

# نحوه اپروچ به باکتریوری در کودک ۳ ساله در درمانگاه پزشکی خانواده

ارائه دهنده: سارینا زکوی، اینترن پزشکی خانواده

استاد راهنما: خانم دکتر حجتی، فوق تخصص ارولوژی اطفال

# HISTORY

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- کودک 2 سال و 9 ماهه که به علت کم وزنی و لاغری شدید از طرف مراقب سلامت به پزشک مرکز ارجاع CC: شده است.
- وزن کودک 10 کیلوگرم (روی نمودار -2 SD) PI:
- و قد 88 سانتی متر (روی نمودار -1 SD)
- مادر کودک شکایت خاصی ندارد و تنها ذکر می کند که ادرار کودک بدبو است و گهگاهی حین ادرار کردن، بی قراری می کند.

# HISTORY

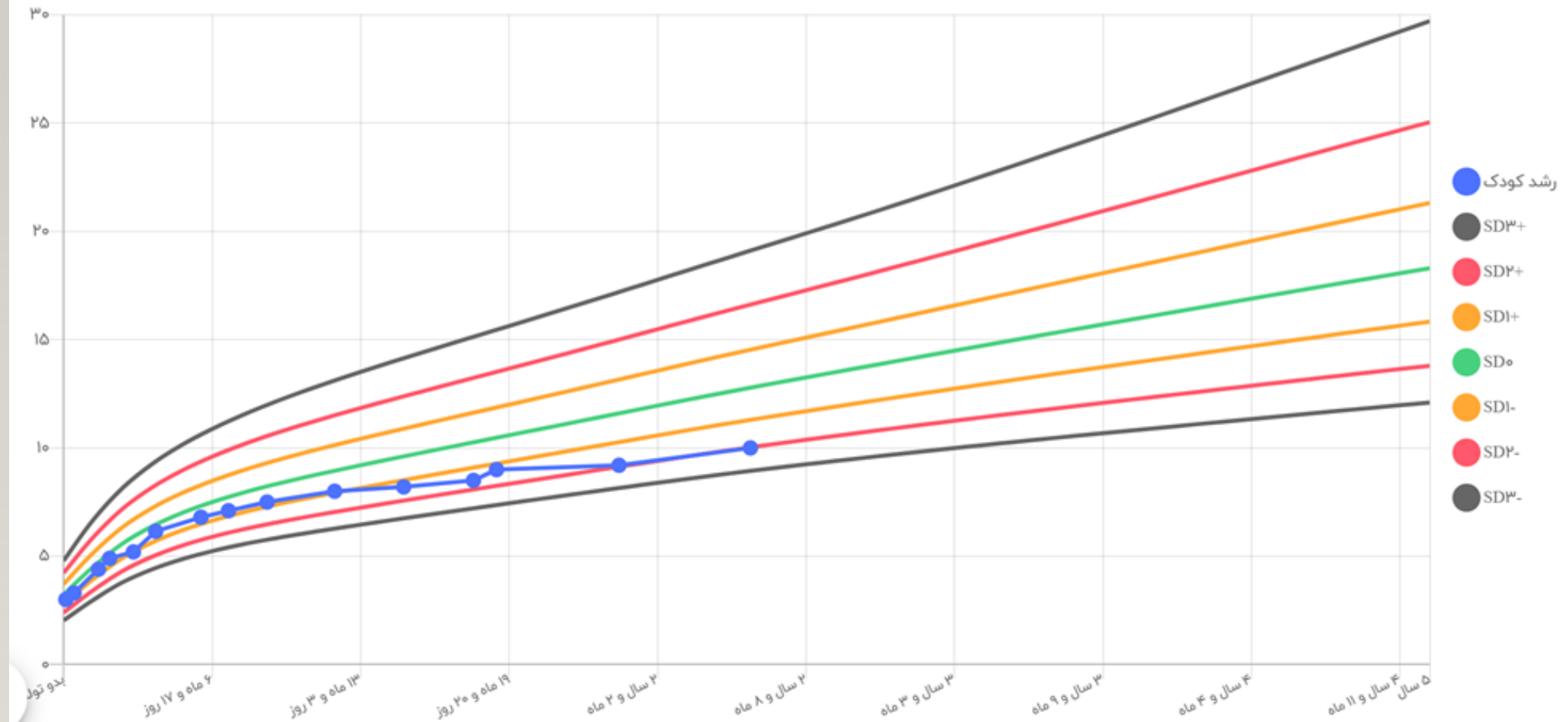
