

Physicians' adherence to guidelines for empirical treatment of urinary tract infection in Taiwan

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Background and Purpose: Guidelines for prescribing antibiotics for uncomplicated urinary tract infection (UTI) were established in Taiwan in 2000. This study investigated the extent of physicians' adherence to the guidelines for treating ambulatory women with UTI.

Methods: National Health Insurance claims data were used to evaluate antibiotic prescription behavior for UTI among physicians serving in hospitals across the range of accreditation levels in Taiwan, including medical centers, regional hospitals, district teaching/non-teaching hospitals and community clinics. A random sample of 5047 female ambulatory care visits during 2001 and 2003 was analyzed.

Results: Sulfonamides (trimethoprim and trimethoprim-sulfamethoxazole), first-generation cephalosporins and quinolones were the most commonly prescribed drugs. The overall guideline adherence rate for physicians was 72.1%. The differences in guideline adherence rates for physicians in medical centers (86.6%), regional hospitals (81.3%), district teaching/non-teaching hospitals (76.9%) and community clinics (69.5%) were statistically significant (chi-squared test; $p < 0.0001$).

Conclusion: Physicians in community clinics were less likely to adhere to guidelines in the treatment of ambulatory cases of UTI than physicians in any of the different levels of accredited hospitals in Taiwan.

Key words: Drug utilization review; Guideline adherence; Practice guidelines; Urinary tract infections

Introduction

Urinary tract infection (UTI) is commonly encountered in daily practice and accounts for considerable health care costs [1,2]. The Infectious Diseases Society of America developed evidence-based guidelines for antibiotic treatment of acute bacterial cystitis in women in 1999 [3]. Based on the local epidemiological data, which includes commonly encountered pathogens and antimicrobial resistance patterns, guidelines for the antimicrobial therapy of UTIs in Taiwan were established in 2000 [4]. Because of the narrow and

predictable spectrum of causative agents for UTI, most physicians prescribe antimicrobials empirically without results of urine culture and subsequent susceptibility testing of the isolated pathogens. In addition, variation in treatment strategies of UTI among physicians was found to be partially associated with cultural and economic factors [5,6].

The government of Taiwan launched the National Health Insurance (NHI) program on March 1, 1995 [7]. More than 97% of the 22.6 million population in Taiwan were enrolled in the compulsory NHI program [8]. Approximately 17,259 health care providers (92%), including hospitals and community clinics, have signed contracts with the NHI program to provide health care services to beneficiaries [8,9]. This program provides comprehensive benefits, including outpatient visits, inpatient hospital stays, and medication. Due to the

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absence of a referral system for health care, people are free to choose any NHI-contracted physicians in clinics or hospitals to receive outpatient services in Taiwan [10]. According to statistics reported by the NHI program, the average number of annual outpatient visits was 14 per person in 2000 [10]. Moreover, for every outpatient visit, only a small amount of co-payment is required (2-15 US dollars). Therefore, access to medical care in Taiwan remains convenient and inexpensive.

Hospital accreditation programs have been established in Taiwan since 1978 [11]. Accredited hospitals are classified into four categories: medical center hospitals, regional hospitals, and district (teaching and non-teaching) hospitals. In 2003, approximately 32,000 doctors practicing western medicine, 4200 practicing Chinese medicine, and 9600 practicing dentistry served in a total of 594 hospitals and 18,183 clinics [12]. Medical specialist training programs and specialist qualifications were started in 1988 but approximately 30% of practicing physicians have not yet undergone any form of specialist training. Among the doctors practicing western medicine, 63.2% worked in hospitals and 36.8% worked in community clinics in 2003 [12].

Medical practice guidelines can improve health care only if they succeed in changing physicians' practice behaviors to follow the guideline recommendations [13]. Physicians working in community clinics have limited resources for accessing updated medical information. This study employed nationwide claims data to evaluate physicians' prescribing behavior and guidelines adherence rate for uncomplicated UTI in different types of accredited hospitals and community clinics in Taiwan.

Methods

Data collection

Data for this study was derived from the NHI claims database and provided by Taiwan's National Health Research Institution. A standardized dataset was obtained using a systematic random sampling scheme of 0.2% of all outpatient visits nationwide. The ambulatory care data files contained detailed information for each physician visit, including age, gender, major and secondary diagnoses, and medication prescribed.

All outpatient visits by females older than 12 years with acute cystitis as the only primary diagnosis from January 2001 through December 2003 were identified. Based on the International Classification of Diseases (ICD), the definition of acute cystitis includes the codes

595.0 (acute cystitis), 595.9 (cystitis, unspecified) and 599.0 (UTI, site not specified). Patients with a secondary diagnosis were excluded from the analysis to facilitate the assessment of appropriateness of prescription of antibiotics. Prescription of only one of the recommended antibiotics was classified as adherence to the guidelines.

Guideline-recommended antibiotics

The guidelines for antimicrobial therapy of UTIs used in this study were established by the Infectious Diseases Society of Taiwan. The guidelines suggest that either nitrofurantoin, ampicillin or amoxicillin, a first- or second-generation cephalosporin, a sulfonamide (trimethoprim and trimethoprim-sulfamethoxazole combination), or a quinolone (nalidixic acid, piperidic acid, ciprofloxacin, norfloxacin, ofloxacin, ciprofloxacin, enoxacin, lomefloxacin, fleroxacin, and levofloxacin) as the antimicrobial of choice for treating patients with acute bacterial cystitis [4].

