Microbiology - GUS

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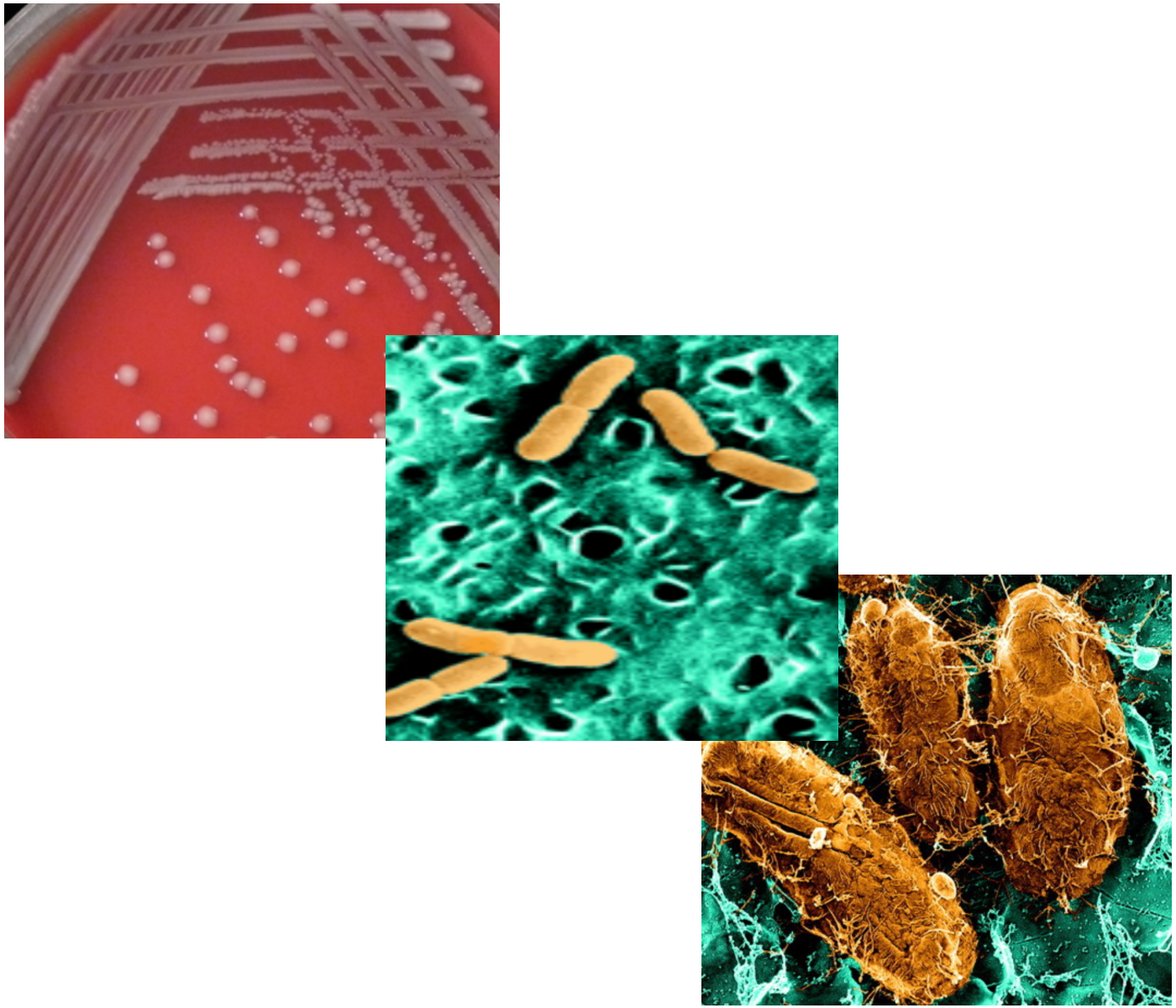
Microbiology of Urogenital system



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Lecture 3

How do UTI patients present?

The term urinary tract infection (UTI) encompasses a variety of clinical entities, including :

- **Asymptomatic bacteriuria (ASB)**
- **Cystitis**
- **Pyelonephritis.**
- **Prostatitis**

Asymptomatic bacteriuria: When there is bacteria present in the urine but no symptoms, we can't call it infection.
In the future, the presences of bacteria in the urine might cause complications: in **pregnancy**,, preeclampsia, abortion, preterm labor and low birthweight (we should screen for asymptomatic bacteria)
Sepsis ,In any time you're going to injure the mucosal lining of the urinary tract (surgery, renal transplantation, removal part of the kidney,….)

