

# **Addressing Confusions IN URINARY TRACT INFECTION**

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# CLINICAL SCENARIO

2 y/o girl was brought for consultation because of 4 days fever (39.80, associated with chills and vomiting). On examination, she appears dehydrated and has no identifiable source of fever.

Laboratory results:

## Analysis:

PMN 6 hpf

RBC 0-4/ hpf

Bacteria- 2/hpf

Specific gravity: 1.030

## Urine dipstick

(+) leucocyte esterase

(-) nitrite

**Urine culture 48 hrs:** 50,000 cfu of E. Coli

## IMPORTANT details:

1) **AGE : 2 y/o**

2) **4 days fever and chills and vomiting**

3) **pmn: 6 /hpf : rbc: 0-4**

**specific grav: 1.03**

6) **(+) leucocyte esterase**

**(-) nitrite test**

7) **urine culture and sensitivity: 50,000 cfu**

# Why confusion?

- FEVER
- VOMITING
- CHILLS

NON specific signs  
and symptoms

URINALYSIS  
SUSPICIOUS RESULTS

- PMN 6 hpf
- RBC 0-4/ hpf
- Bacteria- 2/hpf
- Specific gravity:  
1.030



URINE CULTURE  
OF 50,000 CFU

PRESIDENTIAL CONFUSIONS

**CONFUSIONS:**





# **AREAS of CONFUSION in UTI**

**AGE: when to be more aggressive**

**Symptomatology: is it UTI?**

**Interpretation of results**

**How to Diagnose?**

**Treatment: DRUG of choice**

**ROUTE of CHOICE**

**FOR HOW LONG?**

**Other Diagnostic tests: HOW FAR should we go**

**Why is it important to treat UTI**



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FOR HOW LONG?**

**Other Diagnostic tests: HOW FAR should we go**

- **AGE : our patient is a 2y/o**

**Recommendation:**

**In any child with fever with no clear focus in a child = or < 2 : UTI should be considered**

**AAP (2011)**

**PNSP (2015)**

# AGE

- Initially cut off is 5 but it was lowered to 2 because of the ability of the child to VERBALIZE the complaint
- Any complaint referable to the Urinary Tract like dribbling, frequency, dysuria, flank pain → very high index of suspicion for UTI
- FEVER and CHILLS → UTI
- FEVER and smelly urine → UTI



# Clinical Manifestations of UTI (NICE guidelines)

Presenting symptoms and signs in infants and children with UTI

Age group		Symptoms and signs		
		Most common	→	Least common
Infants younger than 3 months		Fever Vomiting Lethargy Irritability	Poor feeding Failure to thrive	Abdominal pain Jaundice Haematuria Offensive urine
Infants and children 3 months or older	Preverbal	Fever	Abdominal pain Loin tenderness Vomiting Poor feeding	Lethargy Irritability Haematuria Offensive urine Failure to thrive
	Verbal	Frequency Dysuria	Dysfunctional voiding Changes to continence Abdominal pain Loin tenderness	Fever Malaise Vomiting Haematuria Offensive urine Cloudy urine



# Clinical Manifestations & Classification

## PYELONEPHRITIS

- abdominal pain
- flank pain
- fever
- malaise
- nausea
- vomiting
- diarrhea
- Newborn – poor feeding, irritability, weight loss
- complication : renal abscess

## CYSTITIS

- bladder involvement
- dysuria
- urgency
- frequency
- suprapubic pain
- incontinence
- malodorous urine
- no fever
- does not result in renal injury

## ASYMPTOMATIC BACTERURIA

- [+] urine culture
- without manifestations of infection
- most common- girls
- incidence  
1-2 % - pre-school & school girls
  
- 0.03%- boys
- benign
- does not cause renal injury except in pregnant women
- take detailed history [day/night incontinence or perineal discomfort]

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# **SYMPTOMOLOGY**

## **.... When to think of UTI?**



- All infants and children  $\leq$  2 yrs with unexplained fever  $\geq$  38.5 C
- Infants and children with alternate sites of infection who remain unwell
- Infants and children with symptoms and signs suggestive of UTI
  
- AAP and IAP recommendation 2011
- Pediatric Nephrology on the Go 2015

# **AREAS of CONFUSION in UTI**

**AGE: when to be more<sup>2</sup> aggressive**

**Symptomatology: is it UTI?**

**Interpretation of results**

**How to Diagnose?**

**Treatment: DRUG of choice**

**ROUTE of CHOICE**

**FOR HOW LONG?**

**Other Diagnostic tests: HOW FAR should we go**

**Why is it important to treat UTI**





# Interpretation of results

## Urine dipstick

(+) leucocyte esterase

(-) nitrite



## Urine dipstick

(+) leucocyte esterase  
(-) nitrite

Gram staining of urine has good  
Sensitivity and specificity



## Can we use Dipstick for diagnosing U

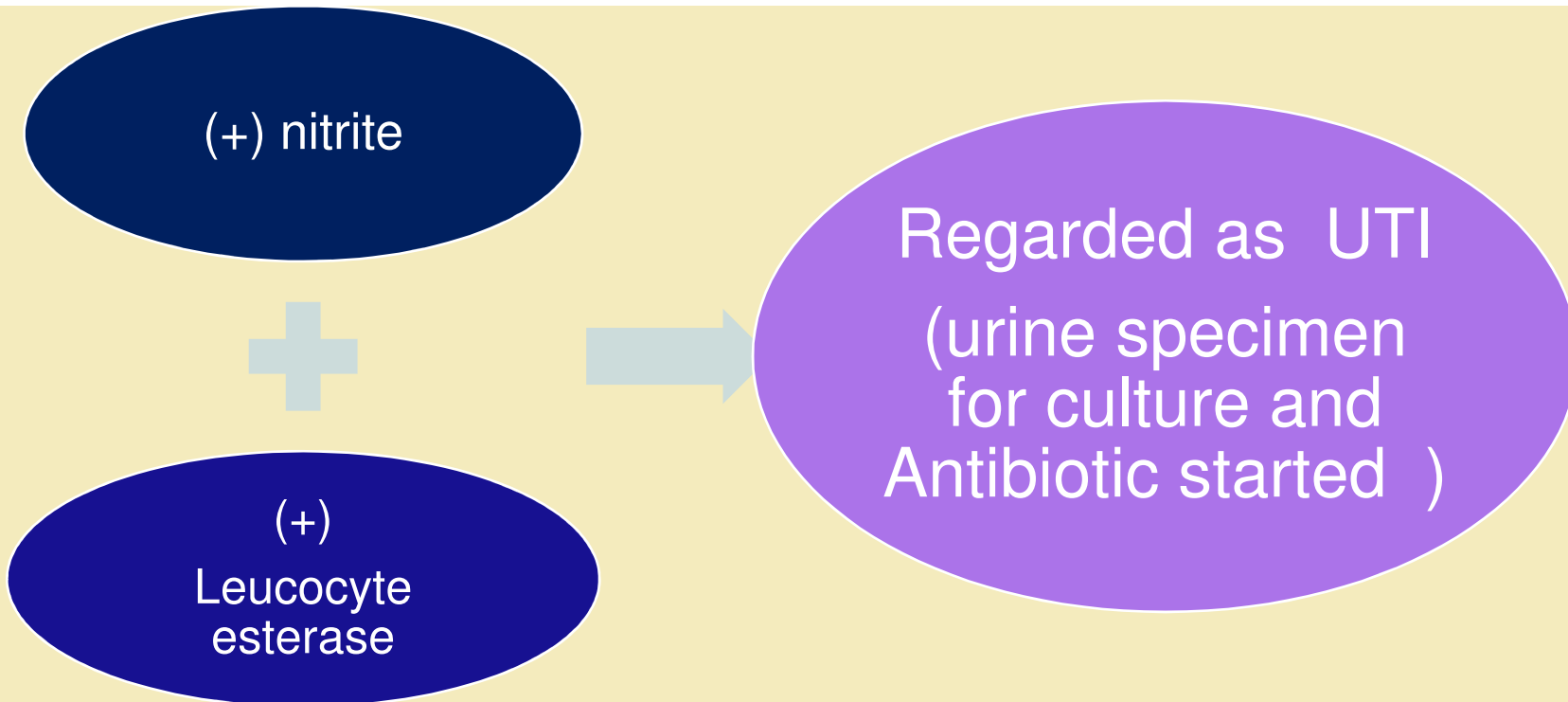
	WBC	Gram stain	LE	Nitrite	Either LE or nitrite	Both and nitrite
Sensitivity	74%	<u>91%</u>	79%	49%	88%	75%
Specificity	86%	<u>96%</u>	87%	<u>98%</u>	79%	<u>98%</u>

