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URINARY SYMPTOMS IN ADOLESCENT FEMALES: STI OR UTI?

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Abstract

Purpose—To determine if urinary symptoms or urinary tract infections (UTI) were associated with sexually transmitted infections (STI) and which history, clinical, and laboratory findings could distinguish these infections in symptomatic women.

Methods— A cross sectional sample of 296 sexually-active females aged 14–22 attending a hospital-based teen health center or emergency department were recruited. Genitourinary symptoms, medical and sexual history, and urinalysis results were recorded. STI was defined as a vaginal swab positive for *Trichomonas vaginalis* or urine nucleic acid amplification test positive for *Neisseria gonorrhoeae* or *Chlamydia trachomatis*. A urine culture with >10,000 colonies of a single pathogen was considered a positive UTI.

Results— In the full sample, prevalence of UTI and STI were 17% and 33%, respectively. Neither urinary symptoms nor UTI was significantly associated with STI. Further analyses are reported for the 154 (51%) with urinary symptoms: Positive urine leukocytes, >1 partner in the last 3 months and history of STI predicted STI. Urinalysis results identified four groups: (1) Normal urinalysis – 67% had no infection; (2) Positive nitrites or protein – 55% had UTI; (3) Positive leukocytes or blood – 62% had STI; and (4) Both nitrites/protein and leukocytes/blood positive – 28% had STI and 65% had UTI. Those without a documented UTI were more likely to have trichomoniasis than those with a UTI, and 65% of those with sterile pyuria had STI, mainly trichomoniasis or gonorrhea.

Conclusions— Adolescent females with urinary symptoms should be tested for both UTI and STIs. Urinalysis results may be helpful to direct initial therapy.

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INTRODUCTION

Urinary symptoms are common reasons for outpatient visits among sexually-active women. [1] [2] Clinical guidelines for the management of these symptoms focus on the predominant outcome of urinary tract infections (UTIs) and typically recommend empiric antibiotic therapy to cover common urinary pathogens.[3] While this approach often leads to symptom resolution in adult women, it may miss the detection and treatment of sexually transmitted infections that exist alone or concurrently with UTIs. Studies have demonstrated that 20% of adult women with culture-proven UTIs have concomitant vaginal or cervical infections with sexually transmitted organisms such as *Trichomonas vaginalis* (TV), *Chlamydia trachomatis* (CT), and *Neisseria gonorrhoeae* (GC).[4] Given the higher rates of sexually transmitted infections (STIs) among adolescent females compared to adult females, it remains unclear if guidelines based on adult data are appropriate for use in adolescent populations.

The main objective of this study is to answer the clinical question: How should a sexually active adolescent female with urinary symptoms be evaluated and treated? In order to answer that question, one needs to know: (1) if urinary symptoms are associated with UTI, STI, or both; (2) if UTI occurs independently of STI; and (3) which clinical variables can differentiate sexually-active adolescent females with UTI from those with an STI such as TV, CT, and/or GC.

METHODS

Subjects

All sexually active female patients aged 14–22 years who presented to the adolescent health center or emergency department of an urban children's hospital when research personnel were available were eligible to participate. Patients were ineligible if they had known genitourinary tract anomalies; kidney disease; cognitive impairment; illness severity that precluded study interview or specimen collection; or antibiotic use in the last two weeks. In addition, we excluded those with testing for TV, CT, or GC within the preceding three months for several reasons. In our setting, STI screening is routine at six-month intervals. Those who have been recently tested for STIs may be at lower risk for STIs due to increased surveillance or may represent a higher risk group that receives frequent screening due to risk behaviors; therefore, we chose a three-month cut-off for this exclusion. The study protocol was approved by the hospital's Institutional Review Board. Signed informed consent to participate in the study was obtained from the participant if ≥ 18 years; for those under age 18, patient assent and parental consent were required. We estimated that about 20% of eligible subjects under age 18 declined to participate due to this requirement. Because this may have introduced a bias, we did not include age as a risk factor for STIs in this analysis.

Data Collection

A trained research assistant obtained the following information from each participant through a structured face-to-face individual interview: current history of dysuria, urinary urgency, urinary frequency, vaginal discharge, vaginal itching, past history of UTI or STI, recent antibiotic use, date of last sexual intercourse, current contraceptive methods, number of lifetime sexual partners, and number of total and new sexual partners within the past three months.