Asymptomatic bacteriuria (ASB)

- The diagnosis of ASB involves criteria that is both **microbiologic** (cut off count of CFU in urine) and **clinical** (no referable symptoms to UTI)

- For asymptomatic women, bacteriuria is defined as 2 consecutive voided urine specimens with isolation of the same bacterial strain in quantitative counts $\geqslant 10^5$cfu/mL

- A single, clean-catch voided urine specimen with 1 bacterial species isolated in a quantitative count $\geqslant 10^5$ cfu/mL identifies bacteriuria in men

- ***Escherichia coli*** remains the single most common organism isolated from bacteriuric women. characterized by **fewer virulence characteristics** than are those isolated from women with symptomatic infection.

- The diagnosis of asymptomatic bacteriuria should be based on culture of a urine specimen collected in a manner that minimizes contamination

2 specimens to call it ASB in the women, while in men a single specimen could be enough to call it ASB. Because contamination is more common with female

Asymptomatic bacteriuria (ASB)

- Screening of asymptomatic subjects for bacteriuria is appropriate if bacteriuria has **adverse outcomes** that can be prevented by antimicrobial therapy

- Women identified with **ASB** in early **pregnancy** have a 20–30-fold increased risk of developing **pyelonephritis** during pregnancy. As well as experience **premature delivery** and to have **infants of low birth weight**.

- **Pregnant women should be screened for bacteriuria** by urine culture **at least once** in early pregnancy, and they should be treated if the results are positive

- ASB or funguria **should not screened for or treated** in patients with an indwelling urethral catheter.

  There is no need for screening or treatment if theyare not showing any symptoms or signs

- Patients with asymptomatic bacteriuria who undergo **traumatic genitourinary procedures** associated with mucosal bleeding have a high rate of **postprocedure bacteremia** and **sepsis**.

- **Screening for and treatment of ASB** before **transurethral resection of the prostate** is recommended

Catheter-associated urinary tract infection (CAUTI)

- Urinary tract infections are the **most common type of healthcare-associated infection**, accounting for more than 30% of infections reported by acute care hospitals.

- Virtually all healthcare-associated UTIs are caused by instrumentation (CAUTI).

- The source of microorganisms causing CAUTI can be **endogenous**, typically via meatal, rectal, or vaginal colonization, or **exogenous**, such as via contaminated hands of healthcare personnel or equipment.

- Patients should be catheterized for **clear indications** only. Consider **alternatives** to chronic indwelling catheters, such as **intermittent catheterization.**