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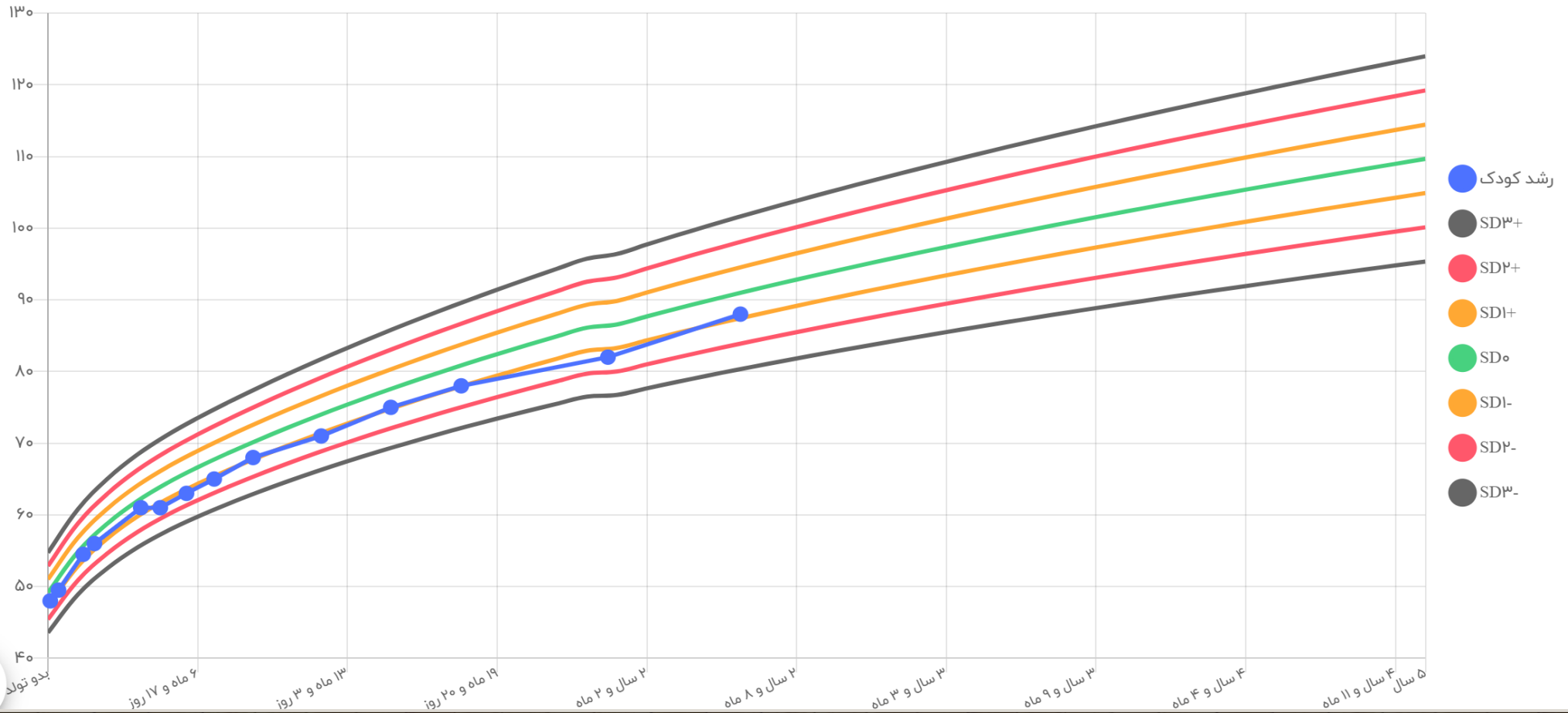
- /فرزند 1 از 2/ اهل کشور افغانستان، متولد ایران؟ NVD وزن و قد بدو تولد: 3 کیلوگرم و 48 سانتی متر / PH:
- غربالگری روز 3-5 و سایر غربالگری های روتین برای کودک انجام شده و هیچکدام مورد غیرطبیعی نداشته است. همچنین کودک از نظر تکاملی نیز نرمال است. وی از شیرمادر تغذیه شده است و هم اکنون از غذای سفره می خورد و طبق پرونده الکترونیک، هیچگاه مشکل تغذیه نداشته است.
- از حدود ؟ ماه گذشته کودک در حال toilet training است.
- همگی منفی هستند PSH, DH, AH, FH