Useful for screening in office practice, equivalent to a microscopic  
Good supportive evidence in case of low bacterial counts in U

Sensitivity & Specificity of rapid urine tests. Pediatric Nephrology 2011

\*Low urinary bacterial count, do they count? Pediatric Nephrology 2015

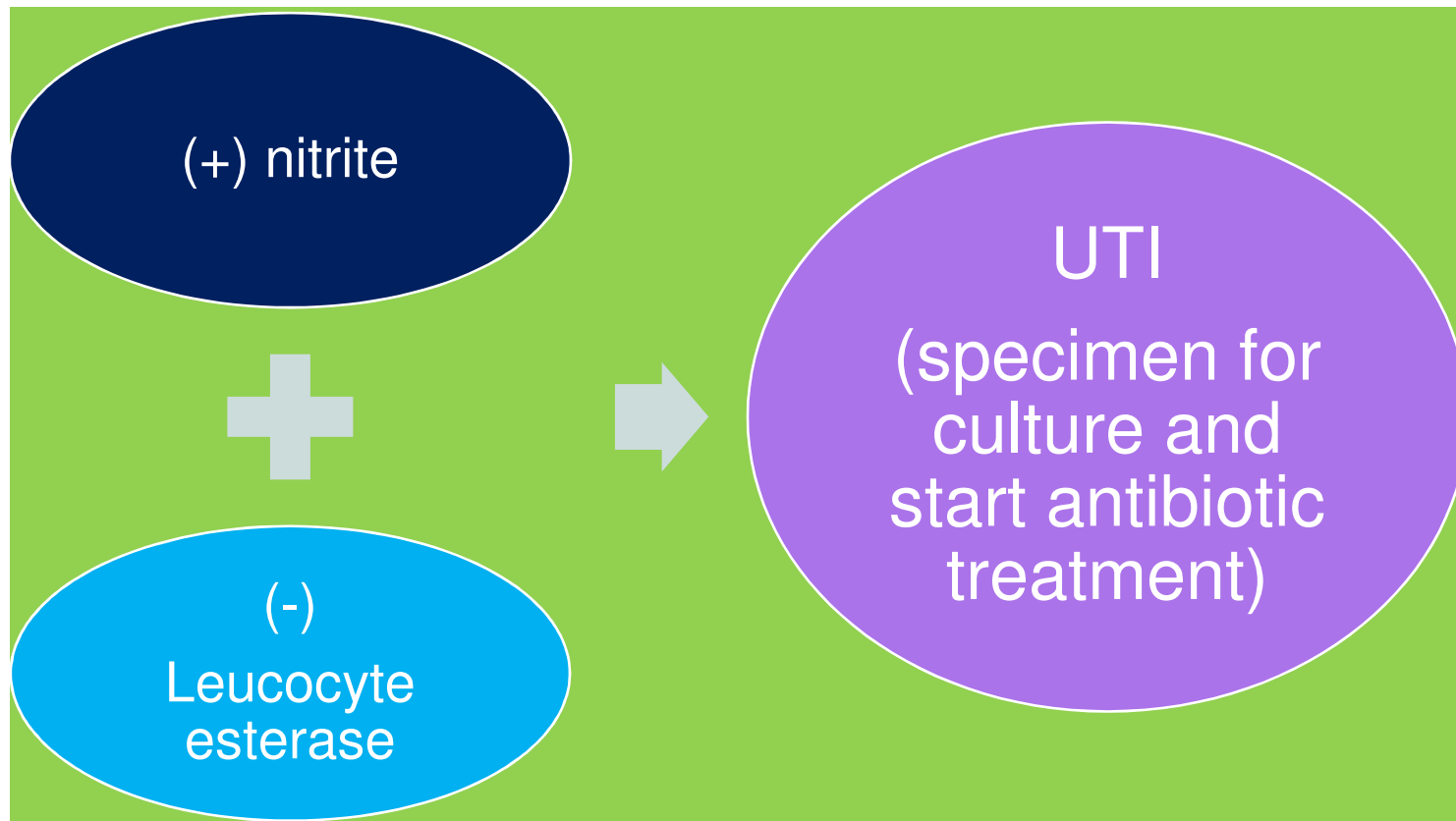
Courtesy of: Kanitkar 2015  
PNSP Convention



