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Original Contributions

EMERGENCY HOSPITAL ADMISSIONS FOR INITIAL FEBRILE URINARY TRACT INFECTION: DO PATIENT DEMOGRAPHICS MATTER?

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☐ **Abstract—Background: In 2011, the American Academy of Pediatrics revised practice parameters regarding febrile urinary tract infection (fUTI) in children aged 2–24 months. The Section on Urology opposed the omission of voiding cystourethrogram (VCUG), and expressed concern that potential untoward consequences of deferring VCUG may be most felt by children on Medicaid. Objective: We ascertained imaging and characteristics of children presenting to the Emergency Department (ED) with initial fUTI to determine the impact of patient demographics on admissions for pyelonephritis. Methods: Children aged 2–24 months presenting to the ED with initial fUTI were identified. Demographics, insurance status, laboratory studies, renal-bladder ultrasound (RBUS), VCUG, and hospital admission status were evaluated. Results: Three-hundred fifty patients met inclusion criteria; 88 (25.1%) were admitted. Admitted patients were significantly ($p < 0.001$) younger (mean 0.31 ± 0.33 years) than those managed as outpatients (mean 0.91 ± 0.7 years). On univariate analysis, male gender ($p < 0.001$), Medicaid insurance ($p < 0.05$), and non-Hispanic race ($p < 0.05$) were associated with admission. Race retained significance on multivariate analysis; Caucasian children were 2.35 times (95% confidence interval [CI] 0.79–7.23) and African-American children 3.8 times more likely to be admitted than Hispanic patients (95% CI 1.88–7.63). Children with abnormal RBUS were 12.8 times more likely to require admission (95% CI 4.44–37.0). Medicaid was also independently predictive of admission; such patients were 2.6 times more likely to be admitted than those with private insurance (95% CI 1.15–5.88). Conclusions: Abnormal ultrasound, non-Hispanic race, and public insurance were strongly associated with hospital admission in children presenting to the ED with initial febrile urinary tract infection.** © 2015 Elsevier Inc.

☐ **Keywords—pyelonephritis; hospital admission; guidelines; demographics; Medicaid**

Ethical Approval: Approved under Children's Healthcare of Atlanta IRB 12-106.

INTRODUCTION

In August of 2011, the American Academy of Pediatrics (AAP) revised their clinical practice parameters regarding the diagnosis and management of initial febrile urinary tract infection (fUTI) in children aged 2–24 months (1). The AAP Section on Urology, while supporting many aspects of the new guidelines, voiced strong disagreement with the omission of voiding cystourethrogram (VCUG) in the evaluation of young children with initial fUTI, and expressed concern that potential untoward consequences of deferring VCUG may be most felt by children on Medicaid (2). This paradigm shift in imaging has placed renewed emphasis on pyelonephritis outcomes in young children.

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Emergency departments (ED) are increasingly serving as a safety net for medically underserved patients, particularly those with Medicaid (3). As such, we evaluated children presenting to the ED with initial fUTI, and found that VCUG utilization, as well as renal-bladder ultrasound (RBUS), significantly decreased since publication of the new AAP guidelines (4). In light of concern that financial status may affect care, in the present study we ascertained imaging and characteristics of children presenting to the ED with fUTI to determine the impact of patient demographics on hospital admissions for pyelonephritis.

MATERIALS AND METHODS

Institutional Review Board approval was obtained. Electronic medical records of all children aged 2–24 months presenting with initial fUTI to either an Urgent Care Clinic or ED within our pediatric health care system were reviewed over a 12-month period to identify predictors of hospital admission. Study locations included five Urgent Care clinics and two EDs associated with a tertiary pediatric health care system, and located within a large metropolitan city. Patients were identified by International Classification of Diseases, 9th Revision codes for acute pyelonephritis (590.0) and UTI (599.0). Differences in imaging practices prior to and after guideline publication were previously reported (4).

Patient demographics, insurance status, temperature, urine culture results, and subsequent imaging including RBUS and VCUG, were assessed. Abnormal RBUS was defined as any degree of calyceal or ureteral dilatation, parenchymal echogenicity or scarring, renal atrophy, alterations in corticomedullary differentiation, or urothelial thickening. Positive VCUG was defined as the presence of any grade of vesicoureteral reflux (VUR). Positive urine culture was defined as a single organism of > 50K colony-forming units obtained by catheterization. Children outside the age range of the new guidelines or those with previous history of VUR or VCUG, known genitourinary anomalies, prior fUTI, and undocumented urine cultures or afebrile UTI (body temperature < 38.6°C [101.5°F]) were excluded from the study. Insurance status of children referred to the outpatient pediatric urology clinic with fUTI or VUR during the same time period was also determined for comparison.

Correlation between patient characteristics and admission was tested in uni- and multivariate analyses. Chi-squared test (or Fisher's exact, when necessary) was used to compare the distribution of categorical variables. Logistic regression was utilized to calculate odds ratios and 95% confidence intervals, with the outcome being hospital admission. Statistical analysis was performed using SAS® 9.3 (SAS Institute, Cary, NC), with $p < 0.05$ representing statistical significance.

RESULTS

Three-hundred fifty patients met all inclusion criteria; 88 (25.1%) were admitted. Two hundred thirty-four children (66.9%) underwent RBUS: 61 (26.1%) were abnormal and the remaining 173 (73.9%) demonstrated no renal or bladder anomalies. One hundred seventy-nine patients (51.1%) underwent VCUG. Sixty-six children had documented VUR.

Results of univariate analysis are summarized in Table 1. Patients requiring hospital admission were significantly ($p < 0.001$) younger (mean age 0.31 ± 0.33 years) than those discharged from the ED and managed as outpatients (mean age 0.91 ± 0.7 years). The number of admitted females (n = 45) was similar to males (n = 43), however, there were 251 females, compared to just 99 males, in the study (2.54:1). Male gender was therefore associated with significantly higher likelihood of admission ($p < 0.001$). Caucasian and African-American patients were more likely to be admitted than Hispanic children ($p < 0.05$). Children with Medicaid insurance were significantly more likely to be admitted than those with private insurance ($p < 0.05$).

A subset of 107 patients (30.6%) underwent C-reactive protein (CRP) testing. CRP (reference range < 1 mg/dL) was marginally different between admitted children (mean 9.5 mg/dL) and those that were discharged from the ED (mean 6.6 mg/dL; $p = 0.05$). There was no difference in white blood cell count (reference range 5–19.5 THOU/uL) between admitted (mean 16.3 THOU/uL) and nonadmitted children (mean 16.5 THOU/uL; $p = 0.914$). Children with an abnormal RBUS (n = 61) were significantly more likely to have required admission than those with a normal RBUS (n = 173; $p < 0.001$). Moreover, children undergoing RBUS in the ED setting (n = 36) were significantly more likely to be admitted than those who underwent delayed RBUS (n = 198; $p < 0.0001$).

Multivariate analysis was then performed; all patient and imaging characteristics were considered in a logistic regression model, with the outcome being hospital admission. Controlling for all other variables, children with an abnormal RBUS were 12.8 times more likely to require admission than those with a normal ultrasound (95% confidence interval [CI] 4.44–37.0). Race retained significance on multivariate analysis. Caucasian children were 2.35 times (95% CI 0.79–7.23) and African-American children 3.8 times more likely to be admitted than Hispanic patients (95% CI 1.88–7.63). Medicaid was also an independent predictor of hospital admission on