THE International Pediatric Nephrology Association

THE Pediatric Nephrology Society of the Philippines, Inc.

VICENTE SOTTO MEMORIAL MEDICAL CENTER SECTION OF PEDIATRIC NEPHROLOGY

The Kidney Strikes Back

14th IPNA-PNSP TEACHING COURSE
FOR GENERAL PEDIATRICIANS AND FAMILY PHYSICIANS

CLINICAL CASE 1 HANDOUT

Clinical Case 1

A 2-year-old male was brought to the Emergency Room for ***high grade fever and chills.***

History of Present Illness:

- 3 days PTA, the patient had intermittent fever with Tmax of 40C associated with chills. She was given Paracetamol with temporary relief.
- On the day of admission, symptoms persisted now with associated 4 episodes of vomiting of previously ingested food amounting to ¼ cup/episode, thus prompted consult.

Developmental History:
At par with age

Immunization History:
Completed primary immunizations at a local health center

Past Medical and Family History:
(-) previous admissions
(-) history of UTI
(-) family history of kidney diseases

Review of Systems:
(+) decreased appetite
(-) seizure
(-) diarrhea

PE at the ER
Awake, responsive, not in respiratory distress
BP: 90/60 mmHg, HR: 110 bpm, RR: 28 cpm, Temp: 39C, O2 sat: 99% at room air
Weight: 14 kg Height: 90 cm

Skin: no rash nor skin lesions

HEENT: Anicteric sclerae, pinkish palpebral conjunctivae, dry lips and oral mucosae, non-hyperemic nonexudative tonsil, (-) CLADS
C/L: Symmetrical chest wall expansion, clear breath sounds
CVS: Adynamic precordium, distinct heart sound, regular rhythm, slightly tachycardic
Abd: Globular abdomen, hyperactive bowel sounds, non-tender
GUT: grossly male, uncircumcised penis, non-phimotic
Ext: full equal pulses, CRT <2sec, no edema
Neuro PE: Awake, responsive
Other finding neuro PE unremarkable

Question 1: What are your considerations?

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1. Urinary Tract Infection
2. Viral Illness Unspecified
3. Acute Gastroenteritis

Question 2: What laboratories would you want to order?

Laboratory Results:

CBC	Results
WBC	20 x 10^9/L
RBC	4.5 x 10
Hgb	132 g/L
Hct	0.42
Neu	0.90
Lym	0.07
Mono	0.02
Eos	0.01
Baso	0
PLT	245

Urinalysis	
Color	Yellow
Characteristic	Turbid
Specific gravity	Sp gr 1.030
Urine pH	pH 6.5
Sugar	Negative
Protein	+1
Leukocytes	Positive
Nitrites	Negative
RBC	5/hpf
WBC	50-100/hpf
Epithelial cells	Rare
Bacteria	Abundant
Mucus threads	Negative

Question 3: Interpret your laboratory results

WBC results:
Leukocytosis with neutrophilic predominance

How to interpret the Urinalysis

1. Specimen collection *(CPG on UTI, 2018)*
    a. Recommendations for choice of urine collection method
        i. < 2 years old – clean-cath urine collection
        ii. Older children – mid-stream urine collection
    b. The use of urine "wee" bag may be accepted as a method of collection only if the result of the urinalysis/urine culture is **negative**. Otherwise, urine collection is to be repeated.
    c. Suprapubic aspiration or urethral catheterization may be used if and only if the other methods cannot be done.
2. The specimen must be fresh (<1 hour after voiding at room temperature or <4 hours after voiding with refrigeration

Leukocyte Esterase Test

- sensitivity of 94% in clinically suspected case of UTI, specificity of 72%
- The absence of leukocyte esterase in the urine of individuals with asymptomatic bacteriuria distinguishes individuals with asymptomatic bacteriuria from those with true UTI.

Nitrite test

- not a sensitive marker for children, particularly infants, who empty their bladders frequently.
- **negative nitrite test** results have little value in ruling out UTI
- Moreover, not all urinary pathogens reduce nitrate to nitrite.
- The test is helpful when the result is positive, however, because it is highly specific (ie, there are few false-positive results)

	Leukocyte (+)	Leukocyte (-)
Nitrite (+)	Send for urine CS Treat as UTI Start antibiotics	Send for urine CS Treat as UTI Start antibiotics
Nitrite (-)	Send for urine CS Start antibiotics if with symptoms	Not UTI

Nice guideline 2007

	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 guideline 2007

Question 4: What would be your next step of action?
Send for UC, treat as UTI, start antibiotics

Question 5: What is the gold standard test to diagnose Urinary Tract Infection?
Urine Culture

AAP CPG on UTI 2016
The AAP defines the diagnosis of a UTI to include clinical symptoms, **UA with evidence of inflammation (at least 5 WBC per hpf or LE)**, and **urine culture results with at least 50,000 CFU/mL of a uropathogenic organism**. The diagnostic bacterial account for UTI depends on the urine sample collection method, requiring >100,000 colony forming units (CFU)/mL for mid-stream urine specimens, >50,000 CFU/mL for catheterization, and only >1000 CFU/mL for suprapubic aspiration.