#### Analysis Interpretation Using the Dipstick Method (refer to Figure 1)

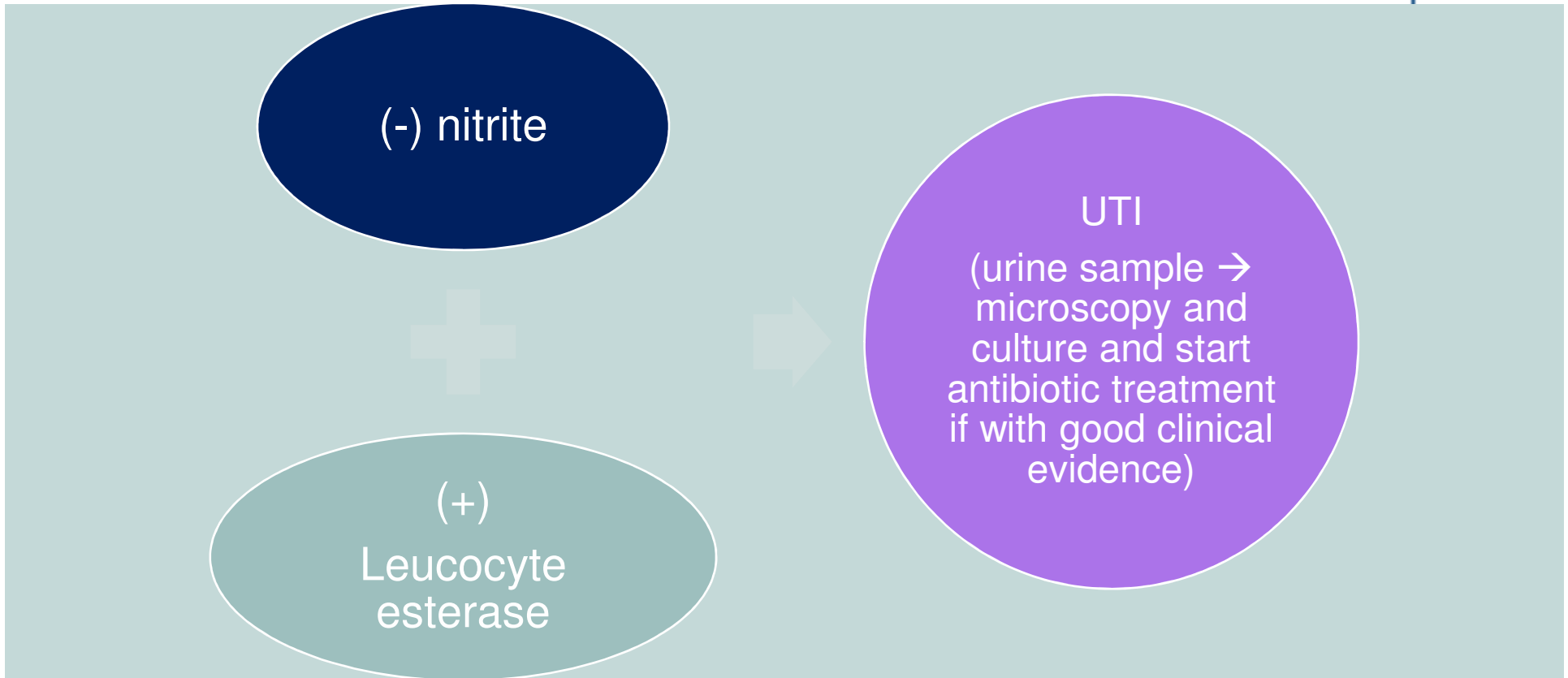
- If both nitrite and leukocyte esterase are positive on urinary dipstick (sensitivity 45%; specificity 98%), the child should be regarded as having UTI, urine specimen should be sent for culture and antibiotic treatment should be started. (*Level 1c*)

If nitrite is positive and leukocyte esterase is negative [sensitivity 49% (range 41-57%); specificity 98% (range 96-99%)], urine specimen should be sent for culture and antibiotic treatment should be started. (*Level 1c*)

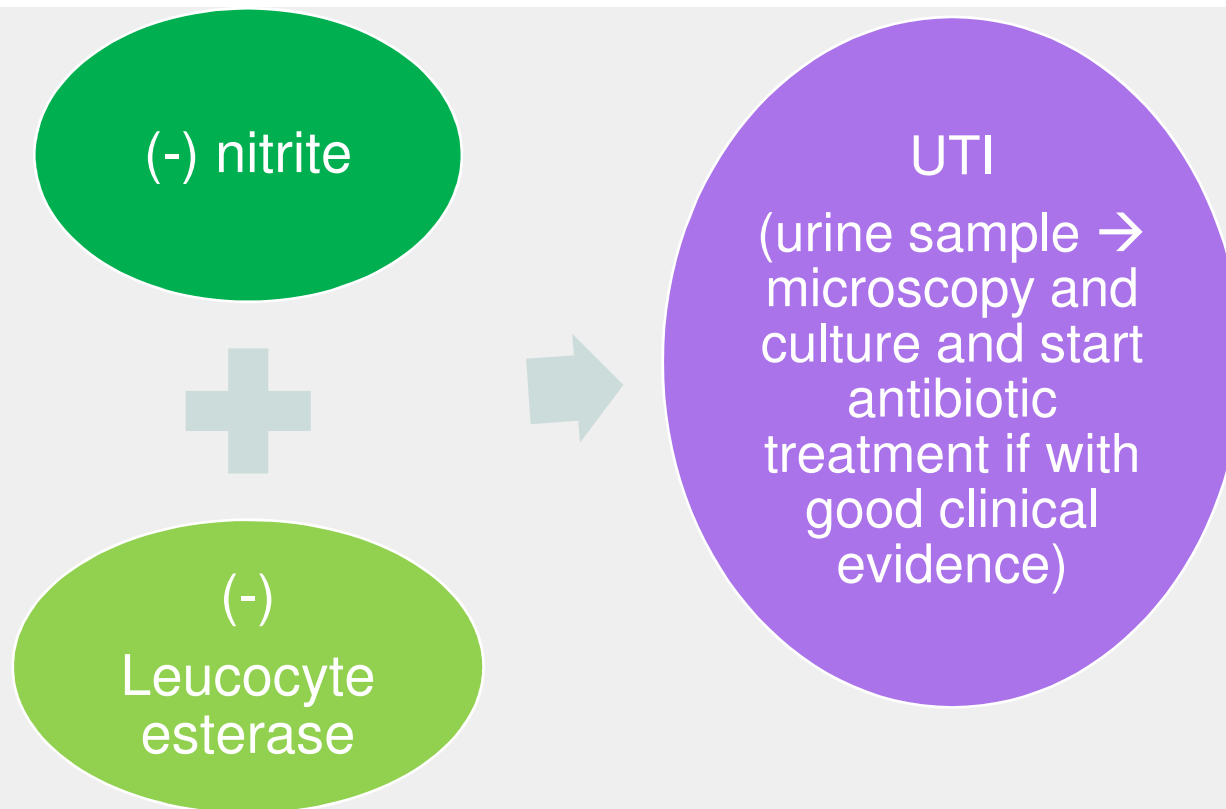




- If nitrite is negative and leukocyte esterase is positive (sensitivity 79%; specificity 87%), urine sample should be sent for microscopy and culture. Antibiotic treatment for UTI should be started only if there is good clinical evidence of UTI. (*Level 1c*)



- If both leukocyte esterase and nitrite are negative, the child should not be regarded as having UTI. Antibiotic treatment for UTI should not be started, and a urine sample should not be sent for culture. Other causes of illness should be explored. (*Level 1c*)



# Interpretation of results

## Urinalysis:

PMN 6 hpf

RBC 0-4/ hpf

Bacteria- 2/hpf

Specific gravity:  
1.030

- HMMMM..