# نمودار وزن

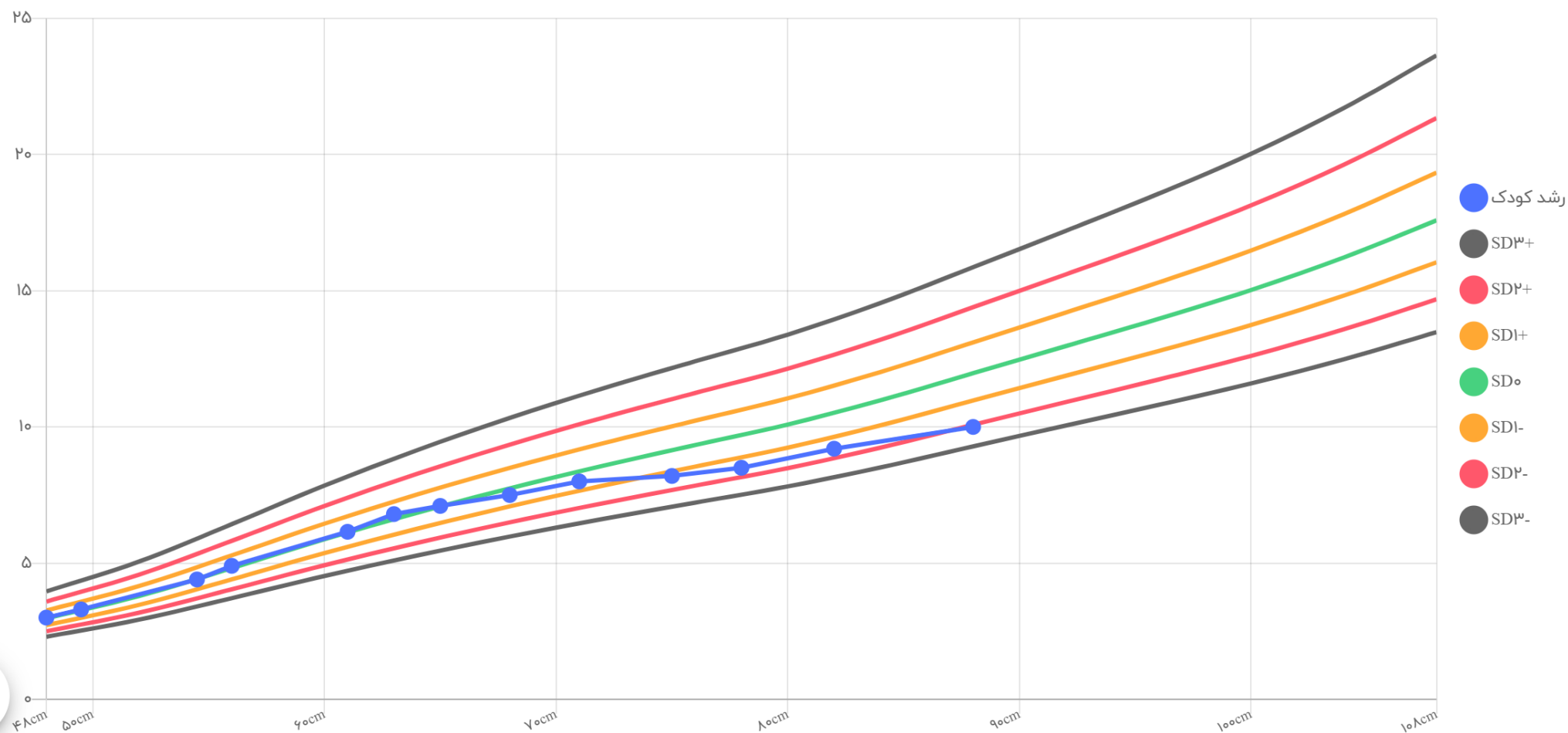
مرسانا عزیزی  
۲ سال و ۹ ماه و ۷





# نمودار وزن برای قد

مرسانا عزیزی  
۲ سال و ۹ ماه و ۷ روز



# PHYSICAL EXAMINATION

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- در معاینه کودک بیدار و به آرامی در اغوش مادر نشسته است.
- تبار نیست. شواهد دیسترس تنفسی و دهیدریشن ندارد.
- علایم حیاتی پایدار، سمع قلب و ریه نرمال و همچنین نبض اندامهای فوقانی پر و قرینه است.



## اپروچ به کموزنی (طبق بوکلت کودک سالم)

- اگر منحنی وزن برای سن کودک مساوی 3- score-z تا پایین تر از 2zscore- باشد کودک در این طبقه بندی قرار میگیرد.
- بعد از شرح حال کامل به ویژه شرح حال تغذیه ای و معاینه فیزیکی، در صورت نبود وجود بیماری آزمایش های زیر درخواست می شود.
- CBC, BUN, Cr, Na, K, Ca, P, FBS, ALP, U/A, U/C, and S/E x3, (Serum IgA, anti TTG IgA)
- در صورت طبیعی بودن آزمایشها --> توصیه مکمل، ارجاع به کارشناس تغذیه و پیگیری کودک زیر 2 ماه 10 روز بعد، 2 ماهه تا یکسال 2 هفته بعد، و بالای یک سال یک ماه بعد
- در صورتی که بعد از 2 بار پیگیری کودک افزایش وزن نداشته باشد یا منحنی وزن برای سن روند نزولی داشته باشد --> ارجاع کودک به متخصص کودکان



شماره پذیرش: 09-268	تاریخ پذیرش: 1403/09/14	سن: 3 سال	صفحه: 1 از 1
نام مراجعه کننده: خانم مرسانا عزیزی	تاریخ جوابدهی: 1403/09/19	نام پزشک: سیرکار خاتم دکتر - عبادتی	