Following the interview, each subject collected a clean-catch, midstream urine sample in a sterile urine container. An aliquot was removed for in-office urinalysis using reagent strips read by an automated urine chemistry analyzer (Multistix 10SG and Clinitek 50, Bayer Diagnostics, Elkhart, IN) according to the manufacturer's protocol. This testing is routinely performed by trained medical assistants in our office laboratory, following CLIA guidelines

and quality assurance procedures. The residual specimen was transported to the clinical laboratory, where urine culture and urine nucleic acid amplification testing for CT and GC (BDProbetec-ET, Becton Dickinson, Sparks, MD) were performed per usual laboratory protocols. A vaginal sample for TV culture was collected either by self-swab or by the clinician during a speculum examination. An In-Pouch TV[®] culture system (BioMed Diagnostics, White City, OR) was inoculated with this swab according to the manufacturer's instructions and transported to the laboratory. The TV culture was incubated and read daily until positive, or to a maximum of 5 days.

Additional testing, such as complete pelvic examination or direct microscopic examination of a saline preparation of vaginal secretions (wet mount), was performed at the discretion of the clinician. In the adolescent health center, the wet mount was read immediately after collection by a wet mount trained and certified clinician. In the emergency department, the specimen was sent to the microbiology laboratory where it was read by trained laboratory technicians.

Data Analysis

The primary outcome variables were UTI and STI. UTI was defined as >10,000 colonies of a single pathogenic organism on urine culture. STI was defined as positive test result(s) for TV, CT, and/or GC. TV was considered present if motile trichomonads were seen on wet mount or TV culture. CT or GC was considered present if the respective urine nucleic acid amplification test was read as positive. Samples where the nucleic acid amplification test was read as indeterminate were defined as negative (<2% of samples) based on the clinical laboratory protocol.

Urinary and vaginal symptoms were evaluated singly and in combinations. Because no differences were detected by individual symptoms, urinary symptoms were defined as the patient report of any dysuria, urinary frequency, and/or urinary urgency. Patient report of either vaginal discharge or itching was defined as vaginal symptoms. Due to the reported poor specificity of urinalysis results that are reported as trace positive,[5] urinalysis readings of 1+ and higher were defined as positive tests for urinary leukocyte esterase (leukocytes), protein, and blood, while nitrites were recorded as positive or negative without quantification.

Chi-square or Fischer's exact tests were used to explore the associations of UTI, STI, TV, CT, and GC with the composite and individual urinary and vaginal symptoms, patient history, and urinalysis results variables. T-test was performed to test the association between age and urinary symptoms. Those variables associated with each outcome at $p \leq 0.1$ were entered into a backward stepwise logistic regression model. For sparse data, exact logistic regression was performed. Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated for the final model. Both SAS (SAS Institute, Cary, NC) and Stata (Stata version 8.0, StataCorp, College Station, TX) were used for these analyses.

To explore the process by which subjects could be separated by clinical or laboratory characteristics into mutually exclusive outcomes, a non-parametric technique called Classification And Regression Tree (CART) analysis was performed (Answer Tree 3.0, SPSS, Inc., Chicago, IL). CART begins with all subjects in a single parent node and progressively grows a decision tree by identifying the one independent variable at each step that best splits the sample into a positive or negative outcome.[6]

CART was developed separately for the dichotomous outcomes of STI and UTI. In addition, CART was performed for a multi-level outcome (STI, UTI, both, or neither) that was generated for patients who had the results of both STI and UTI testing. A risk estimate, or probability of making a misclassification error, was calculated for the resulting trees by dividing the number

of false positives plus false negatives by the total sample size. Sensitivity and specificity were calculated for the dichotomous outcomes of STI and UTI.

RESULTS

We recruited 305 subjects between 5/1/03 and 1/31/05. Four subjects did not complete the interview and five subjects were missing both STI and UTI outcomes, leaving 296 for analyses. Subjects missing either STI or UTI results were included in pairwise analyses. Subjects ranged in age from 14–22 (mean 18.0 years); 230 (78%) were black (Table 1). STI prevalence was 33% and UTI was documented in 47/281 (17%) with urine culture results. The prevalence of TV, CT, and GC was 18%, 18%, and 10%, respectively. For the 164 (56%) who had a wet mount performed, wet mount detected 62% (20/32) of TV cases, including 2 that were wet mount positive and culture negative (specificity of wet mount is set at 100% by convention). Culture alone detected 20 cases of TV in the group where no wet mount was performed.