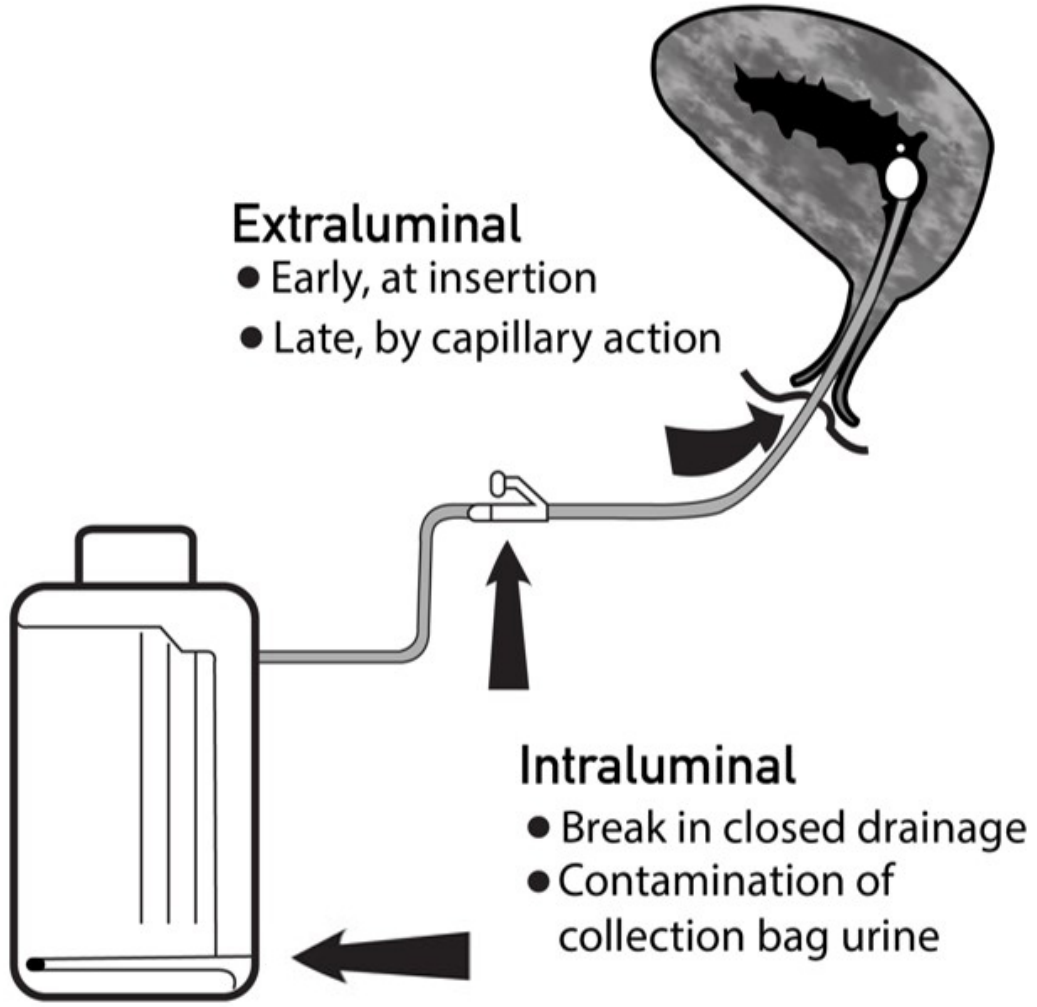
- Bacteria may **persist** in the catheter **biofilm**, and it is sensible to **remove or replace** the catheter, if possible. Patients are treated with **empirical IV antibiotics**, based on local antibiotic susceptibility patterns and previous infections.

Biofilm: polysaccharides, proteins, DNA, micro molecules…it coversthe bacteria from the outside environment including antibiotics, immune system, antibodies,,, it facilitate communication between bacteria

Catheter-associated urinary tract infection (CAUTI)

- There are two ways through which bacteria can enter the body (routes of entry) via the urinary catheter. Potentially harmful bacteria may enter the bladder by either **extraluminal** or **intraluminal** routes. The extraluminal route refers to the outside of the catheter—i.e., between the catheter and the uroepithelial surface (urethral surface). The intraluminal route refers to bacteria entering through the inside of the catheter—e.g., when there is a break in the closed drainage system and/or when asepsis is defective. This can occur during specimen collection or when the bag is disconnected.

- CAUTI may either be endogenous (occurring via meatal, rectal, or vaginal colonization) or exogenous (occurring via contamination from equipment or contact with the hands of an HCW).