TABLE 1 Sensitivity and Specificity of Components of Urinalysis, Alone and in Combination

Test	Sensitivity (Range), %	Specificity (Range), %
Leukocyte esterase test	83 (67–94)	78 (64–92)
Nitrite test	53 (15–82)	98 (90–100)
Leukocyte esterase or nitrite test positive	93 (90–100)	72 (58–91)
Microscopy, WBCs	73 (32–100)	81 (45–98)
Microscopy, bacteria	81 (16–99)	83 (11–100)
Leukocyte esterase test, nitrite test, or microscopy positive	99.8 (99–100)	70 (60–92)

Urine Culture Interpretation		
Collection Method	Colony Count (cfu/ml)	Probability of infection (%)
Suprapubic aspiration	Any growth	>99%
Catheterization	>100,000 >10,000 – 100,000	95% Infection likely

Clean Catch, midstream urine	>10,000 (males) >100,000 (females) - 3 specimens - 2 specimens - 1 specimen	Infection likely 95% 90% 85%

CPG on UTI, 2018

Question 6: What empiric antibiotic should you start for Acute Uncomplicated Pyelonephritis?

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When initiating treatment, the clinician should base the choice of route of administration on practical considerations. Initiating treatment orally or parenterally is equally efficacious. The clinician should base the choice of agent on local antimicrobial sensitivity patterns (if available) and should adjust the choice according to sensitivity testing of the isolated uropathogen.

DOH CPG on UTI 2023 Recommendation
We **suggest** the use of either short course (3-4 days) intravenous antibiotics followed by oral antibiotics OR oral antibiotics to complete 7-10 days treatment duration for children with acute pyelonephritis. *(Low certainty of evidence, Weak recommendation)*

CPG on UTI 2023 Recommendation

We suggest the use of the following antibiotics as empiric treatment regimen for children with acute pyelonephritis:

- Nitrofurantoin 5-7 mg/kg/day divided into 3 to 4 divided doses PO.
- Ampicillin-sulbactam: Ampicillin 100mg/kg/dose in 4 divided doses IV.
- Co-amoxiclav 30-50 mg/kg/day in 2 divided doses PO.
- Cefuroxime 20-30 mg/kg/day in 2 divided doses PO
- Ceftriaxone 50-75 mg/kg/day in 2 divided doses IV.
- Cefixime suspension 8 mg/kg/day in 2 divided doses PO.
- Amikacin 15-22.5 mg/kg/day divided in 2 to 3 doses IV.

**Review local and institutional antibiograms, if available.*
**Antibiotic treatment should be switched appropriately as soon as culture study results are available.*

Question 7: Is antibiotic prophylaxis needed for this patient?

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The AAP guidelines **do not** generally recommend routine antibiotic prophylaxis after a first UTI, but it may be considered in high-risk groups:

1. Recurrent UTI
   - Defined as >/= 2 episodes of pyelonephritis or 1 pyelonephritis and >/=1 cystitis, or >/= 3 cystitis in a year
   - Until 6-12 months infection-free
2. Children < 2 years old with high grade VUR (Grade III – V), until at least 2 years after a febrile UTI
3. Children > 2 years old with high grade VUR (Grade III – V) and febrile UTI, until at least 2 years after a febrile UTI
4. Children with recurrent UTI and non-dilating VUR (Grade I – II), until 2 years after a febrile UTI

Prophylactic Antibiotics for UTI
Cephalexin 12.5mgkg/day ODHS Cefaclor 10mg/kg ODHS Amoxicillin 15-20 mg/kg/day ODHS Trimethoprim-Sulfamethoxazole 2-4mg/kg/day of Trimethoprim, 10-20 mg/kg/d ay of Sulfamethoxazole ODHS Nitrofurantoin 1-2 mg/kg/day ODHS

Question 8: Will you request for further tests like repeat urinalysis/cultures and imaging studies?

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The *AAP guidelines* recommend repeat urinalysis and/or urine culture <u>only if a patient's condition does not respond to treatment as expected or if there are signs of complications</u>. Routine imaging such KUB Ultrasound is recommended for infants and young children (2-24 months) with a first febrile UTI, but is not always needed for older children with recurrent UTIs or those who respond well to treatment.