Association of Urinary Symptoms with UTI or STI

Overall, 154 (52%) reported urinary symptoms. Of these, dysuria alone or in combination with other urinary symptoms was reported most frequently, followed by both urgency and frequency, and fewer reported either urinary urgency alone or urinary frequency alone (Table 1). Compared to those without urinary symptoms, those with urinary symptoms were more likely to report vaginal symptoms, have a history of prior STI or UTI, have a wet mount done by the provider, and to be positive for current UTI. However, they did not differ with respect to age, race, or other STI risk factors, such as condom use and number of sexual partners. Among symptomatic women, there was a trend toward a higher prevalence of STI than UTI (36% vs. 26%, $\chi^2 = 3.6$, $p = .06$) that did not reach statistical significance. TV was as prevalent as CT (22% vs. 20%); both were higher than GC (11%); 9(6%) were co-infected with STI and UTI; and for 63 (43%), all diagnostic tests were negative. All STIs were more prevalent in those with urinary symptoms compared to those without, but this difference did not reach statistical significance.

Urinary symptoms in any combination were associated with UTI. We evaluated symptoms singly and in combinations (for example, dysuria alone or urinary symptoms without vaginal symptoms) for each STI outcome, but we found no statistically significant associations between urinary symptoms and any STI. We also examined combinations of outcomes (such as STI without UTI, or TV plus GC) and were unsuccessful at discovering any significant associations between urinary symptoms and STI outcomes (data not shown).

Association of UTI with STI

Thirty eight subjects (26.2%) in the group with urinary symptoms had a documented UTI. The most common pathogen isolated was *Escherichia coli* (25/38), followed by *Staphylococcus saprophyticus* (4/38), *beta hemolytic streptococci* (4/38), *Proteus mirabilis* (3/38), and *Citrobacter koseri* (2/38). There was no increase in STIs among those with UTIs in the full or asymptomatic sample (Table 2). However, women with urinary symptoms who had no UTI were more likely to have TV compared to those with a documented UTI (26% vs. 9%, $p = .03$).

Differentiation of STI from UTI in Symptomatic Adolescent Women

To assess how to differentiate STI from UTI in symptomatic adolescent women, three approaches were used for the 154 subjects with urinary symptoms: univariate analyses, multivariable logistic modeling to assess predictors of infection, and CART analysis to derive a clinical decision tree. Because treatment differs for each outcome (CT, GC, TV, any STI,

UTI), we evaluated the associations between history, symptoms, and laboratory variables separately for each outcome.

Logistic Regression—Multivariable logistic regression models were developed to adjust simultaneously for all variables found significant at $p \leq 0.1$ in univariate analyses. A backward stepwise process was used to delete non-significant variables. Final models are presented in Table 3.

UTI Model Among women with urinary symptoms, the strongest predictor of UTI was the presence of nitrites on urinalysis followed by proteinuria and history of STI. No other history or lab findings remained significant. Of note, the presence of vaginal symptoms did not decrease the odds of UTI.

STI Models For these females with urinary symptoms, a history of prior STI was associated with increased odds of TV, while a report of more than one sexual partner in the last three months was associated with increased odds of CT and GC. In addition, urinalysis positive for leukocytes significantly increased the odds of GC and TV by 5- to 13-fold. Blood on urinalysis increased the odds of GC and TV, while proteinuria was associated with a decreased prevalence of TV. Other variables, such as new sexual partner in the last three months, condom use at last sexual intercourse, withdrawal as contraceptive method, black race, the presence of dysuria alone, or short duration of symptoms (modeled at ≤ 48 hours or ≤ 7 days), did not reliably distinguish STI from UTI and did not contribute to the final models.(Data not shown).

CART Model We developed a CART that distinguished multiple outcomes: UTI only, STI only, both infections, and neither infection. Initially, all variables were available to the CART analyses. However, the resulting trees were complex and did not have a good predictive value. We could not identify any symptom or history variables that reliably predicted any outcome, and therefore these variables were deleted.