- PMN of 6/hpf

- RBC 0-4/hpf

- High specific gravity

## URINALYSIS:

- Pus cells of greater than 5 of centrifuged sample is considered significant

- (+) symptomatology → UTI

## Diagnosing UTI by Urinalysis Interpretation

### Urine Microscopy

	Pyuria (+)*	Pyuria (-)
Bacteriuria (+)	Send for urine CS Treat as UTI Start antibiotics	Send for urine CS Treat as UTI Start antibiotics
Bacteriuria (-)	Send for urine CS Start antibiotics if with symptoms	Not UTI

NICE guidelines 2007

Legend:

- Pyuria (+) – WBC >5/HPF in centrifuged urine
- WBC >10/uL in uncentrifuged



	<b>Sensitivity</b>	<b>Specificity</b>
<b>Gram stained bacteria</b>	91% (95% CI 80–96)	96% (92–98),
<b>Unstained bacteria</b>	88% (75–94)	92% (84–96),
<b>Urinary white cells</b>	74% (67–80)	86% (82–90),
<b>Leukocyte esterase or nitrite positive dipstick</b>	88% (82–91)	79% (69–87),
<b>Nitrite-only positive dipstick</b>	49% (41–57)	98% (96–99)
<b>Leukocyte only positive dipstick</b>	79%	87%
<b>Both leukocyte esterase and nitrite</b>	45%	98%
	<b>ODDS ratio</b>	
<b>Microscopy for bacteria with gram stain compare with bacteria without Gram stain</b>	8.7 (95% CI 1.8–41.1)	
<b>Microscopy for bacteria with gram stain compare with white cells</b>	14.5 (4.7–44.4),	
<b>Microscopy for bacteria with gram stain compare with nitrite</b>	22.0 (0.7–746.3).	

*Williams et al, 2010. Absolute and relative accuracy of rapid urine tests for UTI in children: a meta-analysis 95 studies with 95,703 children*



# **Position Statement 4: Urinalysis Interpretation**

Urinalysis findings positive for nitrites, leukocyte esterase, pyuria or bacteriuria may suggest urinary tract infection in children

# Which guideline to follow?

**ACTA PÆDIATRICA**  
PROMOTING CHILD HEALTH

Guidelines for management of children with urinary tract infection and vesico-ureteric reflux.  
Recommendations from a Swedish state-of-the-art

Authors: Jodal U.<sup>1</sup>; Lindberg U.  
Source: Acta Paediatrica, Volume 88, Supplement 431, 9 Novem  
Publisher: Informa Healthcare

**PEDIATRICS**  
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## GUIDELINES

### Revised Statement on Management of Urinary Tract Infections

INDIAN SOCIETY OF PEDIATRIC NEPHROLOGY

Correspondence to: Dr M Vijayakumar, Department of Pediatric Nephrology, Mehta Children's Hospital, Chennai 600 031, India.  
doctorvsk@gmail.com

Indian Pediatrics Sep 2011

Guideline for the Diagnosis and  
Management of Urinary Tract Infection and STEERING  
COMMITTEE AND MANAGEMENT  
Steering Committee  
Online August 28, 2011;  
2011-1330

The JOURNAL  
of PEDIATRICS

Normal Dimercaptosuccinic Acid Scintigraphy Makes Voiding  
Cystourethrography Unnecessary after Urinary Tract Infection

Johan Preda, MD, Ulf Jodal, MD, PhD, Rune Sixt, MD, PhD, Eira Stokland, MD, PhD, Sverker Hansson, MD, PhD

Received: February 8, 2007; Received in revised form: April 10, 2007; Accepted: May 1, 2007; Published Online: August 28, 2007

PPS CPG on UTI 2004

Management of patients with  
UTI have been reviewed.  
Encouraging the participants to arrive



National Collaborating Centre for  
Women's and Children's Health

## Urinary tract infection in children

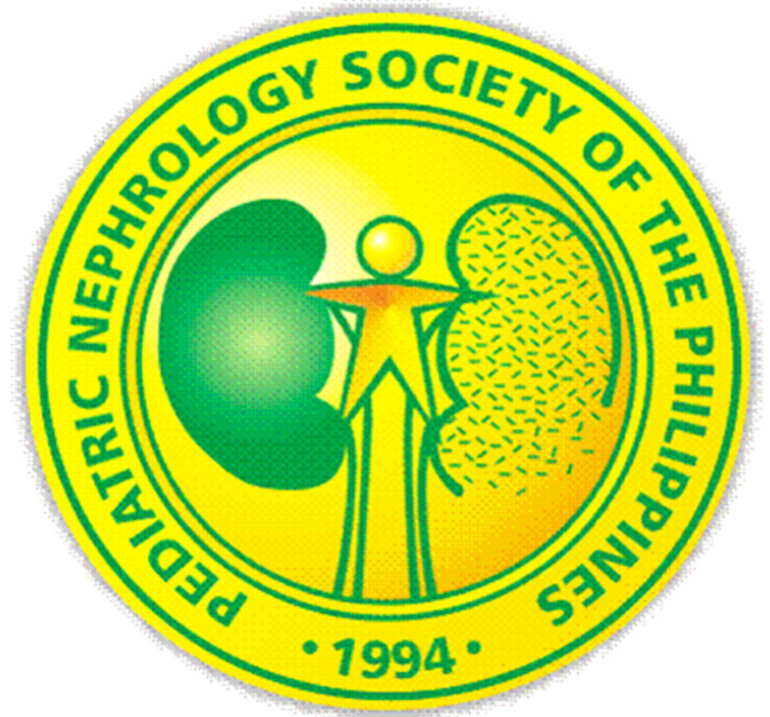
diagnosis, treatment and  
long-term management

Clinical Guideline  
August 2007



# **PNSP Consensus of UTI 2016**

- **A Philippine stand on UTI**
- **Reviewed all pertinent literature**
- **Considered local practice and circumstances**
- **Incorporated all local available searchable data and other national consensus in the world**
- **SOON to come ,,,**
- **This is just a preview...**



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Bacteria- 2/hpf  
Specific gravity: 1.030

## Urine dipstick

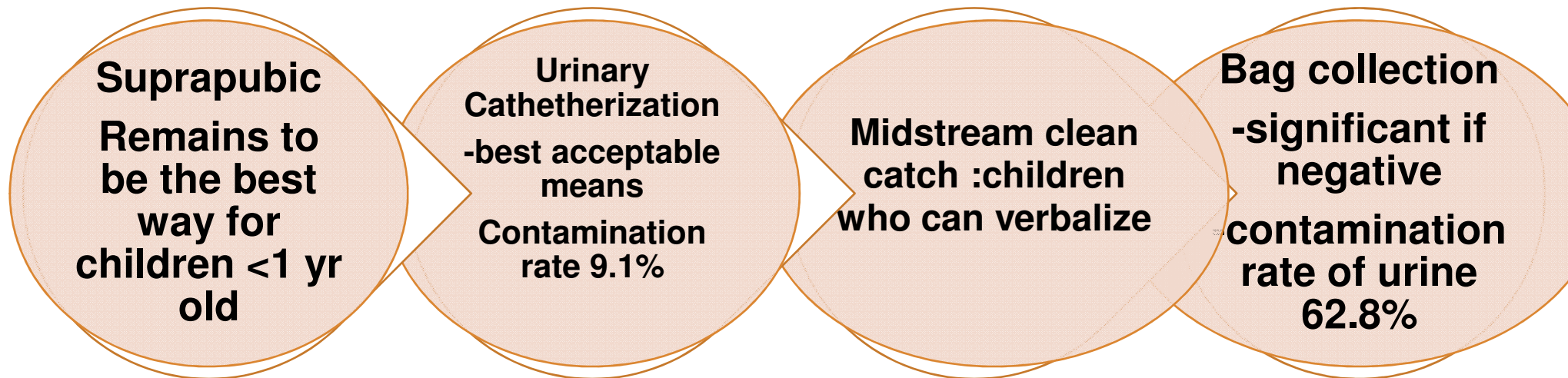
(+) leucocyte esterase  
(-) nitrite

**Urine culture 48 hrs: 50,000  
cfu of E. Coli**

## IMPORTANT details:

- 1) AGE : 2 y/o
- 2) 4 days fever and chills and vomiting
- 3) dehydrated
- 5) 6 /hpf : PMN,specific grav: 1.03
- 6) (+) leucocyte esterase
- 7) urine culture and sensitivity: 50,0000 cfu

