

Impact of Asymptomatic Bacteriuria (ASBU) Overtreatment During a Controlled Trial of Antimicrobial Stewardship (AS)

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Background and Objectives

Resistance to the action antimicrobials has emerged for virtually all classes within a short time of their introduction. Each year in the United States 23,000 deaths are linked to antimicrobial resistant pathogens, 250,000 cases of Clostridium difficile colitis(CDI) are reported, and \$ 25-35 billion direct and indirect costs are linked to antimicrobial resistance.

In July, 2015, NorthShore University HealthSystem (NUHS), initiated a controlled trial of AS, AHRQ 5R01HS022283, described below, to integrate information technology with “hands on” involvement by infectious diseases physicians with the ultimate goal of achieving greater antimicrobial prescription appropriateness, patient safety, cost effectiveness, and reduced antimicrobial resistance. The weighted-incidence syndromic, combination antibiogram (WISCA) tool was employed to predict the best agent or combination for a particular patient.

Using information from AHRQ 5R01HS022283 we sought to determine 1. The frequency of ASBU in patients treated for presumed urinary tract infection (UTI) and 2. The clinical profiles, outcomes, and antimicrobial costs attributed to patients admitted with presumed UTI but deemed to have “no infection” (NI) by infectious diseases (ID) physician reviewers.

Methods

Setting: NorthShore University HealthSystem (NUHS) NUHS is a four-hospital healthcare corporation with over 2000 affiliated physicians, 60,000 annual admissions, and a centralized microbiology laboratory and electronic medical record.

AHRQ 5R01HS022283: Following an antimicrobial order (within 24 hours) one of the ID physicians performed an electronic chart review for all adult (> 18 yrs.) patients admitted with cellulitis, intra-abdominal infection, urinary tract infection (UTI), and community acquired pneumonia.

The ID physician either agreed with the choice, suggested an alternative, suggested a formal ID consult, or indicated NI. ID pharmacists continued in their usual role of monitoring results, advising dose changes or de-escalation. Of the 4 hospitals in our system, 2 were intervention (a note was placed regarding the ID review, and a call placed if necessary). The remaining 2 hospitals underwent the same review and documentation, but no intervention. During the initial phase of the study no intervention of any kind was made for NI patients.

Current report: We performed a retrospective review of a subset of patients entered into AHRQ 5R01HS022283 and designated NI. Patients with NI were tracked but not included in the study intervention to identify AS opportunities.

The initial admission of NI subjects was reviewed to determine if an active UTI was documented during the admission. For those without an active UTI, the following was absent: frequency, urgency, dysuria, suprapubic pain, flank pain, or costo-vertebral angle tenderness on physical examination. The cause for admission, and the presence or absence of neurological disease (dementia, seizure, or stroke), was recorded.

Systemic inflammatory response syndrome (SIRS) criteria were: (1) temperature >38.3° Celsius (C) or <36° C, (2) heart rate >90 beats/minute (min), (3) respiratory rate >20 breaths/min (4) white blood cell count >12000 cells/mm³, <4000 cells/mm³.

Methods (continued)

The quick Sepsis Related Organ Failure Assessment (qSOFA) criteria were: (1) altered mental status, (2) respiratory rate > 22/min, and (3) systolic blood pressure < 100 mmHg.

The electronic record was also reviewed for results of urine cultures, days of antimicrobial therapy in-patient and prescribed at discharge, and for subsequent admissions, bacteriuria, CDI, and mortality during AHRQ 5R01HS022283.

Antimicrobial costs: acquisition costs.

Results

Of the first 104 patients designated NI, upon review 4 appeared to have active urinary infection and were excluded from analysis. The remaining 100 patients with NI form the basis of this report. Tables 1-5 refer to NI patients (n=100). Table 6 summarizes the number of entries in AHRQ 5R01HS022283, and projected cost savings.

Table 1. No Infection, NI. Age, Neurological status, Sex.

Age (mean yrs.)	Admission for acute or chronic altered mental status (dementia, seizure, stroke) (%)	Sex M/F (%)
83.6	50	20 / 80

Table 2. NI. Microbiology.

Pyuria (%)	Positive urine culture (%)
100	65

Table 3. NI. SIRS and qSOFA criteria.