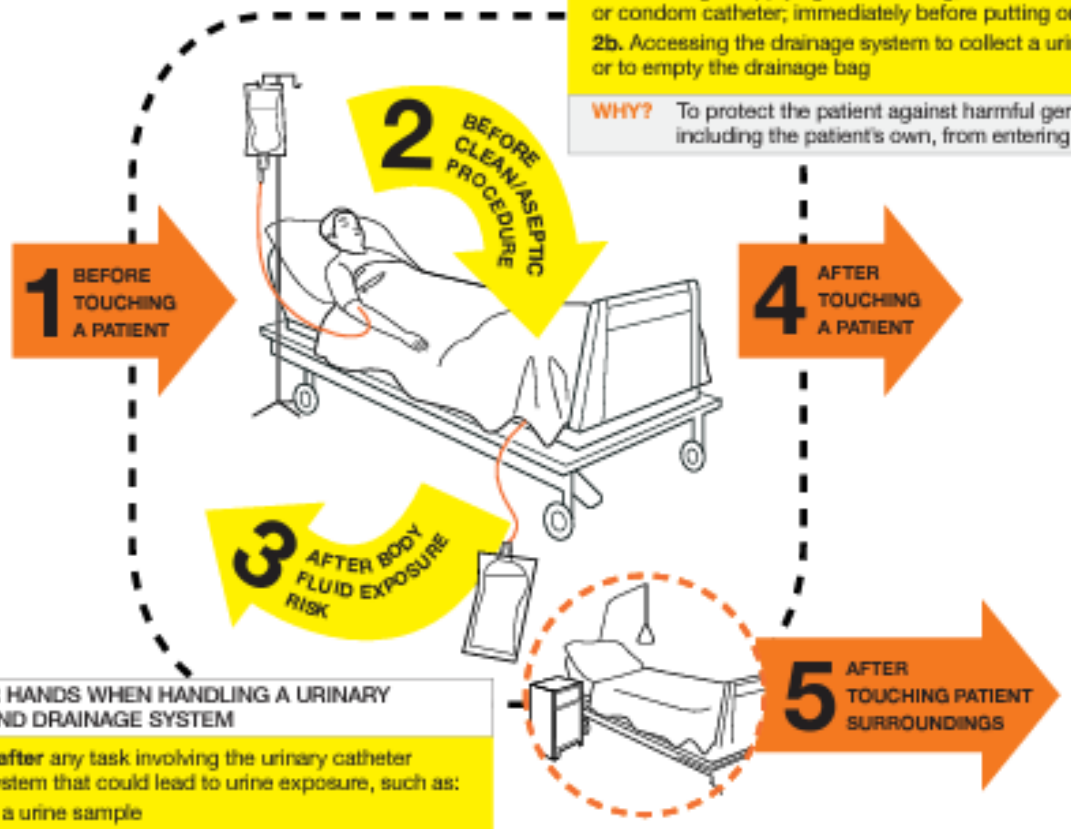
CLEAN YOUR HANDS WHEN HANDLING A URINARY CATHETER AND DRAINAGE SYSTEM

Immediately before any manipulation of the urinary catheter or drainage system that could lead to contamination of the sterile urine, such as:

2a. Inserting or applying an indwelling, intermittent straight, or condom catheter; immediately before putting on sterile gloves

2b. Accessing the drainage system to collect a urine sample or to empty the drainage bag

WHY? To protect the patient against harmful germs, including the patient's own, from entering his/her body.



CLEAN YOUR HANDS WHEN HANDLING A URINARY CATHETER AND DRAINAGE SYSTEM

Immediately after any task involving the urinary catheter or drainage system that could lead to urine exposure, such as:

3a. Collecting a urine sample

3b. Emptying the drainage bag

3c. Removing the urinary catheter

WHY? To protect yourself and the health-care environment from harmful patient germs.

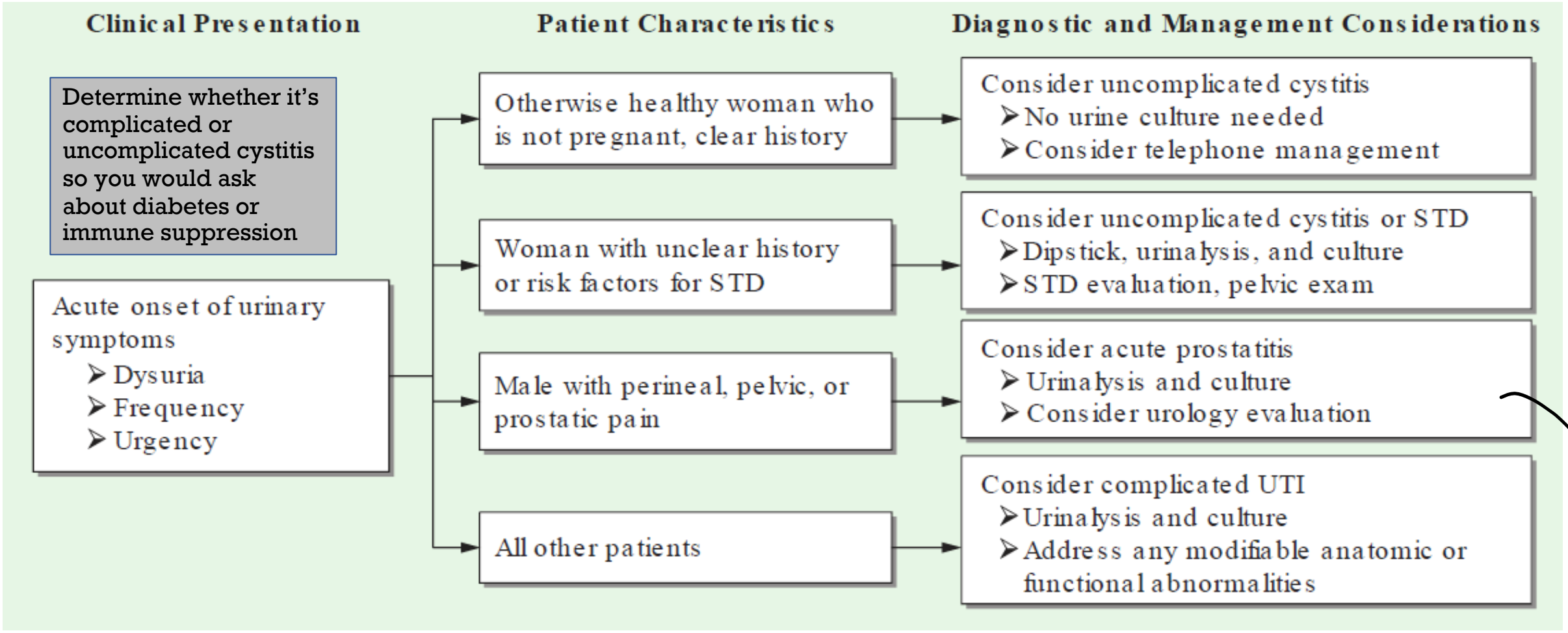
https://openwho.org/courses/IPC-CAUTI-EN