# Interpretation of Urine Culture is based on Manner of Collection



BAG vs Catheter: **4 to 5x** more likely to have unnecessary treatment and radiological investigation  
**12x** more likely to have unnecessary hospitalization



## PNSP Consensus on the Definition of Urinary Tract Infection

Acute pyelonephritis is to be defined as:

Clinical symptomatology and urinalysis findings\* referable to UTI and

Urine culture which is either:

- Any growth of a single uropathogen collected via suprapubic aspiration
- Growth of  $\geq 50,000$  single uropathogen collected via urinary catheterization
- Growth of  $\geq 100,000$  single uropathogen collected via midstream/clean catch

Recommended Approach: If the above criteria are met

- Request for a Kidney Urinary Bladder (KUB) ultrasound and
- If KUB ultrasound is abnormal, **REFER** to a pediatric nephrologist for further work up



## To diagnose UTI-Use Gold Standard Culture a must!!!

- **Culture** of urine *required*
  - Plate within hour/refrigerate 4°C upto 24 h
- **Method of collection** *important*
  - clean catch midstream
  - catheterization
  - suprapubic aspiration
  - *bag??*

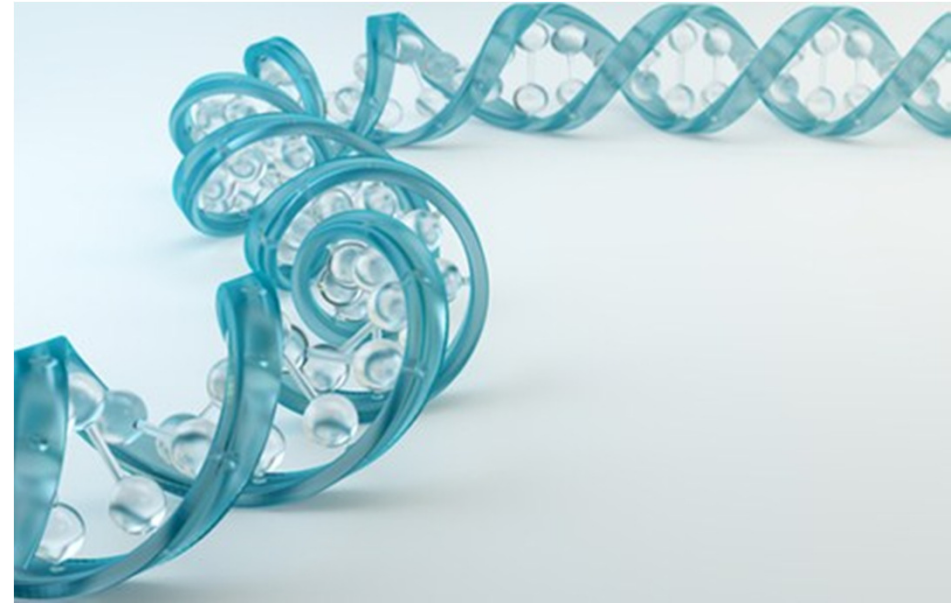


**How can we make a diagnosis in office quickly?**

# FOR CONFUSING UTI? Are there other ways?

## DIAGNOSIS

- CLINICAL
- DMSA?
- BLOOD TESTS?



# DMSA

- How does a scan in acute infection help?
  - It is sensitive and specific for the diagnosis of acute pyelonephritis
  - Can differentiate cystitis and pyelonephritis
  - Helps in the need of the VCUG to diagnose VUR

## The reality

- It is expensive :

SLMC	TMC	MMC	Cardinal
6,995	5.965	6,300	7,437

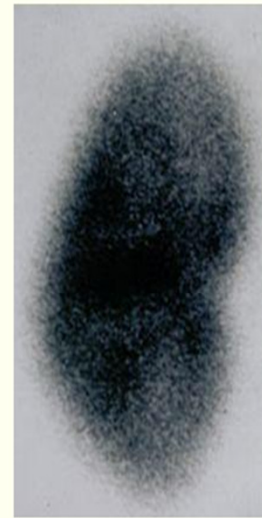
- Requires infrastructure that is not found anywhere
- It requires a still child → or else needs an anesthesiologist to sedate
- May delay treatment
- Radiation
- Can not always differentiate between acute pyelonephritis and old scar

# DMSA

Gold standard  
for renal scars

Decision  
making on  
confusing  
UTI

May sedate  
patient but  
with  
radiation  
exposure



Normal kidney



Acute PNA



Renal scars



# Position Statement 5: Serum Markers

Acute Phase Reactants such as C-reactive protein, Erythrocyte Sedimentation Rate and White Blood Cell count are non-specific but may help in the diagnosis of Urinary Tract Infection.

Procalcitonin promises to be a stronger predictor in the diagnosis of Acute Pyelonephritis





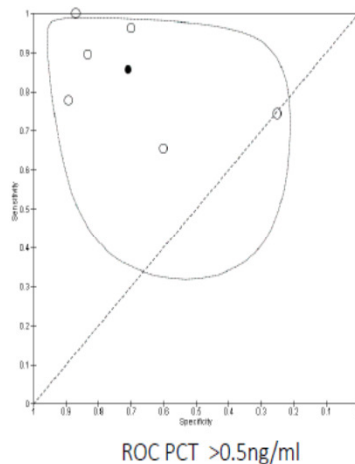
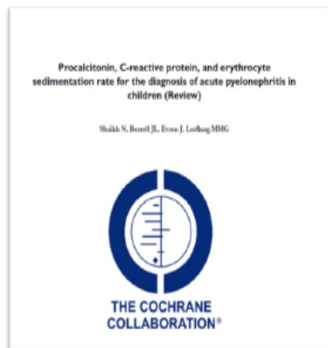
# **BLOOD TEST**

## **Clinical and Laboratory test that may aid in the diagnosis of UTI**

		<b>Sensitivity</b>	<b>Specificity</b>	
Neutrophil		50%(41.94-58.08	70.45% (63.1-77.81)	
White Blood Cell count		50%(41.94-58.08)	70.93%(63.61-78.25)	
Absolute Neutrophil Count		59.26%(51.32-67.3)	75.27%(68.29-82.24)	
C Reactive Protien		49.32%(41.26-57-37)	73.33%(66.21-80.46)	
Procalcitonin		100%	100%	

