is only symptomatic
*no affect on infectivity or development of cancer*

- **Patient applied:**
  Podofilox 0.5% solution or gel BID x 3 days, off 4
  Imiquimod 5% cream QHS 3 times/week

- **Provider-administered**
  Cryotherapy, Podophyllin resin 10-25%,
  TCA or BCA 80-90%, Surgical removal
Other things

Perinatal exposure

**Screen** mom

HIV: All pregnant women in USA ASAP

1\textsuperscript{st} visit / Trimester:

- Syphilis, Chlamydia, HBsAg
- +/- gonorrhoeae, Hep C, BV, PAP

**Treat** mom, baby

per CDC’s recommendations - Look up!

**Vaccines**

- **Hep B** vax if evaluated for STD
- **Hep A** vax for homo/bisexuals & IVDA
- **Gardisil** if you are female

& might ever have sex