5 KEY ADDITIONAL CONSIDERATIONS FOR A PATIENT WITH A URINARY CATHETER

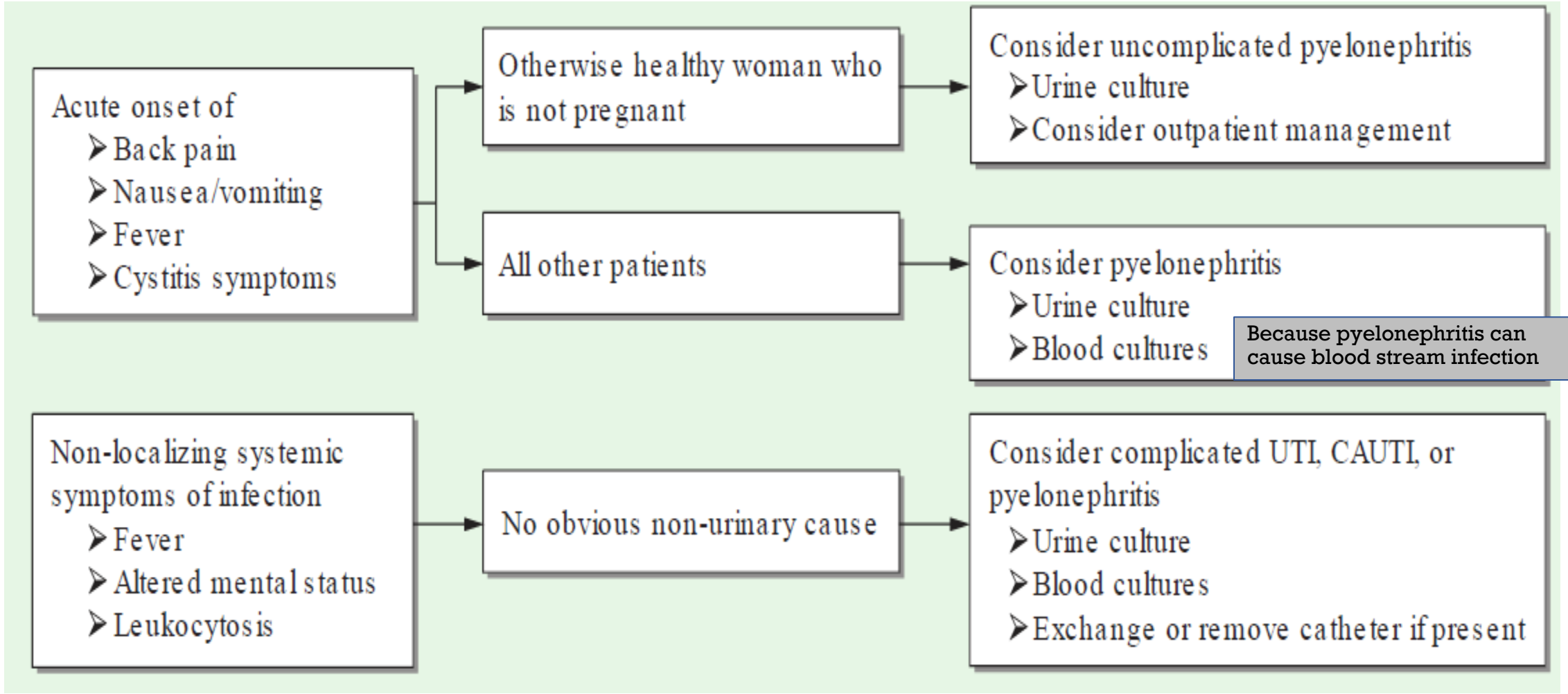
- Make sure that there is an appropriate indication for the indwelling urinary catheter.
- Use a closed urinary drainage system, and keep it closed.
- Insert the catheter aseptically using sterile gloves.
- Assess the patient at least daily to determine whether the catheter is still necessary.
- Patients with indwelling urinary catheters do not need antibiotics (including for asymptomatic bacteriuria), unless they have a documented infection.