For the multi-level outcome, a decision tree using only urinalysis results as predictor variables correctly classified 62% of the symptomatic sample into five groups, displayed as nodes in Figure 1. Sensitivity and specificity cannot be easily calculated due to the overlap in infections. The group with positive nitrites only (node 1) had the highest prevalence of UTI (93%). In the group that was negative for nitrites and protein but positive for leukocytes (node 10), 73% had an STI. The group with both leukocytes and protein had mixed infections (node 7), and only 21% were negative for both STI and UTI. The majority (61%) of those with negative nitrites and leukocytes had no infection (node 5). However, nearly a quarter of these had an STI, and a misclassification rate of 38% is considered a poor performance for CART.

Based on the results of the CART, logistic regression and univariate analyses, we identified four groups based on urinalysis results as shown in Table 4. For the 142 sexually active adolescent women with urinary symptoms and complete laboratory data, 29 (20%) had UTI only, 42(30%) had STI only, and 9 (6%) had both. In the first group with normal urinalysis results, the prevalence of STI and UTI were at baseline for our sample, and 36 (67%) were free of infection. Group 2 (only positive for nitrite or protein) had increased UTI prevalence (55%). Group 3 (those positive only for leukocytes or blood) had increased STI prevalence (62%). Group 4 (positive for both nitrites &/or protein and leukocytes &/or blood) had increased STI (28%) and UTI (73%) prevalence over baseline, and 6 (17%) were free of infections. These groups were significantly different from one another using a Fisher's exact test, at $p < 0.01$.

Of the remaining 62 (44%) without a diagnosed STI or UTI, an additional 14 were given clinical diagnoses, including herpes simplex virus ($n = 3$), bacterial vaginosis ($n = 5$), candida ($n = 2$), and pelvic inflammatory disease ($n = 4$) (data not shown).

In women with urinary symptoms, 24/37 (65%) with sterile pyuria (negative urine culture and positive leukocytes) had a STI, compared to 18/67(27%) of those with negative urine culture and negative leukocytes ($\chi^2=14$, $p<.001$). The majority of these STIs (19/24, 79%) were TV or GC.

DISCUSSION

In addition to UTIs, urinary symptoms have often been attributed to STIs such as TV, CT, and GC, and it is possible for UTI and STIs to occur concurrently. In a retrospective review, we showed that adolescent females who were screened for both UTI and CT had high rates of concurrent disease, and that urinary or vaginal symptoms were imprecise in distinguishing the two infections.[7] While some other studies have shown an increase in CT or GC among women with urinary symptoms or UTI, others have not.[8] [9,10] The only prospective study of adolescent girls with urinary symptoms found that 29% had an STI (TV, GC, HSV, or CT), 23% had candida vaginitis, 17% had UTI, and an additional 17% had both UTI and vaginitis. [11] However, the sample size was small, there was no asymptomatic control group, and the testing methods in 1982 were less sensitive than those that are currently available.

Because UTI and STI share similar risk factors, such as recent sexual contact, we hypothesized that these infections might frequently coexist. In fact, we believed that alteration in host factors caused by one infection, such as inflammation of the urethra, might render a subject more susceptible to a second infection. However, our data do not support this hypothesis, and STI and UTI appear to be independent infections.

In this study, we determined that sexually active adolescent females with urinary symptoms did not have a significantly higher prevalence of CT, GC, and/or TV than those without urinary symptoms (36 vs. 29%, $p = 0.16$). The small increase in STIs in women with urinary symptoms compared to those without noted in our study would require a sample size of 723 symptomatic and 1445 asymptomatic women to reach statistical significance. However, in this sample of young women, the high STI prevalence found is remarkably similar to that reported in prior studies of adolescent females with urinary symptoms.[7] [11]

While symptoms did not predict outcomes, we showed that urinalysis results of leukocytes or blood predicted STI, while nitrites or protein predicted UTI in symptomatic patients. In a classic study of women with acute urethral syndrome, sterile pyuria (defined as a negative urine culture and positive urine leukocytes) was strongly associated with CT.[12] However, we found that sterile pyuria was more commonly associated with TV and GC instead of the CT that we expected. Finally, in women with urinary symptoms, we found a higher prevalence of TV in those without a UTI compared to those with a UTI.