Hematology					
Test	Result	Unit	Normal Range	Differential	
C.B.C	-		-	Neutrophils	64
W.B.C	12.4	ul/×1000	5-15.5	Lymphocyte	36
RBC	4.62	M/ul	4.1-5.1	Monocyte	-
Hemoglobin	12.9	g/dl	11.5-13.5	Eosinophilia	-
Hematocrite	40	%	35 - 48		
M.C.V	88	fL	80-96.1		
M.C.H	27	pg	27-33.2		
M.C.H.C	L 31	g/dl	32-36		
Platelets	303	×1000/mm3	150-450		

L=Low :

Urine Analysis				
Macroscopic	Result	Normal Range	Microscopic	Result
Urine analysis	-	-	W.B.C	1-2
Color	Yellow	-	RBC	1-2
Appearance	Clear	-	Epithelial cells	0-1
Specific Gravity	1.030	-	Bacteria	Negative
PH	5.00	-	Mucus	Negative
Proteins	Negative	-		
Glucose	Negative	-		
Bilirubin	Negative	-		
Urobilinogen	Negative	-		
Ketones	Negative	-		
Nitrite	Negative	-		
Hemoglobin	Negative	-		
Blood	Negative	-		

Microbiology				
Test	Result	Unit	Method	Normal Range
Colony Count	>100000			-
Culture	E.coli			-
Resistant to	OXACILLIN(OX), CEFTRIAXON(CRO), Nalidixic Acid(NA), cefazolin(CZ)			-

# URINE SAMPLING

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- Toilet trained children:
  - Females: spread the labia → cleanse perineum with non-foaming antiseptic solution or mild soap x2-3
  - Male: retract foreskin and cleanse the perineum
- Then collect specimen midway through urination in a sterile container.