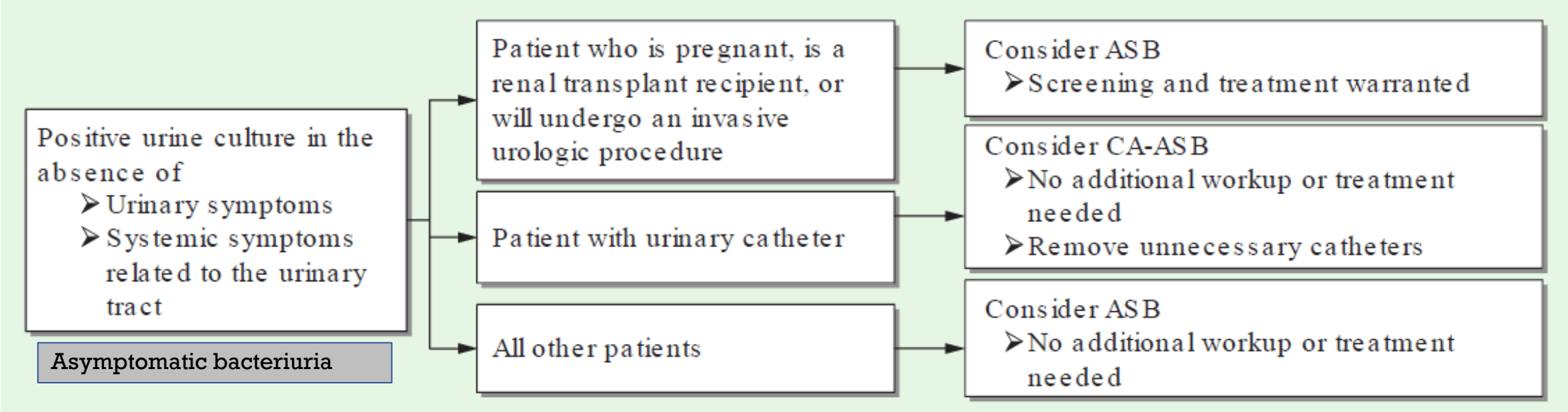
World Health Organization | **SAVE LIVES** Clean **Your** Hands | **No Action Today No Cure Tomorrow**

Revision for the last lectures read them carefully



Examine to the prostate to know whether the prostitis is caused by a malignancy or to immune disease …


Acute onset of
Back pain
Nausea/vomiting
Fever
Cystitis symptoms
Otherwise healthy woman who is not pregnant
All other patients
Consider uncomplicated pyelonephritis
Urine culture
Consider outpatient management
Consider pyelonephritis
Urine culture
Blood cultures
Because pyelonephritis can cause blood stream infection
Non-localizing systemic symptoms of infection
Fever
Altered mental status
Leukocytosis
No obvious non-urinary cause
Consider complicated UTI, CAUTI, or pyelonephritis
Urine culture
Blood cultures
Exchange or remove catheter if present


Positive urine culture in the absence of
Urinary symptoms
Systemic symptoms related to the urinary tract
Asymptomatic bacteriuria
Patient who is pregnant, is a renal transplant recipient, or will undergo an invasive urologic procedure
Patient with urinary catheter
All other patients
Consider ASB
Screening and treatment warranted
Consider CA-ASB
No additional workup or treatment needed
Remove unnecessary catheters
Consider ASB
No additional workup or treatment needed

- A 23-year-old woman at 8 weeks gestation, comes to the clinic for her first antenatal visit. She reports no symptoms apart from some mild nausea which she is managing with small, frequent meals. A urine sample is sent as part of the routine pregnancy panel. Culture shows greater than 100,000 CFU/mL of gram-negative rods. Failure to appropriately treat this condition will place this patient at an increased risk for?

