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Cost Analysis of the Management of Pediatric Febrile UTI: Traditional, AAP, and Population Health Algorithms

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Introduction

The management of Pediatric febrile or symptomatic UTI has been controversial since the release of the American Academy of Pediatrics (AAP) guidelines in 2011. Whereas traditional management evaluated patients for reflux after first UTI, AAP recommended evaluation after the second episode. Furthermore, population health algorithms have emerged with the goal of reducing resource utilization by focusing on prompt UTI treatment and aggressive management of bowel and bladder dysfunction. We hypothesized that delaying evaluation for reflux would translate in to significant cost reductions from the payer's perspective.

Methods

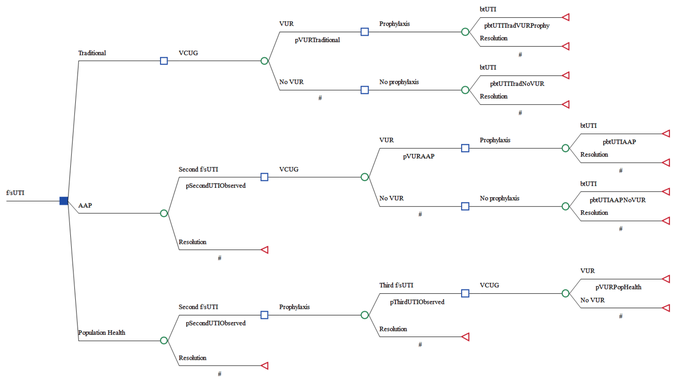
A decision tree model was created evaluating Traditional, AAP, and a Population Health algorithm for the management of Pediatric UTI. The index patient is a child aged 2 to 71 months with a febrile or symptomatic UTI. A total of three UTIs were modeled over the course of two years. Probabilities were based on the RIVUR[1] and CUTIE[2] studies. Costs were calculated from the perspective of the payer, and were based on Centers for Medicare and Medicaid services data and prior peer-reviewed publications written by the authors.

References

1. RIVUR Trial Investigators: Antimicrobial Prophylaxis for children with vesicoureteral reflux. NEJM 2014, 370(25): 2367-76.

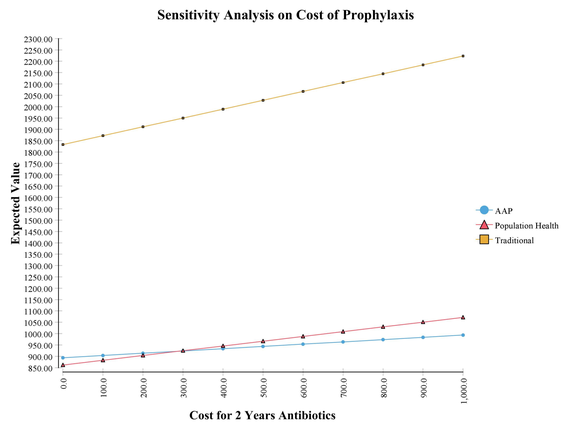
2. Keren R, Shaikh N, Pohl H, et al.: Risk Factors for Recurrent Urinary Tract Infection and Renal Scarring. Pediatrics 2015, 136(1): 13-21.

Figure 1: Decision Tree



Decision tree modeling for management of pediatric UTI utilizing the Traditional, AAP, and Population Health algorithms. The main difference between the strategies relates to when VCUG and prophylaxis is administered.
Abbreviations: f/sUTI, febrile or symptomatic UTI; btUTI, breakthrough UTI; VCUG, voiding cystourethrogram; VUR, vesicoureteral reflux.

Figure 2: Sensitivity Analysis on the Cost of 2 Years of Prophylaxis



The AAP and Population Health strategies were approximately one-half the cost of the Traditional strategy. The model was sensitive to the cost of 2 years of prophylaxis. At costs < $300, Population Health is the last costly strategy.

Table 1: Cost Inputs

Item	Cost ($USD)
PCP (First Visit)	*109.46*
PCP (F/U Visit)	*73.93*
Specialist (First Visit)	*108.74*
Specialist (F/U Visit)	*166.16*
Urinalysis	*4.18*
Urine Culture	*18.38*
DMSA	*822.05*
RBUS	*231.31*
VCUG	*558.51*
Reimplant	*8733.87*
Two Years Antibiotics	*264.00*

Cost inputs for office appointments and laboratory tests are derived from the Centers of Medicare and Medicaid Services Physician Fee Services and Laboratory Fee Schedules. Imaging and surgical data are derived from Raju et al. J Urology 2013 189(6):2287-92. Cost for two years of antibiotics are derived from Shaikh et al. J Pediatrics 2017 189:64-60.

Results

Three different strategies were evaluated for the management of Pediatric UTI (Figure 1). The estimated per-patient cost of the Traditional model is $1,935.94, AAP $919.92, and Population Health $916.98. Due to the fact that Population Health utilizes empiric antibiotic prophylaxis for all patients with second UTI regardless of reflux status, the model was sensitive to the cost of prophylaxis (Figure 2). At antibiotic costs below $300, Population Health was the least costly strategy. At costs above $300, AAP was least costly. The Traditional model was the most expensive in all scenarios evaluated.

Conclusions

Deferring evaluation of reflux beyond the incident UTI results in significant cost savings due to reductions in overall resource utilization. The least costly strategy varies according to the cost of two years of antibiotic prophylaxis.

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