# URINE SAMPLING

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- Infants and non-trained children:
- Bag specimen: In children  $\geq 6$ mo; broadly cleanse genitalia and perineum with antiseptic solution → apply the urine bag
- Bladder stimulation technique: For infants  $< 6$ mo; feed the infant for up to 20 min → cleanse genitalia → suspend the infant under the arms with legs dangling in males and hip flexed in females → hold the sterile cup below patient → gently tap over bladder 100/min for 30 sec followed by 30 sec of paravertebral massage (up to x5).
- However, because of the importance of timely detection of a UTI in younger infants, and because the bladder stimulation technique is successful in only about half of patients, bladder catheterization is the recommended technique to acquire urine from infants six months of age and younger.



# URINE SAMPLING

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- Catheterization or SPA → the preferred method of urine collection for dipstick and microscopic examination of the urine in infants and young children who are not toilet-trained
- However, preliminary evidence suggests that a *bag urine for a screening urine dipstick and/or urinalysis may prevent the need for a catheterized urine culture* in selected patients older than 6 months of age at low risk for a UTI.
- If a negative dipstick for leukocytes and nitrites on a bag urine specimen is used to forego urine culture → closely follow-up to assure that fever resolves and no further signs of UTI develop because a negative urinalysis does not exclude a UTI.



# URINE SAMPLING

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- Urine screening with a bag specimen is not recommended for children with urinary tract abnormalities, recent genitourinary tract surgery, immune deficiency, neurogenic bladder, ill-appearing children, or children who require antibiotics immediately after the urine specimen is collected.
- Furthermore, an infant or young child should not receive antibiotics on the basis of a positive urine dipstick or urinalysis, from a clean catch or voided bag urine specimen because of the high rates of urine culture contamination associated with these methods. For example, up to 85 percent of positive cultures from bag urine specimens represent false-positive results. Positive urine screening from a voided or bag urine sample warrant another urine sample for urinalysis and culture collected by TUBC or SPA

# URINE SAMPLING

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- Transurethral bladder catheterization (TUBC): 72-100% success rate in sampling
- Explain anatomy and indications for parents, to avoid unnecessary parental anxiety.
- Use latex-free catheters, especially in children with spina bifida and other conditions requiring frequent catheterization.
- Use point-of-care ultrasound to ensure presence of urine in bladder.
- Topical lidocaine doesn't relieve pain in infants and young children <4 years.
- Procedure is similar to adults' catheterization.
- Catheter size is 5F for <6mo, 8F for >6mo-adolescents, 10F for adolescents

# URINE SAMPLING

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- Suprapubic aspiration (SPA): much less common than TUBC, usually not performed in children > 2 years.
- Success rates 45-65% without ultrasound and up to 80% with it.
- Explain anatomy and indications to the parents → restrain patient in supine and frog-leg position → prepare the area widely with antiseptic solution → occlude urethral opening by squeezing penile urethra in males or applying urethral pressure to meatus in females → insert a 22G needle attached to a 3-5ml syringe in the midline 1-2 cm above symphysis pubis, angled at a 10-20 degrees from vertical plane, under negative pressure until urine returns.



# URINE SAMPLING

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- Relative rates of urine culture contamination in different techniques:
- SPA: 1%
- TUBC: 6-12%
- Clean catch voided ( stimulation technique or bag specimen): 16-63%
- We recommend that infants and children with a suspected UTI, who are not toilet trained and who are ill enough to merit antimicrobial therapy, have urine cultures obtained by TUBC or SPA rather than by clean catch or clean urine bag specimen.



Test characteristics of tests used to diagnose urinary tract infections in children

	Sensitivity	Specificity	Positive likelihood ratio*	Negative likelihood ratio <sup>†</sup>
Dipstick				
LE	84%	78%	4	0.2
Nitrite	50%	98%	25	0.5
Nitrite or LE	88%	93%	13	0.1
Nitrite and LE	72%	96%	18	0.3
Microscopy				
Uncentrifuged				
Pyuria (> 10/mm <sup>3</sup> ) (all ages)	77%	89%	7	0.4
Pyuria (> 10/mm <sup>3</sup> ) (< 2 years)	90%	95%	18	0.1
Bacteriuria (Gram-stained)	93%	95%	19	0.1
Overall (P + B) = enhanced	85%	99.9%	85	0.1
Overall (P or B)	95%	89%	9	0.1
Centrifuged				
Pyuria (> 5/hpf)	67%	79%	3	0.4
Bacteriuria	81%	83%	5	0.2
Overall (P + B)	66%	99%	7	0.4

