Urinary Tract Infection Inpatient Clinical Practice Guidelines

Inpatient 9/2020

Developed by: Dr. Angelica Parra, Dr. Karezhe Mersha, Dr. Pilar Gutierrez, and Dr. Robert Reid.

This clinical guideline is intended as an evidence-based guide for clinical care and not as a replacement for clinical decision making.

Estimated revision schedule every 3 years

Inclusion Criteria:
- Birth (with postmenstrual age of at least 40 weeks) to 18 years of age
- Suspected or confirmed UTI

Exclusion Criteria:
- Chronic kidney disease
- Known or suspected genitourinary conditions
  - Vesicoureteral reflux
  - Neurogenic bladder
  - Obstructive uropathy
  - Prior genitourinary surgeries
- Septic shock
- Meningitis
- High suspicion of meningitis (inconclusive cerebral spinal fluid (CSF) cell count or only CSF culture pending)
- Immunocompromised host
- Neonatal Intensive Care, Pediatric Intensive Care, or Intermediate Care admission

Goal:
- Decrease the amount of renal ultrasounds done during hospitalization in order to decrease unnecessary false positives which could decrease need of voiding cystourethrograms (VCUG)
- Decrease overuse of broad spectrum antibiotics which can lead to emergence of resistant E. Coli and other gram negatives.

Definition

- 2011 AAP Clinical practice guidelines*1,2:
At least 50K CFU/ml of uropathogen via catheterized (cath) specimen or suprapubic catheter \textbf{AND} \\
Urinalysis (UA) suggesting infection \\
\begin{itemize}
  \item pyuria (\textgreater{} or = trace Leukocyte esterase (LE) or \textgreater{} or = 5 WBC/hpf) \\
  \item bacteriuria
\end{itemize} \\
Definitely Positive \\
\begin{itemize}
  \item UA + (\textgreater{}5 wbc/hpf) and Cath Ucx + >50 K CFU/ml \\
  \item UA + and Bag Ucx + >100K CFU/ml single organism
\end{itemize} \\
Possibly Positive \\
\begin{itemize}
  \item High clinical suspicion and \\
    \begin{itemize}
      \item UA positive and >10K organism or \\
      \item UA neg and >50K single organism
    \end{itemize}
\end{itemize} \\
Can have urinary inflammation without bacteria \\
Sterile Pyuria \\
\begin{itemize}
  \item Kawasaki disease, viral infection, pelvic inflammatory disease, appendicitis
\end{itemize} \\
Can have colonization which is bacteria can be present in urinary tract without causing inflammation or infection \\
\begin{itemize}
  \item asymptomatic bacteriuria occurs in \textasciitilde{}1\% of infants and children \\
  \item a common risk factor for colonization are children who require regular catheterization
\end{itemize}

\textbf{Diagnosis}

\begin{itemize}
  \item Evaluate for UTI in all febrile infants 0-56 days old \\
  \item Consider UTI in all infants <24 months with fever without source \\
    \begin{itemize}
      \item AAP CPG 2011\textsuperscript{1,2} \\
        \begin{itemize}
          \item Factors to change risk \\
            \begin{itemize}
              \item Age \\
              \item Gender \\
              \item Race \\
              \item Circumcision status \\
              \item Duration of fever \\
              \item Lack of other source
            \end{itemize}
        \end{itemize}
    \end{itemize}
\end{itemize}

\begin{itemize}
  \item Can use UTIcalc tool to help with probability of UTI \url{https://uticalc.pitt.edu/}
\end{itemize}

\begin{itemize}
  \item Fully Toilet Trained \\
    \begin{itemize}
      \item Consider diagnosis based on symptoms, history, and physical exam
    \end{itemize}
\end{itemize}
■ Symptoms may vary with age
  ● Vomiting
  ● Fever
  ● Diarrhea
  ● Strong smelling urine (could be misleading symptom)
  ● Abdominal pain /flank pain/back pain
  ● Dysuria, urgency, frequency, incontinence

■ Exam
  ● Suprapubic tenderness
  ● Costovertebral angle tenderness

■ History
  ● of bowel or bladder dysfunction
  ● Prior UTI and fever >2 or = 2 days
  ● Prolonged fever > or = 5 days

If high suspicion of UTI

  ● Obtain Urinalysis and Urine culture
    ○ Infants and No-toilet Trained Children:
      ■ Catheterization or suprapubic aspiration
    ○ Toilet Trained Children
      ■ Midstream Clean Catch
    ○ Adolescents
      ■ Midstream Clean catch
      ■ Consider GC/Chlamydia testing
        ● If GC/Chlamydia positive
          ○ Consider HIV testing, Syphilis Screen, hepatitis B and C screens.
      ■ Consider pregnancy testing in girls

Admission Criteria

  ● Infants 0-56 days

  ● All Ages
    ○ Dehydration requiring IV fluids
    ○ Failed outpatient therapy
      ■ Persistent clinical symptoms beyond 48 hours on appropriate therapy
    ○ Concern of medical non-compliance
      ■ Not tolerating home treatment
      ■ Unreliable caregiver
At risk for loss to follow up

