

# Moving from Bag to Catheter for Urine Collection in Non-Toilet-Trained Children Suspected of Having Urinary Tract Infection: A Paired Comparison of Urine Cultures

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**Objective** To compare, in the same children, urine culture results from bag- versus catheter-obtained specimens with catheter culture as the reference.

**Study design** A total of 192 non-toilet-trained children <3 years of age from 2 emergency departments were recruited for this prospective cross-sectional study. All had positive urinalysis results from bag-obtained specimens that were systematically checked with a catheter-obtained specimen before treatment. Results of comparison of urine cultures obtained with these 2 collecting methods are presented.

**Results** A total of 7.5% of bag-obtained specimen positive cultures had false-positive results. Twenty-nine percent of bag-obtained specimen cultures with negative results were false negative. Altogether, bag-obtained specimens led to either a misdiagnosis or an impossible diagnosis in 40% of cases versus 5.7% when urethral catheterization was used.

**Conclusion** Every bag-obtained positive-result urinalysis should be confirmed with a more reliable method before therapy. (*J Pediatr* 2009;154:803-6)

Urinary tract infection (UTI) is a frequently suspected cause of fever in young children, affecting as many as 5% of febrile infants without any clinical sign of infection.<sup>1</sup> Most cases of febrile UTIs are caused by pyelonephritis. Early diagnosis is important to prevent parenchymal complications and detect urinary tract malformations. The choice of the urine collection method used is decisive for the reliability of UTI diagnosis in non-toilet-trained children. Four methods are currently used in emergency departments. First, the clean-catch method is not practical, time-consuming, and remains difficult to use for non-toilet-trained children, especially in an emergency department.<sup>2</sup> Second, suprapubic aspiration is frequently recommended in official guidelines,<sup>3,4</sup> but its use remains rare in many countries, especially in western Europe.<sup>4-6</sup> The main drawbacks of this method are its limited success rate (only 25%-60%),<sup>7</sup> especially when used without ultrasound scanning guidance,<sup>8</sup> and the associated pain that has been reported to be greater than for urethral catheterization.<sup>9</sup> Thus, for some authors, the third method, catheterization, appears to be a good alternative to suprapubic aspiration.<sup>10</sup> The last method, urine bag collection, remains widely used in many countries,<sup>5,6</sup> despite numerous guidelines, because of its practical aspects despite its well-known limitations, including a high contamination rate. In their study comparing urine culture results from bag or catheter in parallel groups of children, Al Orifi et al reported a contamination rate of 62.8% with bag collection versus 9.2% with urethral catheterization.<sup>10</sup> More recently, McGillivray et al confirmed, in a head-to-head comparison study, that the specificity of direct urine analysis in predicting UTI was much lower with bag-obtained specimens (BOS) than with catheter-obtained specimens (COS; 62% versus 97%).<sup>11</sup> Thus, on the basis of these 2 studies, we decided to confirm bag-based UTI suspicions with a catheter-obtained urine sample before initiating any antimicrobial treatment in 2 pediatric emergency units. Urine culture results were then obtained with both collection methods in the same children, thereby allowing us to compare the results of these 2 methods.

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BOS	Bag-obtained specimen	UTI	Urinary tract infection
CFU	Colony forming unit	WBC	White blood cells
COS	Catheter-obtained specimen		

## METHODS

### Study Design

We conducted a prospective cross-sectional study involving non-toilet-trained children who were younger than 3 years and had been admitted to 1 of 2 pediatric emergency departments (Limoges, Poissy, France) between October 2004 and June 2007.