# What is procalcitonin?

## Procalcitonin- A marker for APN?



- Only 6 studies for PCT
- Heterogeneity of studies
- Focussed on a cut off of 0.5ng/ml
- Studies with higher cut-offs had higher specificity
- NO CONCLUSIVE RECOMMENDATIONS

The Cochrane Collaboration  
published in *The Cochrane Library* 2015, Issue 1

- It is a precursor of calcitonin without hormonal activity
- Virtually undetectable in physiological conditions
- Rises quickly and in proportion to bacterial infection and not viral
- Elevation from 2h after the onset of infection peaks at 12h and normalizes with in 2-3 days when subsides
- Cochrane focused on a cut off 0.5 ng/ml
- High cut offs had higher specificity
- NO CONCLUSIVE RECOMMENDATIONS

# Role of PCT



- DMSA remains the Gold Standard for APN or scarring
- PCT is not meant to replace DMSA scan
- PCT can be used as an intermediate strategy since
  - Based on a single biomarker
  - Easier to set up than a nuclear imaging process
  - **Can help discriminate between cystitis and APN**
  - Useful to predict scars when DMSA not available
- **PCT may therefore be helpful when choosing between oral or intravenous antibiotic treatments**

TMC	SLMC	MMC
4200	3605	2000

# **AREAS of CONFUSION in UTI**

**AGE: when to be more aggressive**

**Symptomatology: is it UTI?**

**Interpretation of results**

**How to Diagnose?**

**Treatment**

**Route of Choice**

**FOR HOW LONG?**

**Drug of Choice**

**Other Diagnostic tests: HOW FAR should we go**

**Why is it important to treat UTI**



# Treatment

## Goals of Treatment:

- Elimination of infection and prevention of urosepsis
- Relief of acute symptoms (eg, fever, dysuria, frequency)
- Prevention of recurrence and long-term complications including hypertension, renal scarring, and impaired renal growth and function



# Treatment

Early and aggressive antibiotic therapy → ( within 72 hours of presentation) is necessary to prevent renal damage.



Delayed therapy:

- 1) increased severity of infection
- 2) greater likelihood of upper tract disease
- 3) Higher risk of renal damage



# TREATMENTS

Empiric antimicrobial therapy → initiated immediately **after** appropriate urine collection in children with suspected UTI and a positive urinalysis).

HIGH INDEX of suspicion on the following subsets of patient: → increased risk for renal scarring if UTI is not promptly treated

- ● Fever (especially  $>39^{\circ}\text{C}$  [ $102.2^{\circ}\text{F}$ ] or  $>48$  hours)
- ● Ill appearance
- ● Costovertebral angle tenderness
- ● Known immune deficiency
- ● Known urologic abnormality



# Antibiotics

oral

- Children older than 2 mos can be effectively treated
- Close contact with family

IV

- Infants less than 2 mos
- immunocompromised
- Poor oral intake
- Organism with resistant to oral antibiotic
- Atypical or complicated UTI

- Atypical means: seriously ill, poor urine flow, abdominal or bladder mass, raised creatinine. Septicimia, failure to respond to treatment within 48 hours or infection with Non-E coli organism, dilatation of the PCS on US

# Choice of Agent : based on Etiology

- Escherichia coli most common → 80% of UTI in children

## Gram-negative bacterial pathogens

- Klebsiella
- Proteus
- Enterobacter
- Citrobacter

## Gram positive bacterial pathogens:

- Gram-positive bacterial pathogen
- Staphylococcus saprophyticus
- Enterococcus
- Staphylococcus aureus.



- Infection with an organism other than E. coli is associated with a **higher likelihood of renal scarring**.
- Viral UTI are usually limited to the lower urinary tract.
- Risk factors for fungal UTI include immunosuppression and long-term use of broad-spectrum antibiotic therapy, and indwelling urinary catheter

## Based the treatment on the sensitivity of the community → guided by Resistance Pattern

RESEARCH base Recommendation:

A. Children greater than 2 mos: orally can be given as long as contact with family and education is very important

Suggestion: Cefixime for 14 days is equal to cefotaxime for 7 days then shifted to oral based on: mean time of defervescence (24 hrs), sterilization of urine (100%), reinfection rate and relapsing (9.8 and 7.2%) ( RCT 3306 children)

Cefixime, cefdinir, and ceftibuten are dosed as follows:

- Cefixime (16 mg/kg by mouth on the first day, followed by 8 mg/kg once daily to complete therapy)
- Cefdinir (14 mg/kg by mouth once daily)
- Ceftibuten (9 mg/kg by mouth once daily)



Amoxicillin and Ampicillin are not routinely recommended for empiric therapy → High rate of resistance of *E. coli*.

Similarly, amoxicillin-clavulanate, first-generation cephalosporins (eg, cephalexin), and TMP-SMX should be used with caution because of the increasing rates of resistance to these drugs in some communities

### Ciprofloxacin:

- NOT routinely used as 1<sup>st</sup> line
- used for *Pseudomonas* or Multidrug resistant

### Nalidixic and Nitrofurantoin:

- oral agents that are excreted in the urine but do not achieve therapeutic concentrations
- Should NOT be used in febrile UTI in whom renal involvement is likely because parenchymal and serum concentrations are insufficient to treat UROSEPSIS and PYELONEPHRITIS



# DURATION OF TREATMENT

NO ROLE FOR SHORT COURSE IN CHILDREN with Upper UTI

(AAP, COCHRANE DATA BASE)

## Role of Short course only on Lower UTI

- 10-14 DAYS COMPLICATED Upper UTI
- 10 DAYS UNCOMPLICATED Upper UTI
- 3-7 DAYS Lower UTI

PERSISTENT BACTERIURIA NOTED IN:

24% → short course

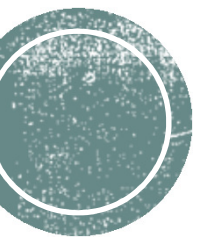
1% → if 10 day course

- Serial cultures not required if clinical improvement is noted within 2-3 days

Gerald:

Cochrane  
Database Syst  
Published  
January 1, 2012.  
Volume 8, Issue ;  
Pages  
006857





# **Other considerations...**



# When to do KUB?

- **Children younger than 2 years of age with first febrile UTI**
  - **Children of any age with recurrent febrile UTI**
  - **Children of any age with a UTI with a family history of renal or urologic disease, poor growth or hypertension**
  - **Those who do not respond to the initial antibiotics**
- **Timing:**
  - **If unusually severe illness or failure to improve as expected after initiation of antimicrobial therapy**
  - **→ do it in the acute phase of illness**
  - **If response is favorable → may do it after the acute phase to reduce risk of false positive due to renal inflammation**

