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Emelia Winston, Rachel Marteney, Erin Casey, and Kevin Conway

### Author Affiliations

Emelia Winston (*Marshall University Joan C. Edwards School of Medicine, Huntington, West Virginia*)

Rachel Marteney (*Marshall University Joan C. Edwards School of Medicine, Huntington, West Virginia*)

Erin Casey (*Marshall University Joan C. Edwards School of Medicine, Huntington, West Virginia*)

Kevin Conway (*Marshall University Joan C. Edwards School of Medicine, Huntington, West Virginia*)

### Corresponding Author


Kevin Conway MD

Marshall University Joan C. Edwards School of Medicine

Huntington, West Virginia

Email: [conaway@marshall.edu](mailto:conaway@marshall.edu)

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## Reducing overtreatment of urinalysis in obstetric triage patients

### Abstract

Overtreatment of asymptomatic bacteriuria (ASB) is a major issue that has been coming to the forefront in recent decades. Studies have shown that it can lead to adverse side effects, extra costs, and antimicrobial resistance. The purpose of this study was to determine the number of patients presenting to obstetric triage who were overtreated for a urinalysis (UA) and to see if an educational intervention could reduce the incidence of overtreatment for suspected ASB. This was a retrospective chart review analyzing UA results and outcomes of OB triage patients that came through labor and delivery before and after an educational intervention. Two time periods were identified. Cohort 1 (pre-intervention) included patients from March-May of 2017. Cohort 2 (post-intervention) included patients from March-May of 2018. These time periods were chosen to have similar training levels on labor and delivery triage. Based on UA criteria it was then determined if subjects were treated appropriately. 1312 charts were reviewed: 601 in Cohort 1 (pre-intervention) and 711 in Cohort 2 (post-intervention). There was a significant reduction in subjects who were overtreated for UA following the intervention. In our study, a resident to resident didactic session appears to have reduced the incidence of overtreatment of bacteriuria. This type of intervention could lead to more cost-efficient care and reduce complications for individual pregnant patients.

### Keywords

Urinary tract infection, asymptomatic bacteria, pregnant, intervention, obstetric triage

### Introduction

Asymptomatic bacteriuria (ASB) occurs when there is a significant number of bacteria in urine without having signs or symptoms of a urinary tract infection (UTI). It can occur between 2% to 10% of pregnant women.<sup>1</sup> In contrast, a UTI is the presence of more than 100,000 organisms/mL of urine with accompanying pyuria (>7 white blood cells [WBCs]/mL) in a patient with symptoms.<sup>2</sup> UTI in pregnancy is a source of morbidity for both mother and fetus. When UTI is untreated it can lead to an increased rate of pyelonephritis up to 20 to 30 times.<sup>3</sup> UTIs can increase risks of preterm labor, preterm delivery, maternal sepsis, maternal hypertension, chorioamnionitis, low birth weight, and stillbirth even without progressing to pyelonephritis.<sup>4</sup>

Overtreatment of asymptomatic bacteriuria is a major issue that has been coming to the forefront in recent decades. Studies are showing that it can lead to adverse side effects, extra costs, and antimicrobial resistance. Increased healthcare-associated costs, antibiotic resistance, and risk of other infections are caused by disturbance of the intestinal flora. When ASB is treated, the promotion of symptomatic UTIs can occur due to the elimination of low-virulence strains that suppress the development of uropathogens.<sup>5</sup>

There are different methods of diagnosing urinary tract infections. Urine dipstick sensitivity and specificity have a wide range, from 50-92% and 86-97% respectively. In comparison, urinalysis has sensitivity and specificity of 25-67% and 97-100% respectively. Urinalysis to diagnose UTIs

has been extensively studied but the results are extremely inconsistent. Associations do exist between leukocyte esterase, blood, RBC, WBC, and the presence of bacteria with a positive urine culture. Greater than 5 WBC on microscopy, although sensitive, is nonspecific and the presence of nitrites and bacteria on microscopy is specific but non-sensitive with wide ranges.<sup>6</sup> Although data is inconsistent, the best evidence for diagnosing a UTI from a urinalysis is the presence of nitrites and >7 WBCs. Urine culture has been the gold standard method for evaluating for UTI during pregnancy per American College of Obstetrics and Gynecology (ACOG) and U.S. Preventative Task Force (USPTF).<sup>7</sup> It has the highest sensitivity and specificity when compared to urine dipstick or urinalysis. Greater than 10<sup>5</sup> colony forming units (CFU) is diagnostic for a UTI.