# UTI IN CHILDREN OLDER THAN 2 YEARS

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- Prevalence: 7.8% in patients presenting with urinary symptoms and/or fever
- Microbiology:
  1. E.coli (80%), other gram-negatives including Klebsiella, Proteus, Enterobacter, and Citrobacter, Gram-positive bacterial pathogens include Staphylococcus saprophyticus, Enterococcus, and, rarely, Staphylococcus aureus.
    - Infection with an organism other than E. coli is associated with a higher likelihood of kidney scarring.
  2. Viruses (eg, adenovirus, enteroviruses, Coxsackieviruses, echoviruses), usually limited to the lower urinary tract.
  3. Fungi (eg, Candida spp, Aspergillus spp, Cryptococcus neoformans, endemic mycoses) are uncommon causes of UTI in children.
    - Risk factors for fungal UTI include immunosuppression and long-term use of broad-spectrum antibiotic therapy, and indwelling urinary catheter.

# HOST FACTORS

1. Age: Prevalence of UTI is highest in males younger than one year and females younger than four years.
2. Lack of circumcision: Uncircumcised male infants with fever have a four- to eightfold higher prevalence of UTI than circumcised male infants penis.
3. Female infants: Female infants have a two- to fourfold higher prevalence of UTI than male infants. This has been presumed to be the result of the shorter female urethra.
4. Genetic factors: First-degree relatives of children with UTI are more likely to have UTI than individuals without such a history. Adherence of bacteria may, in part, be genetically determined.
5. Urinary obstruction: due to anatomic conditions (eg, posterior urethral valves, ureteropelvic junction obstruction), neurologic conditions (eg, myelomeningocele with neurogenic bladder), and functional conditions (eg, bladder and bowel dysfunction).
  - infrequent in children presenting with a first UTI (1 to 4 percent).
  - Suspect when the patient has voiding problems (eg, daytime enuresis, dribbling of urine), other family members have had urologic abn, GU abnormalities are detected on p/e, or when symptoms do not respond to appropriate therapy.



# HOST FACTORS

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6. Bladder and bowel dysfunction: it's an important and often overlooked factor in the pathophysiology of UTI in children.
  - An abnormal elimination pattern (frequent or infrequent voids, daytime wetting, urgency, constipation), bladder and/or bowel incontinence, withholding maneuvers
  - Up to 40 percent of toilet-trained children with their first UTI and 80 percent of children with recurrent (three or more) UTI report symptoms of bladder and bowel dysfunction.
  - it is also a risk factor for persistent vesicoureteral reflux (VUR), kidney scarring, and recurrent UTIs.
7. Vesicoureteral reflux: it is the most common urologic anomaly in children.
8. Sexual activity: the association between sexual intercourse and UTI in females has been well documented.
9. Bladder catheterization: the risk of UTI increases with increasing duration of bladder catheterization



# RISK FACTORS FOR KIDNEY SCARRING

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- Renal scarring is a potential complication of UTI. Long-term consequences may include hypertension, decreased kidney function, proteinuria, and end-stage kidney disease.
  - General RFs:
    - Recurrent febrile UTI
    - Delay in treatment of acute infection; early initiation of UTI treatment requires that the diagnosis be considered even in the absence of symptoms referable to the urinary tract (eg, in the febrile infant or young child with or without a focus of infection).
    - Bladder and bowel dysfunction: modification of bladder and bowel dysfunction requires that it be recognized.
    - Obstructive urinary tract malformations
    - Vesicoureteral reflux (VUR)
    - Young age has been shown to be associated with scarring in some studies
  - Prediction of kidney scarring after first UTI
    - VUR: especially high-grade VUR
    - Abnormal kidney bladder ultrasonography (KBUS)
    - Elevated inflammatory markers including a C-reactive protein of >4 mg/dL or a polymorphonuclear cell count >60 percent
    - Temperature  $\geq 39^{\circ}\text{C}$  ( $102.2^{\circ}\text{F}$ )
    - UTI caused by organism other than *E. coli*

