Antibiotic Stewardship and the Misdiagnosis of UTI

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Under normal conditions...
the skin surface is not sterile...
the mouth is not sterile...
the colon is not sterile...
and in many patients,
the bladder is not sterile.
Asymptomatic Bacteriuria

*the culture is positive but no infection is present*

- Positive culture is:
  - $\geq 10^5$ CFU (midstream clean-catch)
  - or
  - $\geq 10^2$ CFU (cath)
Asymptomatic Bacteriuria

- Positive urine culture, but no need for antibiotic treatment

Exceptions:
- Pregnancy
- Urological surgery
Infectious Diseases Society of America Guidelines

Strength of Recommendation
A. Strongest recommendation in favor
B. Recommend in favor
C. Neutral
D. Recommend against
E. Strongest recommendation against
Infectious Diseases Society of America Guidelines

Type of evidence

I. Randomized clinical trials
II. Well-controlled nonrandomized studies
III. Expert opinion, strong logic
Grade A – III example:
Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Gordon C S Smith, Jill P Pell

Abstract

Objectives To determine whether parachutes are effective in preventing major trauma related to gravitational challenge.

Design Systematic review of randomised controlled trials.

Data sources: Medline, Web of Science, Embase, and the Cochrane Library databases; appropriate internet sites and citation lists.

Study selection: Studies showing the effects of using a parachute during free fall.

Main outcome measure Death or major trauma, defined as an injury severity score greater than 15.

Results We were unable to identify any randomised controlled trials of parachute intervention.

Conclusions As with many interventions intended to prevent ill health, the effectiveness of parachutes has

accepted intervention was a fabric device, secured by strings to a harness worn by the participant and released (either automatically or manually) during free fall with the purpose of limiting the rate of descent. We excluded studies that had no control group.

Definition of outcomes

The major outcomes studied were death or major trauma, defined as an injury severity score greater than 15.

Meta-analysis

Our statistical approach was to assess outcomes in parachute and control groups by odds ratios and quantified the precision of estimates by 95% confidence intervals. We chose the Mantel-Haenszel test to assess heterogeneity, and sensitivity and subgroup analyses are fixed effects weighted regression techniques to explore
Asymptomatic Bacteriuria:

“Do not test, do not treat”

<table>
<thead>
<tr>
<th>Population</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly, institutionalized</td>
<td>A - I</td>
</tr>
<tr>
<td>Pre-menopausal, non-pregnant women</td>
<td>A - I</td>
</tr>
<tr>
<td>Diabetic women</td>
<td>A - I</td>
</tr>
<tr>
<td>Older people in the community</td>
<td>A - II</td>
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# Asymptomatic Bacteriuria

<table>
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<th>Population</th>
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<td>4-19%</td>
</tr>
<tr>
<td>Healthy pre-menopausal women</td>
<td>1-5%</td>
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Therefore, without UTI symptoms, urine testing leads to false diagnosis of UTI.
Our Goal: Give you a new perspective on urine microbiology

→ Faster care
→ Lower expenses
→ More accurate testing & treatment
→ and fewer unnecessary antibiotics!
Case Vignette

- 75 year old female, “Hip pain”
- Slipped on wet floor at her nursing home
- Exam reveals shortened & externally rotated leg
- Xray: hip fracture
Case Vignette

- Tests that are done:
  - CBC, Chem 7, PT/PTT, Type and Screen
  - Chest xray
  - EKG
  - Urine dip
Challenges

- Can this lady do a midstream clean-catch?
- Did the clinician specify how the specimen should be collected?
But the real challenge is…

- Why is the urine being tested in the first place?!
- Was the urine dip *ordered*?
- Was it done “because of her age?”
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Antibiotics in long-term care

- 2/3 elderly long-term care residents receive antibiotics every year.
How do they overlap?

- Urinary tract infection
- Asymptomatic bacteriuria
- False-positive urinalysis
Overlapping Sets

- When symptoms are **absent**:
  - “Positive” urine dip is meaningless.
  - “Positive” urinalysis is meaningless.
  - “Positive” urine culture is just ASB.