The purpose of this study was to determine the number of patients presenting to OB triage who were overtreated for a urinalysis (UA), and if an educational intervention could reduce the incidence of overtreatment for suspected ASB.

## Methods

This was a retrospective chart review analyzing urinalysis results and outcomes of triage patients at a single academic center before and after an educational intervention. At the study site, triage patients are managed by obstetrics and gynecology (OBGYN) residents and family practice (FP) residents. The intervention was an educational didactic session given January 2018 to all obstetrics and gynecology residents. Additional education was provided to family medicine residents at the start of each month after January 2018. This included proper identification of those needing treatment for a UTI and how to properly assess/interpret a urinalysis and urine culture. Periods of study included two cohorts: Cohort 1 (pre-educational intervention): March through May 2017 and Cohort 2 (post-educational intervention): March through April 2018. Dates were chosen to have similar resident training levels in triage.

Data collected included: gestational age at triage visit, age, BMI, comorbidities such as hypertension, diabetes or kidney pathology, h/o recurrent UTIs, UA results, whether criteria were met for treatment on UA results, whether treatment was given and urine culture results. Subjects were then classified into three groups. Those “treated appropriately” (met criteria for treatment and received a prescription for an antibiotic), those “overtreated” (did not meet criteria for treatment and received a prescription for an antibiotic) and those “missed” (met criteria for treatment and did not receive a prescription for an antibiotic). Proportions of “treated appropriately”, “overtreated” and “missed” from Cohort 1 and Cohort 2 were compared using chi-square analysis. Inclusion criteria were pregnancy, assessment by either FP or OBGYN residents in triage and urinalysis performed. Patients were excluded if they were treated more than one time for UTI during the pregnancy or had risk factors precluding them to UTIs (history of recurrent UTIs, kidney pathology, or those on antibiotic suppression therapy already). Patients were also excluded if they were given antibiotics at an outside facility. The primary outcome was to assess the prevalence of overtreatment of urinalysis results in obstetric triage patients. Secondary outcome evaluated whether educating residents about how to properly interpret a urinalysis would improve the accuracy of urinalysis treatment among obstetric triage patients.

## Results

1312 charts were reviewed; 601 in Cohort 1 (pre-intervention) and 711 in Cohort 2 (post-intervention). Groups did not differ by age, gestational age, or history of genitourinary pathology, but were slightly different in other past medical history, including the presence of hypertension, diabetes, and obesity. (Table 1)

Table 1: Baseline characteristics of subjects in Cohort 1 (pre-educational intervention) and Cohort 2 (post-educational intervention)

|                          | Cohort 1<br>n=601 | Cohort 2<br>n= 711 | p value |
|--------------------------|-------------------|--------------------|---------|
| Age                      | 24.7 (D 5.3)      | 25.4 (SD 4.4)      | 0.32    |
| Gestational Age          | 29.6 (SD 8.3)     | 29.3 (SD 8.1)      | 0.23    |
| Hypertension n (%)       | 118 (19.6)        | 106 (14.9)         | 0.027   |
| Diabetes n (%)           | 34 (5.7)          | 64 (9)             | 0.026   |
| Obesity n (%)            | 289 (48.1)        | 403 (56.7)         | 0.002   |
| Recurrent UTI n (%)      | 22 (3.7)          | 30 (4.2)           | 0.67    |
| Pyelonephritis n (%)     | 9 (1.5)           | 9 (1.3)            | 0.81    |
| Kidney Pathology n (%) * | 13 (2.2)          | 26 (3.7)           | 0.13    |

\*Kidney pathology (nephrotic syndrome, nephrolithiasis, horseshoe kidney)

There was no significant difference in the number of subjects treated appropriately or the number of patients who should have been treated but were not (“missed”) in both cohorts. (Table 2). There was, however, a significant reduction in subjects who were overtreated for UA following the intervention. In both cohorts, all cases of pyelonephritis were treated appropriately.