Inpatient Management

- Infants 0-28 days
  - Start IV ampicillin and gentamicin
  - If E. coli
    - Minimum of 2 days of IV antibiotics
    - Consider switch to PO after 2 days if afebrile and back to baseline > or + 24 hours, identification and sensitivities returned
    - MDR
      - Consult ID
  - If non E. coli
    - S. aureus or Pseudomonas:
      - Consult ID
      - Higher chance of abnormal urinary tract
    - Other non E. coli pathogens
      - Consider ID consult to discuss length of IV therapy
  - Total Duration IV + PO 10-14 days
  - If positive blood Culture
    - If E. coli
      - Repeat Blood Culture if not improved within 48 hours of starting antibiotics
      - Consider switching to PO after 2-3 days if meets above criteria
      - If a follow up blood culture was obtained, consider switching to po after repeat blood culture is negative for 36 hours.
    - If non E. coli
      - Repeat Blood Culture
      - Consult ID to discuss IV antibiotic duration
- Infants 29-56 days
  - Start IV Cefazolin or ampicillin + gentamicin if enterococcus is suspected
  - Minimum of 36 hrs IV antibiotics
  - Switch to PO after 36 hours, if afebrile and back to baseline > or equal 24 hours, identification and sensitivities returned
  - Total IV + PO duration 10-14 days
  - Positive blood culture
    - If E. coli
      - Repeat Blood Culture if not improved within 48 hours of starting antibiotics
      - Consider switching to PO after 2 days if meets above criteria
      - If a follow up blood culture was obtained, consider switching to po after repeat blood culture is negative for 36 hours.
- If non E.coli
  - Repeat Blood Culture
  - Consult ID to discuss IV antibiotic duration

- Older infants, children and adolescents
  - Give IV Cefazolin
  - Switch to PO if clinical response
  - Total antibiotic duration 7-10 days
  - Adolescents with cystitis can treat 3 day total
  - Identify children with Bladder and Bowel Dysfunction
    - Inquire about constipation symptoms, daytime wetting, and withholding behaviors
    - Bladder dysfunction can be treated
      - Recommend scheduled voiding every 3-4 hours
      - Treat constipation

- For all ages
  - Children who worsen or fail to improve in 48 hours consider imaging
    - Start with RUS
      - to evaluate for renal abscess or
      - other surgically correctable anatomic abnormalities or
      - Obstruction
    - If RUS is negative and continued concern for abscess, consider CT scan
    - If there is abnormal anatomy or reflux, consider longer treatment course (this is more relevant in older children where sometimes they only get treated for 3-7 days for a typical cystitis).

**Discharge Criteria**

- Clinical response to therapy
- Family and patient education completed
- If Renal ultrasound (RUS) not completed, notify PCP it needs to be scheduled
- If VCUG indicated, notify PCP it needs to be scheduled
- Social risk factors assessed and addressed
- If other studies were done to evaluate for meningitis or bacteremia, these are negative
- If bacteremia, appropriate treatment completed

**Imaging**
- Infant 0-56 days
  - RUS
    - **Timing**\textsuperscript{8,9,10}
      - **Ask PCP to schedule** 2 weeks after diagnosis
      - During hospitalization if
        - severe illness
        - not improving by 48hrs
        - Concern of noncompliance
        - Concern for abnormal anatomy such as male with history of weak urinary stream
  - VCUG
    - **Timing**
      - **Ask PCP to schedule** after diagnosis
      - During hospitalization
        - Concern of noncompliance
        - if done during acute infection, radiology requests
          - Negative urine culture
          - Afebrile >24 hrs

- Children 2-24 months
  - RUS
    - First febrile UTI or recurrent UTI
    - **Timing**\textsuperscript{8,9,10}
      - **Ask PCP to schedule** 2 weeks after diagnosis
      - During hospitalization if
        - severe illness
        - not improving by 48hrs
        - Concern of non-compliance
        - Concern for abnormal anatomy such as male with history of weak urinary stream
  - VCUG
    - Febrile UTI and an abnormal renal and bladder ultrasonographic finding
    - **Timing**
      - 2-4 weeks after diagnosis
      - In the hospital,
        - Concern of non-compliance
        - if done during acute infection, radiology requests
          - Negative Urine Culture
          - Afebrile >24 hours
        - **Ask PCP to schedule** if less than 24 months with recurrent febrile UTI
        - Had abnormal RUS

- Children > 24 months
- RUS
  - Recurrent febrile UTI
  - Atypical Clinical course
  - Non E. coli UTI
  - **Ask PCP to schedule** 2 weeks after diagnosis**8,9,10**
  - During hospitalization if
    - Severe illness
    - Not improving by 48hrs
    - Concern of non-compliance

- VCUG
  - Discuss with nephrology for imaging recommendations

- Consider Nephrology or Urology Consult:
  - Recurrent febrile UTIs
  - Abnormal imaging
  - Impaired kidney function
  - Elevated blood pressure
  - Bowel or bladder dysfunction refractory to primary care measures
Bibliography