# WHEN TO INITIATE ANTIMICROBIAL THERAPY

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- We typically initiate antimicrobial therapy for acute infectious cystitis pending culture results for:
- Children who are ☐ whether or not they have evidence of bacteriuria on dipstick or microscopic analysis
  - ☐ febrile
  - ☐ immunocompromised
  - ☐ ill-appearing
  - ☐ have an indwelling bladder catheter, underlying genitourinary abnormalities, previous history of UTI
- Children who are ☐ only if they have evidence of bacteriuria (+/-pyuria) on dipstick or microscopic analysis
  - ☐ Afebrile
  - ☐ Immunocompetent
  - ☐ well-appearing
  - ☐ without indwelling bladder catheter, underlying genitourinary abnormalities, or history of UTI

# WHEN TO INITIATE ANTIMICROBIAL THERAPY

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- In afebrile, immunocompetent, well-appearing children without indwelling bladder catheter, underlying genitourinary abnormalities, or history of UTI, who have evidence of pyuria, we typically initiate antimicrobial therapy only if the urine culture is positive.
- Probability of culture-proven UTI in verbal children  $\geq 2$  years with urinary or abdominal symptoms
  - ~ 90 percent if the urine dipstick was + for both nitrite and leukocyte esterase
  - only 4 to 8 percent if the urine dipstick was - for both.



# CHOICE OF AGENT

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- The choice of empiric antibiotic therapy is guided by:
    - clinical features
    - Age
    - local resistance patterns
    - Urine Gram stain & culture
  - Uncomplicated cystitis
    - is limited to the lower urinary tract
    - typically occurs in children older than two years with no underlying medical problems or anatomic or physiologic abnormalities
    - It may occur in children <2y, but is difficult to differentiate upper from lower UTI, thus they are usually assumed to have upper UTI.
  - Recommended empiric therapy for uncomplicated acute bacterial cystitis in children and adolescents provides coverage for *Escherichia coli*.
    - Add coverage for *S.saprophyticus* in addition to *E.coli* for sexually active female adolescents or if the urine Gram stain or culture demonstrates gram-positive organisms.
    - Add coverage for *Enterococcus* rather than *E. coli* if the urine Gram stain or culture demonstrates gram-positive organisms.
      - However, *Enterococcus* is more commonly isolated in cases of complicated cystitis.



# CHOICE OF AGENT

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- Ecoli coverage:
  - Third-generation cephalosporin (eg, cefdinir, cefixime, cefpodoxime, ceftibuten)
    - not effective against gram-positive uropathogens (eg, Enterococcus or S. Saprophyticus)
  - TMP-SMX, amoxicillin-clavulanate, and 1<sup>st</sup> & 2<sup>nd</sup> gen cephalosporins: not recommended due to increasing rates of resistance.
- S. saprophyticus coverage:
  - TMP-SMX or nitrofurantoin
- Enterococcus coverage:
  - For most of community-acquired Enterococcus, amoxicillin provides appropriate coverage.
  - Nitrofurantoin is an alternative for children with penicillin allergy.

## Antibacterial agents for oral treatment of acute infectious cystitis in children older than two years and adolescents

Antimicrobial	Regimen	Maximum single dose
Amoxicillin <sup>*¶</sup>	13.3 mg/kg 3 times per day	500 mg
Amoxicillin-clavulanate (immediate release formulations) <sup>*</sup>	22.5 mg amoxicillin/kg twice per day	875 mg amoxicillin
Cefdinir	14 mg/kg once per day	600 mg
Cefpodoxime	5 mg/kg twice per day	200 mg
Cefprozil	15 mg/kg twice per day	500 mg
Ceftibuten	9 mg/kg once per day	400 mg
Cefuroxime	15 mg/kg twice per day	500 mg
Cephalexin	12.5 to 25 mg/kg twice per day	500 mg
Nitrofurantoin <sup>Δ</sup>	1.25 to 1.75 mg/kg 4 times per day	100 mg
Trimethoprim-sulfamethoxazole (TMP-SMX) <sup>*Δ</sup>	4 to 6 mg trimethoprim/kg twice per day	160 mg TMP

Refer to UpToDate topic on treatment of cystitis in children for information regarding choice of antimicrobial therapy.