- When symptoms are **present**:
  - Only urine culture can rule out UTI.

- Regardless of symptoms:
  - Poor urine collection technique causes false-positive urinalysis.
How can we function with such uncertainty?

- Clinical judgment
- Communication
conceptual framework:

Spectrum of Appropriateness

for urine testing & treatment
Spectrum of Appropriateness

[Images of different symptom categories: no symptoms, non-specific symptoms, specific symptoms]

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no symptoms

non-specific symptoms

specific symptoms
No symptoms

DO NOT TEST!

DO NOT TREAT!
Specific symptoms

Test & treat
(or just treat)
Non-specific symptoms

Individualize care
The Gray Zone

- Weak and dizzy
- Altered mental status
- Decreased appetite
- Decreased mobility
- Fever without a focus
The Gray Zone – Evidence?


- Ducharme et al. studied
  200 ED patients aged ≥65
- 100 with vague symptoms, possibly UTI
- 100 with no urinary symptoms
## Study Definitions

<table>
<thead>
<tr>
<th>Vague Symptoms</th>
<th>No UTI Symptoms</th>
</tr>
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<tbody>
<tr>
<td>Confusion</td>
<td>Cast check</td>
</tr>
<tr>
<td>Weakness</td>
<td>Minor trauma</td>
</tr>
<tr>
<td>Fever without focus</td>
<td>etc.</td>
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</table>
The gray zone patient probably does NOT have UTI!  
(p value = 0.34)

<table>
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<tr>
<th>Positive Urine Culture</th>
<th></th>
</tr>
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<tr>
<td>No symptoms</td>
<td>14%</td>
</tr>
<tr>
<td>Vague symptoms</td>
<td>19%</td>
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## Loeb Criteria: Should I Treat?

<table>
<thead>
<tr>
<th>No Chronic Cath</th>
<th>Chronic Cath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute dysuria</td>
<td>Any one of the following:</td>
</tr>
<tr>
<td></td>
<td><em>or</em></td>
</tr>
<tr>
<td>Temp ≥ 100 or 2.4°F above baseline</td>
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</tr>
<tr>
<td><em>plus increase in any of:</em></td>
<td>Rigors</td>
</tr>
<tr>
<td>• Urgency</td>
<td>New delirium</td>
</tr>
<tr>
<td>• Frequency</td>
<td></td>
</tr>
<tr>
<td>• Suprapubic pain</td>
<td></td>
</tr>
<tr>
<td>• Gross hematuria</td>
<td></td>
</tr>
<tr>
<td>• Costovertebral angle tenderness</td>
<td></td>
</tr>
<tr>
<td>• Urinary incontinence</td>
<td></td>
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What’s not in the Loeb criteria?

- Odor or appearance of urine
- Patients without catheter
  - Altered mental status
  - Isolated fever
  - Weakness
Can I defer antibiotics?

- Communicate with the team that will care for the patient next.
  - Inpatient
  - Nursing home
Why is this important?

1. Antibiotic stewardship
2. Efficiency in the ED
3. Premature closure/patient safety
Antibiotic Stewardship

- Individual patient
  - C. difficile
  - Other diarrhea
  - Allergy
  - Drug interactions

- Society
  - Widespread antibiotic resistance
Emergency physicians already in stewardship mode for:

- Rhinitis
- Viral pharyngitis
- Bronchitis
- Acute gastroenteritis
Stewardship and Emergency Medicine

- Pride in specificity, accuracy, efficiency
Efficiency in the ED

- Prescriber’s bandwidth is finite.
- Nurse’s time is finite.
- *We all need to avoid distractions.*
Financial Implications

- We cannot afford to spend time and money chasing red herrings.

- A national priority

- What could help affordability more than eliminating unnecessary costs?
Premature Closure/
Patient Safety

- UTI is blamed, while the real criminal goes free.
  - Hyponatremia
  - Dehydration
  - Ischemia
  - Medication adverse events
  - Etc.
Premature Closure

- As long as you are “open” to other possibilities, you have not “closed” prematurely.