SIRS criteria (x/4)	q SOFA score (x/3)
0.6	0.9

Table 4. NI. Subsequent Admission with ASBU, CDI, readmission, mortality over 0 - 21 months follow up.

Subsequent admission with ASBU (%)	Subsequent CDI (%)	Readmission n,mean (range)	Mortality (%)
49	9	2.4 (0-14)	34

Results (continued)

Table 5. NI. Days of antimicrobial therapy in-patient and prescribed at discharge.

Days of antimicrobial therapy in – patient (mean).	Days of antimicrobial therapy prescribed at discharge (mean).
3.72	3.15

Table 6. AHRQ 5R01HS022283: enrollment at 21 months and projected at 36 months. NI: antimicrobial projected costs at study end.

Category	At 21 months (no. (%))	Projected at 36 months (no.)	Antimicrobial costs projected at 36 months \$ USD.
Enrolled	6402	10975	
Total UTI	2196 (34.3)	3765	
UTI- NI	564 (25.7) *	967	472,000 *
UTI - infection	1632 (74.3)	2798	

* Projected cost savings are based upon \$ 51,000.00 USD actual cost for 100 patients and does not include savings from antimicrobials prescribed at discharge and subsequent care for CDI.

Discussion

Various organizations have joined together to fight antimicrobial resistance. The Infectious Diseases Society of America (IDSA), together with the Society for Healthcare Epidemiology (SHEA) have published guidelines to aid hospitals in organizing such programs and suggesting appropriate strategies.

The Joint Commission introduced an “Antimicrobial Stewardship Standard” for hospitals and nursing care centers, effective January 1, 2017. This mandate calls for the development of a stewardship program employing multidisciplinary expertise with organizational support to be based upon current scientific literature.

The 2013 CDC document: *Antibiotic Resistance Threats in the United States*, warned of: “...the complex problem of antibiotic resistance today and the potentially catastrophic consequences of inaction. Further: “The overriding purpose of *this* report is to increase awareness of the threat that antibiotic resistance poses and to encourage immediate action to address the threat...research has shown that as much as 50% of the time, antibiotics are prescribed when they are not needed or they are misused...”

Discussion (continued)

Trautner and Grigoryan reviewed multiple studies (hospital, emergency department, and long-term care) focusing on the use of antibiotics in ASBU. In 12 2003-2012 studies rates of inappropriate treatment for ASBU ranged from 26-83%.

Dasgupta and colleagues showed that residents of long term care with delirium who had ASBU and were treated with antimicrobials had a poorer functional outcome at 3 months than those who were not treated.

So why do clinicians prescribe antimicrobials for a condition in which treatment has no benefit and may be harmful? Naik and Trautner suggest that reflexive ordering of a urinalysis, and, or culture upon hospital admission, and cognitive biases such as older age, frailty, pyuria, and types of organisms and resistance patterns seen on culture results prompt prescribing of antimicrobials. Subsequent studies by these authors used urine culture ordering to measure the effectiveness of AS focusing on education and feedback to ordering professionals with regard to ASBU. The intervention was successful; in both acute and long-term care.

Furthermore, Leis and colleagues reported that suppression of publication of urine culture results led to a decrease in inappropriate treatment of non-catheterized hospitalized medical and surgical patients. Results were released only when the lab was informed of the presence of signs and symptoms of urinary tract infection.

Our review, part of a broader AS study, identified 25.7% of patients treated empirically for UTI as NI (ASBU), consistent with literature reports. NI patient were notably elderly, predominantly female, with a high incidence of new or preexisting neurological conditions, subsequent bacteriuria, re-admission, and short-term mortality. Although the history of urinary symptoms may not be reliable in these patients, low SIRS and qSOFA scores supported a lack of clinically significant infection. Four of 104 patients had a true UTI, however, suggesting that AS physicians using electronic chart review must use care before designating a patient NI.

AS will take an active and increasing role in the management of ASBU in the future. In addition to the promising ideas mentioned above, AS programs should focus on *EARLY* efforts to identify ASBU. Preservation of antimicrobial resources, antibiotic cost savings (estimated over 3 years to be \$ 472,000 in our health system), and avoidance of CDI and additional costs are among the likely benefits.

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