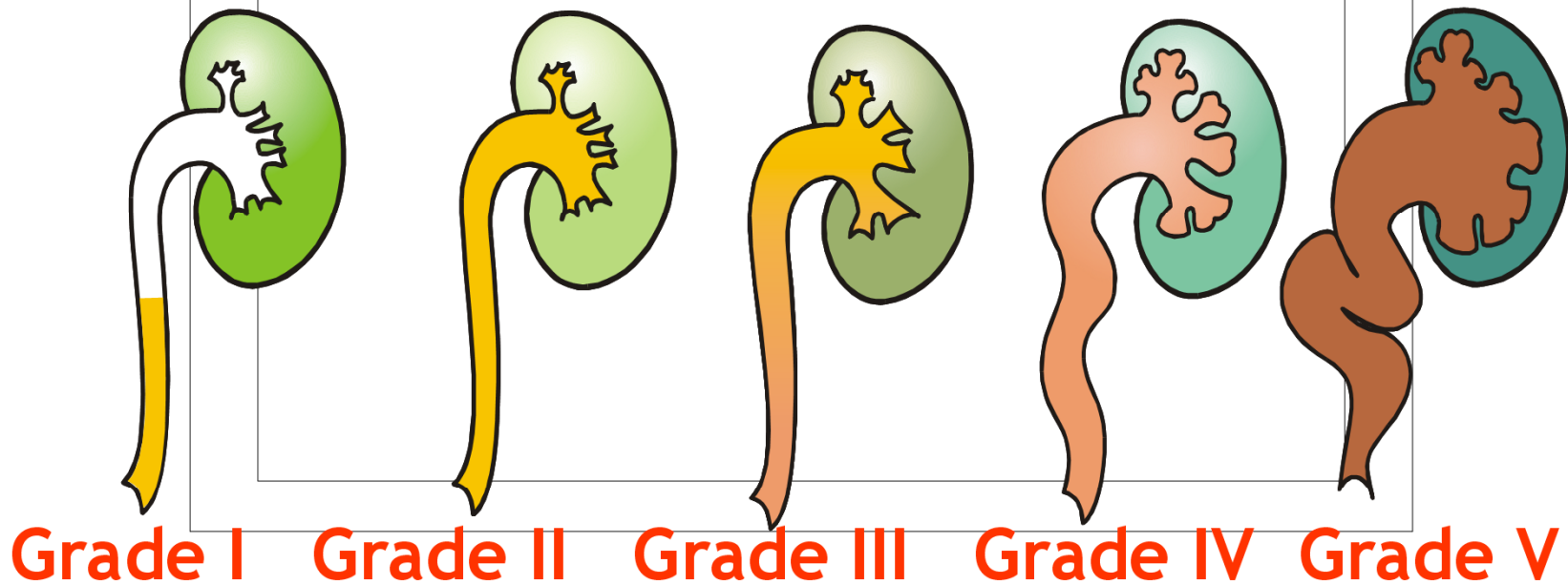
# VCUG

- Children of any age with 2 or more febrile UTI
- Child of any age with first febrile UTI and any anomalies on renal ultrasound
- High temp of 39 and a pathogen other than E. Coli
- Poor growth and hypertension



# International Classification of Vesicoureteral Reflux

Pediatrics 1981; 67:392



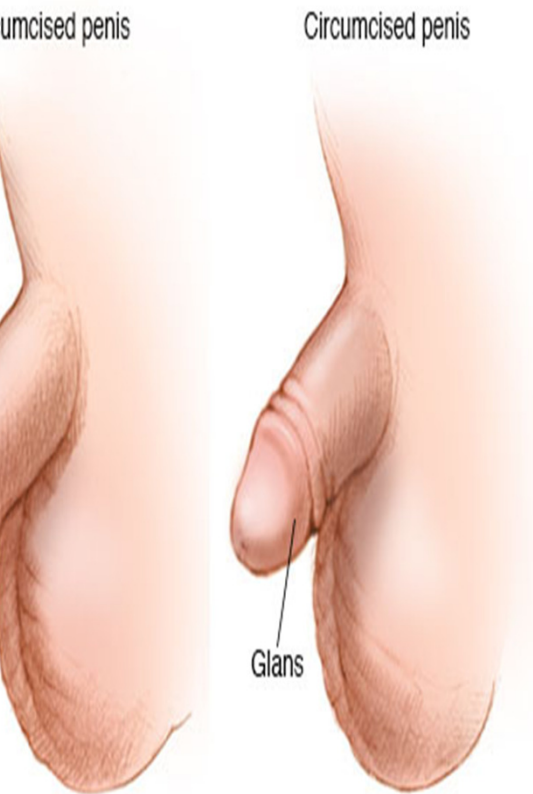
Slide courtesy of  
RHFrancisco, MD

# CIRCUMCISION

Uncircumcised male infants → 4-8X higher prevalence of UTI

Two mechanisms:

- The mucosal surface of the uncircumcised foreskin → binds uropathogenic bacterial species than keratinized skin on a circumcised penis
- Partial obstruction of the urethral meatus 85 versus 42% The tightness of the foreskin diminishes with time and is an infrequent finding after one year of age



111 circumcisions would be needed to prevent one UTI



# Renal Scarring

- Seen in 15.5% of children with UTI

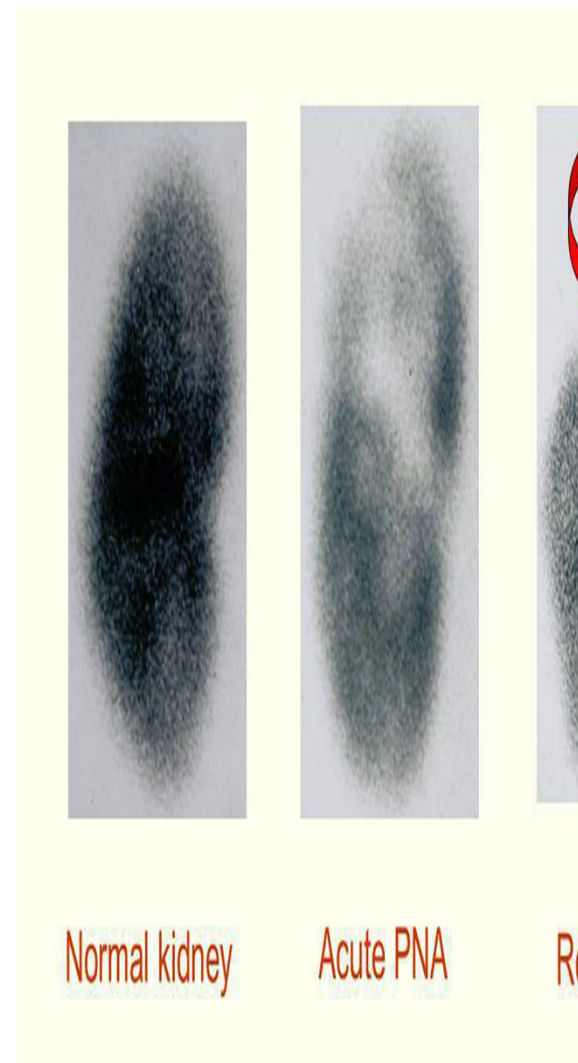
**VUR** – VUR, especially high-grade VUR, was associated with the development of renal scars (Grade I and II [odds ratio (OR) = 1.8, 95% CI 1.2–2.8] and Grade IV and V VUR [OR 22.5, 95% CI 11.3–44.8])