AAP CPG on UTI 2011

CPG on UTI 2018 Recommendation
All cases of UTIs (culture proven acute pyelonephritis; febrile presumptive UTI and recurrent UTI) should undergo KUB ultrasound with post void study especially for children who are toilet trained. (*Grade C*) Any abnormal KUB ultrasound finding should be referred to pediatric nephrology and pediatric urology specialists. (*Grade B*)

Table 553.4	Recommended Imaging Schedule for Children With Urinary Tract Infection		
	TYPE OF INFECTION		
CHILD AGE AND TESTS	RESPONDS WELL TO TREATMENT WITHIN 48 HR	ATYPICAL INFECTION	RECURRENT INFECTION
CHILDREN YOUNGER THAN 6 MO OLD			
Ultrasound scan during acute infection	No	Yes	Yes
Ultrasound scan within 6 wk of infection	Yes	No	No
DMSA scan 4-6 mo after acute infection	No	Yes	Yes
Micturating cystograms	Consider if ultrasound scan abnormal	Yes	Yes
CHILDREN 6 MO TO 3 YR OLD			
Ultrasound scan during acute infection	No	Yes	No
Ultrasound scan within 6 wk of infection	No	No	Yes
DMSA scan 4-6 mo after acute infection	No	Yes	Yes
Micturating cystograms	No	Not routine; consider if dilation on ultrasound, poor urine flow, non–*E. coli* infection, or family history of vesicoureteric reflux	
CHILDREN OLDER THAN AGE 3 YR			
Ultrasound scan during acute infection	No	Yes	No
Ultrasound scan within 6 wk of infection	No	No	Yes
DMSA scan 4-6 mo after acute infection	No	Yes	Yes
Micturating cystograms	No	No	No

DMSA, dimercaptosuccinic acid.

Adapted from National Institute for Health and Clinical Excellence. Urinary tract infection in children: diagnosis, treatment, and long-term management. NICE clinical guidelines, no. 54. London, 2007, RCOG Press, Tables 6-13, 6-14, and 6-15.

Nelson's 21st edition

Question 9: Among patients with recurrent UTI, should we recommend cranberry as a preventive measure?

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CPG on UTI 2023 Recommendation

Among women with recurrent UTI, we **suggest** cranberry products. *(Low certainty of evidence, Weak recommendation)*

**Taking cranberries as a juice, syrup, tablets or powder reduced the number of UTIs in women with recurrent UTIs, in children with UTIs and in people susceptible to UTIs following an intervention such as bladder radiotherapy.*

Question 10: Will you advice circumcision for this patient?

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CPG on UTI 2018 Recommendation
Breastfeeding and circumcision may reduce the risk of recurrent UTI (*Grade C*). **Health benefits are not great enough to recommend routine circumcision for all male newborns, however, the benefits of circumcision are sufficient to justify access to this procedure for families choosing it.*

FREQUENTLY ASKED QUESTIONS

1. What are indications for admissions for patients with UTI?
   - Severely ill
   - Inability to tolerate oral antibiotic
   - Infants younger than 2 months with a febrile UTI
   - Complicated UTIs (with structural problems such as congenital anomalies of the kidney and urinary tract or other renal diseases)

2. When do we send for urine culture sample?
   - Symptoms of acute upper UTI/pyelonephritis
   - High to intermediate risk of serious illness
   - Under 3 months old
   - Positive result for leukocyte esterase or nitrite
   - Recurrent UTI
   - Infection not responding to treatment within 24-48 hours
   - Clinical symptoms and signs of UTI but dipstick tests do not correlate

3. How will you interpret a urine culture result with 2 pathogens?

Growth of 2 or more different bacteria or polymicrobial growth is interpreted as a potential contamination rather than a true infection, especially if the colony counts for both organisms are not significantly high.

However, if there's suspicion of a true infection, repeat urine cultures may be necessary to confirm the presence of the same pathogens and their colony counts.

4. When do we need to refer to a pediatric nephrologist?
    - Complicated UTIs
    - Recurrent UTis
    Any signs of kidney disease (hematuria, proteinuria, oliguria, and other red flags of kidney disease)

5. What are other measures to prevent UTI in children?
    - Proper hygiene such as wiping from front to back
    - Change diapers frequently
    - Avoid bubble baths and harsh soaps in the genital area
    - Encourage oral fluid intake
    - Avoid or treat constipation
    - Empty bladder fully
    - Urinate frequently and avoid postponing urination
    - Choose appropriate clothing such as loose-fitting cotton underwear which allows for better airflow