An untreated urinary tract infection in pregnant patients is associated with an increased risk of several complications including: **pyelonephritis**, **preterm labor**, second-trimester abortion, preeclampsia, maternal anemia, and chroioamnionitis.

nitrofurantoin or **trimethoprim** tend to be used first line for empiric treatment and are both safe in pregnancy

First line drugs

- A 25-year-old woman comes to the clinic because of urinary frequency and dysuria for the past 3 days. She is otherwise healthy and states that she is sexually active. Physical examination shows suprapubic tenderness. Urinalysis shows the presence of leukocyte esterase and nitrites. Which of the following is the most likely causative organism for her condition?

Escherichia coli is a gram-negative bacteria that is the most common pathogen found in community-acquired urinary tract infections.

Leukocyte esterase has a high sensitivity but low specificity – any inflammation can cause it However nitrites is much more specific

- A 82-year-old woman is sent from her nursing home to the emergency department because of concerns for sepsis. The patient has late-stage Alzheimer's, no known drug allergies, and an indwelling Foley catheter. The referral letter states that she has **had back pain, fevers, and tachycardia** for the past two days. Physical examination shows costovertebral tenderness on the right. Urinalysis is positive for protein, leukocyte esterase, and nitrates and shows greater than 50 WBC per high powered field. Laboratory studies show a leukocytosis. Which of the following is the next best step in the management of this patient?

This patient has classic signs of urosepsis, most likely caused by a **catheter-associated urinary tract infection (CAUTI).** While the culture is pending, the next best step is to **remove the indwelling Foley catheter** and then commence **empiric antibiotic therapy** according to local guidelines.

Take sample from urine bag for culture

- A 48-year-old woman comes to the emergency department because of ‘burning, bloody urine’ (dysuria). She has been urinating more frequently for the past 2 days, but she denies polydipsia, vaginal discharge, back pain, abdominal pain, nausea, vomiting, or fevers. Physical examination shows that she is afebrile and her other vital signs are stable. Her abdomen is soft, non-tender and there is no flank tenderness. Urine dipstick is positive for leukocyte esterase and nitrites. What is the most appropriate initial treatment option?

Uncomplicated UTI is most commonly caused by Escherichia coli and **trimethoprim-sulfamethoxazole** (TMP-SMX) is the most common first line empiric antibiotic used for treatment whilst awaiting culture results.

Individualized treatment choice between nitrofurantoin, TMP-SMX, and ciprofloxacin depends largely on **clinical picture**, **allergy**, **tolerability**, **compliance** and **local community resistance patterns**

A 38-year-old woman comes to the office because of ongoing urinary frequency, urgency, and dysuria. Patient's medical history includes recurrent urinary tract infections, with about four to six each year for the last three years. She says that her symptoms typically resolve with antibiotic use, but will return once she stops using the antibiotics. Urinalysis is performed and shows the following:

Urine Studies	Result
pH	9
Protein	0 mg/dL
Glucose	Negative
Blood	Negative
White blood cells	15-20 cells HPF
Leukocyte esterase	Positive
Epithelial cells	<5 cells HPF
Bacteria	Absent

What is the most likely underlying cause of this patient's recurrent urinary tract infections?

Not uncomplicated cystitis because it is recurrent

High PH -> stone formation

Recurrent urinary tract infections despite appropriate antibiotic use, and a **urinary pH >8** should clue you into a **urease producing organism** or a **struvite kidney stone**.
Struvite kidney stones or triple phosphate stones are composed of magnesium, ammonium and phosphate.

Further reading:

- Oxford handbook of infectious diseases and microbiology-

Part4: Clinical syndroms

Chapter 17 Urinary tract infections

- Harrison's Infectious Diseases 3rd Edition

SECTION III Infections in organ systems

Chapter 33