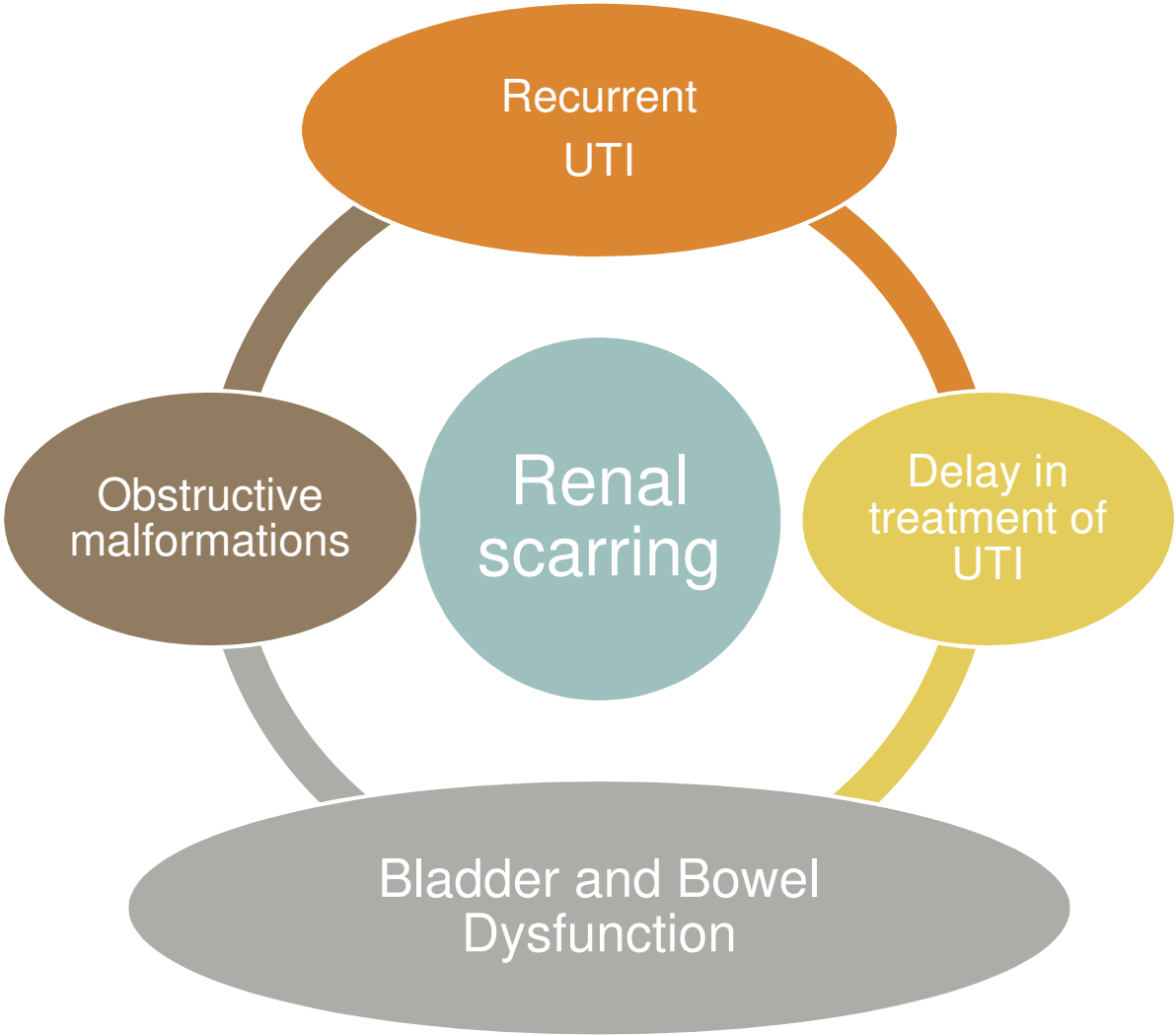
**Abnormal renal bladder ultrasonography** (OR 3.8, 95% CI 2.6–5.5)

**Inflammatory markers** including a **high C-reactive protein** of >40 mg/L (OR 3.0, 95% CI 2.0–4.6), or a polymorphonuclear cell count >80 percent (OR 1.9, 95% CI 1.3–2.8); only children who have glomerulonephritis are at risk for the development of renal scarring

**Temperature  $\geq 39^{\circ}\text{C}$  ( $102.2^{\circ}\text{F}$ )** (OR 2.3, 95% CI 1.6–3.3)

UTI caused by organism **other than *E. coli*** (OR 2.2, 95% CI 1.3–3.6)





Recurrent  
UTI

Obstructive  
malformations

Renal  
scarring

Delay in  
treatment of  
UTI

Bladder and Bowel  
Dysfunction

# Global Burden

**Overall prevalence among febrile infants: 7%**

**Cognizant of the prevalence of UTI in childhood: a meta-analysis**  
*(Shaikh, 2008)*

**Prompt and accurate diagnosis of childhood UTI maybe the only clue in the recognition of urologic abnormalities**

**Need to focus on the:**

- Diagnosis
- Treatment
- Urologic work-up

**May lead to renal scarring and chronic kidney disease (CKD)**

**2010 Global Burden of Disease (GBD) CKD ranked 18th**

**Prevent complications**  
Urologic abnormalities remain as the leading causes of pediatric CKD requiring KT

# Which guideline to follow?

**ACTA PÆDIATRICA**  
PROMOTING CHILD HEALTH

Guidelines for management of children with urinary tract infection and vesico-ureteric reflux. Recommendations from a Swedish state-of-the-art study.

Authors: Jodal U.; Lindberg U.  
Source: Acta Paediatrica, Volume 88, Supplement 431, 9 November 2009  
Publisher: Informa Healthcare

**PEDIATRICS**  
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

**GUIDELINES**

**Indian Pediatrics Sep 2011**

Guideline for the Diagnosis and Management of Urinary Tract Infection and STEERING COMMITTEE STATEMENT AND MANAGEMENT  
Published online August 28, 2011; 2011-1330

## Revised Statement on Management of Urinary Tract Infections

INDIAN SOCIETY OF PEDIATRIC NEPHROLOGY

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**The JOURNAL of PEDIATRICS**

Normal Dimercaptosuccinic Acid Scintigraphy Makes Voiding Cystourethrography Unnecessary after Urinary Tract Infection

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National Collaborating Centre for Women's and Children's Health

**Urinary tract infection in children**

diagnosis, treatment and long-term management

**Clinical Guideline**  
August 2007

SP is coming up with a consensus that will truly fit the Filipino experience- ready by Nov 2011

# **AREAS of CONFUSION in UTI**

**AGE: when to be more aggressive**

**Symptomatology: is it UTI?**

**Interpretation of results**

**How to Diagnose?**

**Treatment: DRUG of choice**

**ROUTE of CHOICE**

**FOR HOW LONG?**

**Other Diagnostic tests: HOW FAR should we go**

**Why is it important to treat UTI**







10  
MARCH  
2016



— KIDNEY —  
DISEASE  
& CHILDREN

**ACT EARLY  
TO PREVENT IT!**