Our data can be used to improve the clinical care of adolescent females. There are two recently published evidence based guidelines for the evaluation of adult women with genitourinary symptoms. The guidelines for UTI[3] report that vaginal symptoms decrease the likelihood of UTI, which is contrary to our findings. The guidelines for vaginitis[13] recommend STI testing for those “at risk.” The literature contains many reports that link patient history variables to STI risk; however, our findings confirm those of others[14–16] who have shown that risk factors alone are inadequate at delineating a sample that requires STI screening. In addition, we demonstrated that there is a large overlap in self-reported vaginal and urinary symptoms in adolescent women. This may reflect that adolescent women find it more difficult to accurately distinguish or describe their symptoms compared to adult women, thus weakening the predictive value of these symptoms. These findings suggest that guidelines developed for adult women may not apply to adolescent females.

Although we could not identify any symptoms that could reliably identify sexually active adolescent females who have CT or GC, the presence of vaginal symptoms increased the likelihood of TV. There are no screening guidelines for TV, and many providers use a wet mount to detect TV, which has 60% sensitivity compared to culture in this study and in other literature.[17] [18] In this study, a self obtained vaginal swab allowed us to detect TV without a speculum exam. Surprisingly, only two thirds of those with urinary symptoms had a wet mount ordered by their provider.

The limitations of this study are that we did not require full pelvic exam for participation, nor did we evaluate patients for other etiologies of urinary symptoms such as *Candida albicans*, bacterial vaginosis, or herpes simplex virus. The small sample size and high STI prevalence in our population decreased our ability to detect a difference in STIs between women with and without urinary symptoms. In addition, this high prevalence may make these results less generalizable to some settings, but does reflect many settings where adolescents receive care. The urine nucleic acid amplification test that we used has high sensitivity for CT and GC (92.5% and 91.3%, respectively) and specificity (>98%). [19] The combination of wet mount and culture for the diagnosis of TV has a reported sensitivity of 80–85% and specificity of 100%.[20,21] While we do not believe that we overestimated the prevalence of infections in this study, these diagnostic tests may not be available in some practice settings.

In contrast to the published guidelines for adult women, many adolescent experts recommend testing for STI and UTI infections in sexually-active adolescent females who have urinary symptoms.[22,23] Our data support this recommendation. CT is asymptomatic and neither clinical nor laboratory variables can accurately predict infection; therefore, routine screening at frequent intervals is recommended. Genitourinary symptoms and abnormal urinalysis results should prompt the provider to add additional STI testing for GC and TV. Although urine leukocytes have not been reported to be good predictor of CT in asymptomatic women,[24] in our study, urine leukocytes appear to be much more useful predictors of GC and TV in symptomatic adolescent women.

Based on our results, we believe that sexually active adolescent women who present with urinary symptoms require the clinician to ask two independent questions: Does she have a UTI? and Does she have an STI? Each patient should be evaluated with a clean catch urine sample for urinalysis, culture, and nucleic acid amplification for CT and GC. A wet mount should be performed to look for TV and other causes of vulvovaginal symptoms. Because urine based TV testing is not currently commercially available at present, additional testing such as TV culture or rapid antigen tests should be added for those with a negative wet mount. Initial therapeutic decisions could be made based on the urinalysis results. There were no history or symptom variables that reliably predicted which adolescent women were at low risk for either STI or UTI. Therefore, telephone triage and empiric antibiotic therapy do not appear to be appropriate strategies for adolescent women with urinary symptoms.

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Figure 1.

CART Model for Multiple Disease Outcomes in the 145 Sexually Active Females with Urinary Symptoms who had a recorded outcome. 0= No infection, 1=UTI only, 2=STI only, 3=Both STI and UTI. UA= urinalysis, Leuk est= Leuckocyte esterase.

Table 1
Comparison of Subjects with and without Urinary Symptoms
 (Column percentages are shown in parentheses.)