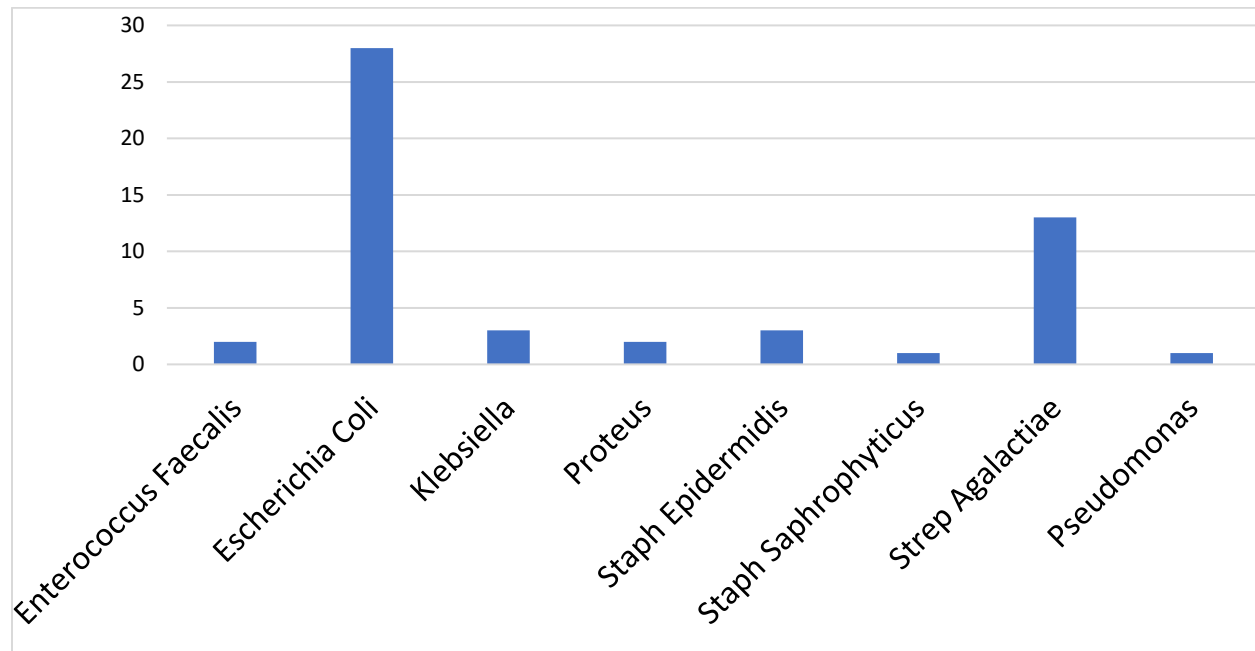
Table 2: Subjects treated appropriately, over-treated, and missed in each cohort.

|                       | Cohort 1<br>n=601 | Cohort 2<br>n=711 | p value |
|-----------------------|-------------------|-------------------|---------|
| Treated appropriately | 21 (3.5)          | 19 (2.7)          | 0.38    |
| Overtreated           | 60 (10)           | 36 (5.1)          | 0.001   |
| Missed                | 3 (0.5)           | 11 (1.5)          | 0.10    |

The most common culture results showed E Coli and Group B Strep (GBS). (Figure 1). While the number of “missed” subjects increased from Cohort 1 to Cohort 2, this was not statistically

significant. Furthermore, urine culture results showed that half of those in this category were skin flora contaminants only. Of the 11 missed patients, 7 of them had GBS with skin flora noted on urine culture.

Figure 1: Most common bacterial results from urine cultures among both cohorts.



## Discussion

Other studies show that at least a third to half of the patients are being overtreated on urinalysis results.<sup>8</sup> Most of these studies however were on nonpregnant patients, and there is limited data on this incidence in the pregnant population. Based on preset criteria, our study demonstrated an initial “overtreatment” incidence of 10%. It was also demonstrated that with a simple didactic session, the incidence of overtreatment of urinalysis results statistically declined. This type of intervention could lead to more cost-efficient care and reduce complications for individual pregnant patients. It is important to use the urinalysis and urine culture to adequately diagnose a UTI. This involves being able to properly interpret these tests especially since the urinalysis has low sensitivity. Based on our preset criteria, not only did overtreatment decline but the majority of “missed” patients had skin flora results from urine culture. There were no differences between cohorts in pyelonephritis.

The strengths of this study include the reproducibility of a simple didactic teaching session on a larger scale, the number of charts reviewed, and similar times of study in regard to resident training. Limitations of this study include the retrospective nature of data collection and the variability of providers. Due to the morbidity associated with UTI in pregnancy, this study offers a helpful initiative to appropriately treat obstetric patients, while avoiding the overuse of antibiotics when not indicated. Future studies could investigate the cost-effectiveness of this intervention.

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