# COMPLICATED CYSTITIS

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- defined by coexisting upper UTI, multiple-drug resistant uropathogens, or hosts with special considerations (eg, anatomic or physiologic abnormality of the urinary tract, indwelling bladder catheter, malignancy, diabetes).
- Empiric therapy
  - is individualized according to clinical status, underlying problem(s), and previous culture results and susceptibilities. Parenteral therapy may be necessary.
- Indications for parenteral therapy
  - Patients with complicated cystitis caused by multiple drug-resistant uropathogens;
    - parenteral therapy can be switched to oral therapy after clinical improvement (eg, resolution of fever, decreased symptoms) if appropriate oral agents are available
  - Patients who are allergic or intolerant to available and appropriate oral agents



# DURATION OF THERAPY

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- We usually treat:
  - the first episode of uncomplicated, afebrile cystitis in females  $\geq 2$  years and males between 2 and 13 years for five days.
  - children  $\geq 2$  years with recurrent, febrile, or complicated cystitis and males  $\geq 13$  years of age with uncomplicated cystitis for 7 to 10 days.

# RESPONSE TO THERAPY

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- If the infecting pathogen is susceptible to the antibiotic → clear signs of improvement (eg, resolution or decrease in lower urinary symptoms) within 24 to 48 hours.
  - In patients who improve as expected, "test of cure" urine cultures are not necessary.
- For patients who worsen or fail to demonstrate the expected clinical response during the first 48 hours of therapy:
  - Urine culture should be repeated to assess persistence of bacteriuria.
  - Imaging of the urinary tract to evaluate potential complications including:
    - Upper tract infection
    - Renal abscess
    - Urinary calculi
    - Surgically correctable anatomic abnormalities or obstruction
- Management of bladder catheters
  - In patients with an indwelling bladder catheter, removal of the catheter may help to eradicate bacteriuria; if the patient requires an indwelling catheter, placement of a new catheter may be beneficial. The new catheter should be changed if signs of colonization recur (eg, isolation of bacteria from the urine without symptoms).

# PRIMORDIAL PREVENTION

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- پیگیری کودکان از لحاظ قد و وزن
- آموزش به مراقبان سلامت و پزشکان جهت آگاهی بخشی به مادران در مورد علایم عفونت ادراری



# PRIMARY PREVENTION

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- آموزش به والدین
- در مورد اهمیت ختنه بعد از دوره نوزادی در فرزندان پسر
- اهمیت توجه به علایم دفعی کودکان (به علت اهمیت بیماری BBD)
- شناسایی کودکان پرخطر از لحاظ بیماری کلیوی (سابقه هیدرونفروز جنینی، سابقه مشکلات اورولوژیک یا عفونت ادراری مکرر در خواهر و برادر)
- درخوا

# SECONDARY PREVENTION

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- شناسایی و درمان به‌هنگام عفونت‌های تبار اداری خصوصا در سنین کم
- درخواست کشت اداری با روش‌های مطمین جهت تعیین نوع ارگانسیم و درمان مناسب انتی بیوتیکی
- خارج کردن کانتترهای اداری به‌محض عدم احتیاج به آنها

# TERTIARY PREVENTION

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- تعبیه استریل کاتترادراری در افرادی که احتیاج به سونداژ طولانی مدت دارند
- پیگیری دقیق و منظم بیمارانی که به علت عفونت ادراری دچار عوارضی مانند HTN ، CKD و ... شده‌اند از جهت جلوگیری از پیشرفت بیماری و درمان عوارضی مانند کوتاه قدی و رشد ناکافی در این کودکان



# QUATERNARY PREVENTION

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- عدم تعبیه روتین کاتتر ادراری در بیماران
- عدم تجویز انتی بیوتیک های broad spectrum در بیماران با اولین عفونت ادراری
- استفاده از VCUG در زمانی که کودک عفونت ادراری ندارد