	Total n = 296	Urinary Symptoms		p-value ^a
		Present n = 154	Absent n = 142	
Age: Years (+/-SD)	18.0 (1.6)	18.1 (1.6)	17.9 (1.6)	.4
Race	230 (78)	103 (73)	127 (82)	.11
Black	42 (14)	24 (17)	18 (12)	
White	24 (8)	15 (10)	9 (6)	
Other				
Type of urinary symptoms	57 (19)	57 (37)		
Dysuria +/- other	47 (16)	47 (31)		
Urgency and frequency	26 (9)	26 (17)		
Urgency alone	24 (8)	24 (16)		
Frequency alone				
Vaginal symptoms	98 (33)	64 (42)	34 (24)	.001
Current oral contraceptive use	57 (19)	30 (20)	27 (19)	.90
Condom at last intercourse	166 (56)	80 (52)	86 (61)	.14
History of STI	161 (54)	97 (63)	64 (45)	.002
History of UTI	128 (43)	76 (49)	52 (37)	.03
New partner in past 3 months	72 (24)	37 (24)	35 (25)	.9
>1 partner in past 3 months	63 (21)	38 (25)	25 (18)	.14
Wet Mount done	164 (56)	102(62)	62(38)	.001
Any STI	97 (33)	56 (36)	41 (29)	.17
UTI ^c	47(17)	38(26)	9(7)	.000
CT ^d	50 (18)	29(20)	21(16)	.39
GC ^d	28 (10)	17 (11)	11 (8)	.38
Ty ^e	52(18)	32(22)	20 (14)	.1
Both STI and UTI ^c	12 (4)	9 (6)	3 (2)	.14
No infection documented ^c	155 (55)	63 (43)	92(68)	.00

^a Chi-square test, except as noted

^b T-test

^c missing outcomes for 9 with urinary symptoms and 6 without urinary symptoms

^d missing outcomes for 6 with urinary symptoms and 8 without urinary symptoms

^e missing outcomes for 8 with urinary symptoms and 3 without urinary symptoms

Table 2
Comparison of Subjects with and without UTI Stratified by the Presence or Absence of Urinary Symptoms and in the Unstratified Full Sample
(Column percentage is shown in parentheses. P value represents chi-squared testing, except as noted.)

	Urinary symptoms				Full sample			
	Present		Absent		UTI +		UTI -	
	UTI +	UTI -	UTI +	UTI -	P	P	UTI +	UTI -
STI: N +/N tested (%)	9/38 (26)	44/107 (41)	.39 (33)	35/127 (28)	.7*		12/47 (26)	79/234 (34)
Tv: N+/N tested (%)	3/35 (9)	27/102 (26)	.03	18/124 (15)	1*		4/44 (9)	45/226 (20)

* Fisher's, exact

Table 3**Logistic Regression Models for Different Outcomes**

Displaying Odds Ratio (OR) and 95% Confidence Interval (CI) only for variables that were significant for each model, for sexually active adolescent females with urinary symptoms. Sample sizes vary due to missing values for some variables.

	Odds Ratio (95% CI) for each Outcome				
	UTI N=141	STI N=149	CT N=148	GC N=143	TV N=139
Vaginal symptoms					5.3 (1.6– 17)
>1 partners in the last 3 months		4.5 (1.9–11.0)	3.2 (1.4– 7.6)	5.1 (1.5– 17)	
History of STI	3.2 (1.0– 9.7)	3.0 (1.3– 7.1)			8.5 (2.0– 37.0)
LE		5.3 (2.4– 11.8)		5.2 (1.5– 18)	13.4 (3.9– 45.9)
Blood				4.4 (1.3–14)	5.3 (1.6– 18.2)
Protein	9.2 (3.2– 26)				0.02 (0.002– 0.2)
Nitrites	71 (8.5–1000)*				

* Exact logistic regression

Table 4

Disease Outcome by Urinalysis Result Groups for sexually active adolescent females with urinary symptoms. Row percentages displayed. Groups are different by Fischer's exact test, $p < .01$.

Urinalysis result:	Outcome (%)				Total N
	Neither UTI or STI	Only UTI	Only STI	Both UTI and STI	
Group 1: All negative N (%)	36 (67)	6 (11)	11 (20)	1 (2)	54 (100)
Group 2: Only Nitrite or Protein + N (%)	4 (36)	6 (55)	1 (9)	0 (0)	11 (100)
Group 3: Only Leukocyte or Blood + N (%)	17 (35)	1 (2)	27 (56)	3 (6)	48 (100)
Group 4: Both nitrite/protein + & Leukocyte/blood + N (%)	5 (17)	16 (55)	3 (10)	5 (18)	29 (100)
Total N (%)	62 (44)	29 (20)	42 (30)	9 (6)	142 (100)

Table 5

Misclassification Matrix		Actual Category				Total
		No infection	UTI only	STI only	Both STI and UTI	
Predicted Category	No infection	49	12	18	1	80
	UTI only	4	17	2	5	28
	STI only	10	0	24	3	37
	Both STI and UTI	0	0	0	0	0
	Total	63	29	44	9	145
	Risk Estimate	0.38	SE of Risk Estimate		0.04	