- In emergency medicine, diagnosis and differential diagnosis go hand in hand.

- Good practice always requires a caveat when a test result could be incidental.
  – “True, true, and unrelated.”
Collection Test Characteristics

- Suprapubic aspiration
- Catheter
- Midstream clean-catch
- First-void non-clean-catch
Suprapubic aspiration

- With ultrasound guidance, likely very safe
- Highly accurate
  (for the presence of bacteria only!)
- Rarely done
Catheterization

- In-and-out catheterization, a.k.a. “straight cath”
- Common and safe
- Embarrassing and uncomfortable
- Highly accurate
  *(for the presence of bacteria only!)*
Midstream Clean-Catch

- Methods vary wildly
  - Textbook to textbook
  - Hospital to hospital
  - Nurse to nurse
  - Doctor to doctor
Midstream Clean-Catch

- Difficult for the elderly
  - Cognitive limitations
  - Short-term memory limitations
  - Physical limitations
Midstream Clean-Catch

- When done correctly:
  - False positive: 22%
  - False negative: 23%

- *For the presence of bacteria only!*
**Midstream Clean-Catch**

- No symptoms + no pyuria = no infection
- Pyuria without symptoms ≠ infection
- Symptoms with negative dipstick ≠ no infection (poor sensitivity)
- Squamous epithelial cells ≠ contamination.
First-void non-clean-catch

- Necessary for PCR
  - Best test for gonorrhea and chlamydia
- Must not have voided x 1 hour
Mid-stream *and* first-void?

- Extremely difficult to explain & coordinate
Case Vignette 2

- 45 year old man has new-onset dysuria

- Challenges:
  - What tests?
  - Collection method?
  - Is urine dip accurate?
  - Is urinalysis accurate?
  - Is urine culture accurate?
What to do about collection?

- Communication is key!
  - Between RNs and prescribers
  - Explain to patients what is needed
  - Ask patients what they did

- Always consider cath if the voided specimen is dirty
Gaming the system?

- Some facilities analyze urine whenever they put in a Foley catheter.
  - Want to avoid being blamed for CAUTI

- Note: the consequence of such blame is limited to non-payment for the UTI (not the whole bill).
Gaming the system?

- This is billing fraud if there was no genuine medical indication for testing.
- This is dangerous because physicians may react by prescribing antibiotics.
- These data should NOT be reported through the usual clinical reporting system when done for this reason.
- At minimum, excellent communication is required as to WHY the test was done.
Specific Action Items re. sample collection

- Prescribers
- Nurses
- Leadership
Sample Collection: Prescribers

- When there are no symptoms: Do not test, do not treat!

- In the gray zone, beware premature closure!
  - Consider observation.
  - Focus on differential diagnosis.
  - Most of these patients probably don’t have UTI.
Sample Collection: Nurses

- Don’t test urine without an order
  - Collect and hold
  - Specify & record collection technique.
  - hCG okay
Sample Collection: Leadership

- Target providers:
  No non-indicated orders.

- Target nurses:
  No non-ordered tests.

- System-wide:
  Separate surveillance from clinical practice.
General Take-Home Messages

- Prescribers
- Nurses
- Leadership
Prescribers

1. Use the conceptual framework
2. Formal, written orders only
3. Specify collection method
Conceptual Framework

- No symptoms
  - DO NOT TEST OR TREAT

- Vague symptoms
  - Beware premature closure – focus on DDx
  - Consider observation instead of treatment

- Specific symptoms
  - Test & treat as indicated
Nurses and Assistants

1. Collect and hold only

2. Advocate for better practice: no urine testing (except hCG) without prescriber’s order

3. Improve communication
   – What sample do we need?
   – What sample did we get?
Leadership

Policies

1. No tests without orders
2. No orders without symptoms
3. No mixing of billing-related surveillance with clinical care

Education

1. Asymptomatic bacteriuria definition & prevalence
2. First-void vs. midstream clean-catch
   (gonorrhea/chlamydia vs. traditional)
If we remember one thing...

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