### Diagnosis Strategy and Urine Collection Methods

Urine cultures were obtained from every non toilet-trained child <3 years with fever of unknown origin. Urine was first collected by application of an adhesive bag (Urinocol, Braun Medical, Diegem, Belgium) after cleaning the perineum with soap water or with an antibacterial skin cleansing agent. Bags were fitted by pediatric nurses. Each unit's good practice guidelines recommend changing the bag every 30 minutes; however, the bag collection duration was not closely monitored. After collecting, urine was sent for urinalysis, especially when the dipstick was positive for leukocyte esterase, nitrites, or both. Recommendations were then to confirm any positive bag-urinalysis results (ie, direct microscopic examination) by sending these bag-obtained samples for culture with a second specimen obtained with catheterization. However, the indication for catheterization was left up to the physician, depending on bag-urinalysis results and the patient's clinical and biological data.

This strategy allowed us to obtain urine culture results with both collection methods for all the children with positive results on bag-obtained urinalysis who underwent catheterization. Microbiologists were not blinded to the method of collection, and cultures were limited to known pathogenic organisms.

The catheterization procedure was evaluated in a subset of 143 children during the study period, allowing us to calculate the catheterization failure rate in this subgroup of patients.

### Patients

All patients with 2 urine analyses (first obtained with bag and second with catheter) performed on the same visit during the study period in the 2 participating centers were included in this study. The data collected included age, sex, consulting reason, urinalysis and culture results from both BOS and COS. Data about the circumcision status were not recorded.

### Definitions

The following definitions were used according to American Academy of Pediatrics guidelines:<sup>3</sup>

Positive urine analysis:  $\geq 10$  WBC/ $\mu$ L, presence of bacteria on direct microscopic examination, or both;

Positive urine culture for BOS:  $\geq 10^5$  CFU/mL (1 species only);

Positive urine culture for COS:  $\geq 10^3$  CFU/mL (1 species only);

Polybacterial urine culture (considered as contaminated samples; both BOS and COS):  $\geq 10^5$  or  $\geq 10^3$  CFU/mL (according to the collection method used) and  $\geq 2$  species present on culture results;

Negative urine culture: all the other specimens.

Results obtained from COS were considered to be the gold standard for comparison with BOS.<sup>3</sup> Ninety-five percent CIs are detailed for every result. Percentage comparison was performed with the  $\chi^2$  test.

### Patients' Description

During the study period, 550 children <3 years old, seen at the participating centers, had positive urinalysis results from BOS. A total of 192 patients (138 girls, 54 boys; mean age,  $9.3 \pm 7.6$  months) were included in this study after their BOS results were confirmed with COS results. Fifty-one of these 192 patients were <3 months old. As this study was a prospective analysis of an every day practice, no consents for research purposes were collected from the patients or their families.

## RESULTS

### Urine Culture Results with Bag- and Catheter-obtained Specimens

All BOS-urinalysis results were positive: in 62.5% for white blood cells (WBC) alone, in 0.5% for the presence of bacteria alone on microscopic examination, and for both in the remaining cases. In these 192 BOS, 93 (48.4%) urine culture results were positive (*E Coli* 87%, *Enterococcus* 4.3 %, *Klebsiella* 3.2 %, others 5.5 %); 41 (21.4%) urine culture results were negative, and the remaining 58 (30.2%) were polybacterial.

According to COS urine culture results, 102 (53.2%) of these 192 patients had a UTI, 79 (41.1%) had a negative urine culture results, and 16 (8.3%) had a polybacterial result.

The positive predictive value of positive urinalysis results for predicting positive results with a catheter urine culture was 53% for BOS and 68% for COS.

### Urine Culture Results from Catheter-obtained Specimen Compared with Bag-obtained Specimen Culture Result Categories

Comparison of COS culture results with BOS culture results are detailed in the Table. A total of 7.5% of positive BOS culture results (95% CI, 2.17-12.9) were false positive. Twenty-nine percent of negative BOS culture results were false negative. These results indicate that for 77 of the 192 children included in this study (40.1%; 95% CI, 33.2-47.0), urine culture of bag-obtained specimens alone would have led to either a misdiagnosis or an impossible diagnosis, if not for the culture results of COS. Only 16 COS culture results (8.3 %, 95% CI, 4.4-12.2) led to an impossible diagnosis because of polybacterial results.

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