Urinary Tract Infection Inpatient CPG (Abbreviated Version)

Inclusion Criteria, hospitalized patients:
- Birth (with postmenstrual age of at least 40 wks) to 18 years of age
- Suspected or confirmed UTI

Exclusion Criteria:
- Chronic kidney disease
- Known or suspected genitourinary conditions
  - Vesicoureteral reflux
  - Neurogenic bladder
  - Obstructive uropathy
  - Prior genitourinary surgeries
- Septic shock
- Meningitis
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- Immunocompromised host
- Neonatal Intensive Care, Pediatric Intensive care or intermediate care admission

Goal:
- Decrease the amount of renal ultrasounds done during hospitalization in order to decrease unnecessary false positives which could decrease need of voiding cystourethograms (VCUG)
- Decrease overuse of broad spectrum antibiotics which can lead to emergence of resistant E. Coli and other gram negatives.

Definition of UTI
- Clinical signs and symptoms
- UA with pyuria and or bacteriuria
- Uropathogen identified in Urine

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Possible</th>
<th>Definitive</th>
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<tbody>
<tr>
<td>Cath</td>
<td>≥10,000 cfu/ml</td>
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Diagnosis:
- Evaluate for UTI in all febrile infants 0-56 days of age
- Consider UTI in all infants <24 months with fever without source
  - Can use UTIcalc tool to help with probability of UTI [https://uticalc.pitt.edu/](https://uticalc.pitt.edu/)
- In fully toilet trained
  - Consider diagnosis based on symptoms, history, and physical exam

Meets diagnostic criteria:
- Obtain Urinalysis and Urine culture
  - Infants and Non-toilet Trained Children:
    - Catheterization or suprapubic aspiration
  - Toilet Trained Children and Adolescents
Midstream Clean Catch

- Adolescents
  - Consider GC/Chlamydia testing
  - Consider pregnancy testing in girls

**Admission Criteria:**
- Dehydration requiring IV fluids
- Failed outpatient therapy
- Concern of medical non-compliance
- Febrile neonate less than 56 days
## Urinary Tract Infection-Inpatient Management

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### Positive Blood Culture

| If E. coli  |
|-----------------|-----------------|
| • Repeat Blood Culture if not improved within 48 hours of starting antibiotics  |
| • Consider switching to PO after 2-3 days if meets above criteria  |
| • If a follow up blood culture was obtained, consider switching to PO after repeat blood culture is negative for 36 hours.  |
| **If non E.coli**  |
| • Repeat Blood Culture  |
| • Consult ID to discuss IV antibiotic duration  |

| If E. coli  |
|-----------------|-----------------|
| • Repeat Blood Culture if not improved within 48 hours of starting antibiotics  |
| • Consider switching to PO after 2 days if meets above criteria  |
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| **If non E.coli**  |
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**Discharge Criteria:**
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- If other studies were done to evaluate for meningitis or bacteremia, these are negative
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**Imaging:**

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<td><strong>VCUG Timing</strong>&lt;br&gt;Ask PCP to schedule 2 wks after dx&lt;br&gt;During hospitalization&lt;br&gt; o Concern of noncompliance</td>
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New Pediatric Clinical Guideline Setup Checklist

Guideline Name:
Goal of Clinical Guideline:

Does the proposed guideline meet the below four criteria?

- The intervention is a structured multidisciplinary plan of care
- The intervention is used to translate guidelines or evidence into local structures
- The intervention details the steps in a course of treatment or care in a plan, pathway, algorithm, guideline, protocol or other ‘inventory of actions’ (i.e. the intervention had time-frames or criteria-based progression)
- The intervention aims to standardize care for a specific population


CHECKLIST

- Physician (or an alternate author) submitting the clinical guideline must be able (directly or through virtual meeting) to attend Clinical Guidelines Meeting
- All participants in the clinical guideline development should be listed and primary author identified
- Participants who are submitting clinical guideline should sign off and include the division chief(s) from all involved specialties (for purposes of disseminating to entire division)
- All clinical guidelines should include a disclaimer “…this clinical guideline is intended as an evidence-based guide for clinical care and not as a replacement for clinical decision making”
- Clinical guideline authors should submit an estimated revision schedule, i.e. every 3 years.
- References must be included in the submission.
- Authors of the guideline must identify 1-2 quality metrics that can be measured to gauge impact on care

Signature of Contributing Pathway Developers:

<table>
<thead>
<tr>
<th>Dept. Name</th>
<th>MD Developer Name</th>
<th>Signature</th>
</tr>
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<tbody>
<tr>
<td>Infectious Disease</td>
<td>Dr. Pilar Gutierrez</td>
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<tr>
<td>Nephrology</td>
<td>Dr. Mariejose Mershe</td>
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<tr>
<td>Hospital Medicine</td>
<td>Dr. Angelica Pan</td>
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<tr>
<td></td>
<td>Dr. Angélique Martin</td>
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Date__________________

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