Statistical analysis

All analyses were performed using the Statistical Analysis Software (SAS) for Windows (Version 8.0; SAS Institute Inc., Cary, NC, USA) software package. The rates of adherence to the guidelines among physicians from hospitals with different accreditation levels and physicians from community clinics were compared using the chi-squared test. A *p* value of <0.05 was considered statistically significant.

Results

A total of 5047 outpatient visits during 2001 and 2003 met the criteria for inclusion in this study. Diagnoses at most of these visits met the criteria for ICD code 599.0 (47.1%), 595.0 (36.7%) or 595.9 (16.2%). Among these outpatient visits, 4242 were prescribed antibiotics for UTI and a total of 5611 antibiotics were prescribed at these visits (Table 1). As shown in Table 1, sulfonamides were the most frequently prescribed antimicrobials (21.3%), followed by first-generation cephalosporins (21.0%), and quinolones (18.7%). These 3 categories of antibiotics are recommended in the UTI treatment guidelines for Taiwan. Nitrofurantoin was the most common non-guideline antibiotic prescribed in this study (7.9%), followed by gentamicin (7.5%) and thiamphenicol (2.2%).

Table 2 shows the antimicrobial utilization rates for the treatment of UTIs in hospitals with different accreditation levels and community clinics. At least one

Table 1. Frequency analysis of antibiotics prescribed for urinary tract infections

Drugs	Prescribed No. (%)
Guideline-recommended drugs	
Sulfonamides (including trimethoprim, trimethoprim-sulfamethoxazole)	1194 (21.3)
First-generation cephalosporins	1178 (21.0)
Quinolones	1048 (18.7)
Amoxicillin	430 (7.7)
Ampicillin, talampicillin	174 (3.1)
Nitrofurantoin	101 (1.8)
Second-generation cephalosporins	25 (0.4)
Non-guideline-recommended drugs	
Nitroxoline	445 (7.9)
Gentamicin	419 (7.5)
Thiamphenicol	123 (2.2)
Chloramphenicol	120 (2.1)
Doxycycline	84 (1.5)
Tetracycline	65 (1.2)
Metronidazole	42 (0.7)
Others	163 (2.9)
Total	5611 (100.0)

kind of antibiotic was prescribed at 84.0% of outpatient visits (4242/5047). A total of 5611 antibiotic prescriptions were written at these 4242 visits. The majority of the patients were treated in community clinics (74.0%, 3737/5047). Antibiotics were prescribed most frequently in community clinics (86.3%), followed by district hospitals (85.2%), regional hospitals (74.1%) and medical centers (69.3%).

When antibiotics were prescribed for UTI, the rate of adherence to the guideline stipulation that only one of the recommended antibiotics be prescribed at each visit was 72.1% (3058/4242). Medical centers had the highest adherence rate (86.6%, 188/217), followed by regional hospitals (81.3%, 270/332), district hospitals (76.9%, 360/468) and community clinics (69.5%, 2240/3225) [Fig. 1A]. The differences in adherence rates between hospital accreditation levels were significant (chi-squared = 52.87; $p < 0.0001$). The non-adherence rates among the 4 types of medical care institutions are shown in Fig. 1B.

Table 2. Antibiotic utilization for urinary tract infections in hospitals and community clinics

Use of any kind of antibiotic	Number of visits (%)				
	Medical centers	Regional hospitals	District hospitals ^a	Community clinics	Total
No	96 (30.7)	116 (25.9)	81 (14.8)	512 (13.7)	805 (16.0)
Yes	217 (69.3)	332 (74.1)	468 (85.2)	3225 (86.3)	4242 (84.0)

^aDistrict hospitals include district teaching hospitals and district non-teaching hospitals.

Prescription of non-recommended drugs or prescription of more than one of the recommended drugs at one visit was classified as non-adherent. District hospitals and community clinics appeared more likely to prescribe more than one of the recommended drugs.

Discussion

This study found that the most frequently prescribed drugs for UTI were sulfonamides, first-generation cephalosporins and quinolones. Although first-generation cephalosporins are not recommended for treatment of UTI in western counties, previous studies from Taiwan have demonstrated the effectiveness of these antibiotics as a treatment option, and their prescription complies with the treatment guidelines for UTI in Taiwan [3,4, 14]. Lau et al found that *Escherichia coli* isolated from patients with both bacteremic and non-bacteremic community-acquired UTI in Taiwan had high rates of resistance to trimethoprim-sulfamethoxazole (56%), cephalothin (59%) and ampicillin (80%) [14]. Due to knowledge of this resistance profile, quinolones have similar prescription rates to sulfonamides and cephalosporins. Furthermore, the extensive marketing of quinolones may also explain their increasing usage.

Antibiotic treatment was not given at one-sixth (805/5047) of outpatient visits. This is partly due to the usually self-limiting nature of UTI and also because some of the visits were for follow-up, such as culture report. Although patients who visited community clinics had less severe disease, physicians in community clinics had the highest rate (86.3%) of prescribing antibiotics to treat UTI. The independent nature of community physician practice in Taiwan seems to increase patient expectations that some type of medication will be prescribed at the visit, and antibiotic prescribing patterns in this setting appear to be more liberal. Although physicians in community clinics had the highest rate of prescribing antibiotics for UTI, their rate of adherence to guidelines was lower than that of physicians working in medical centers where there is better access to continuing medical education and a greater likelihood that physicians will

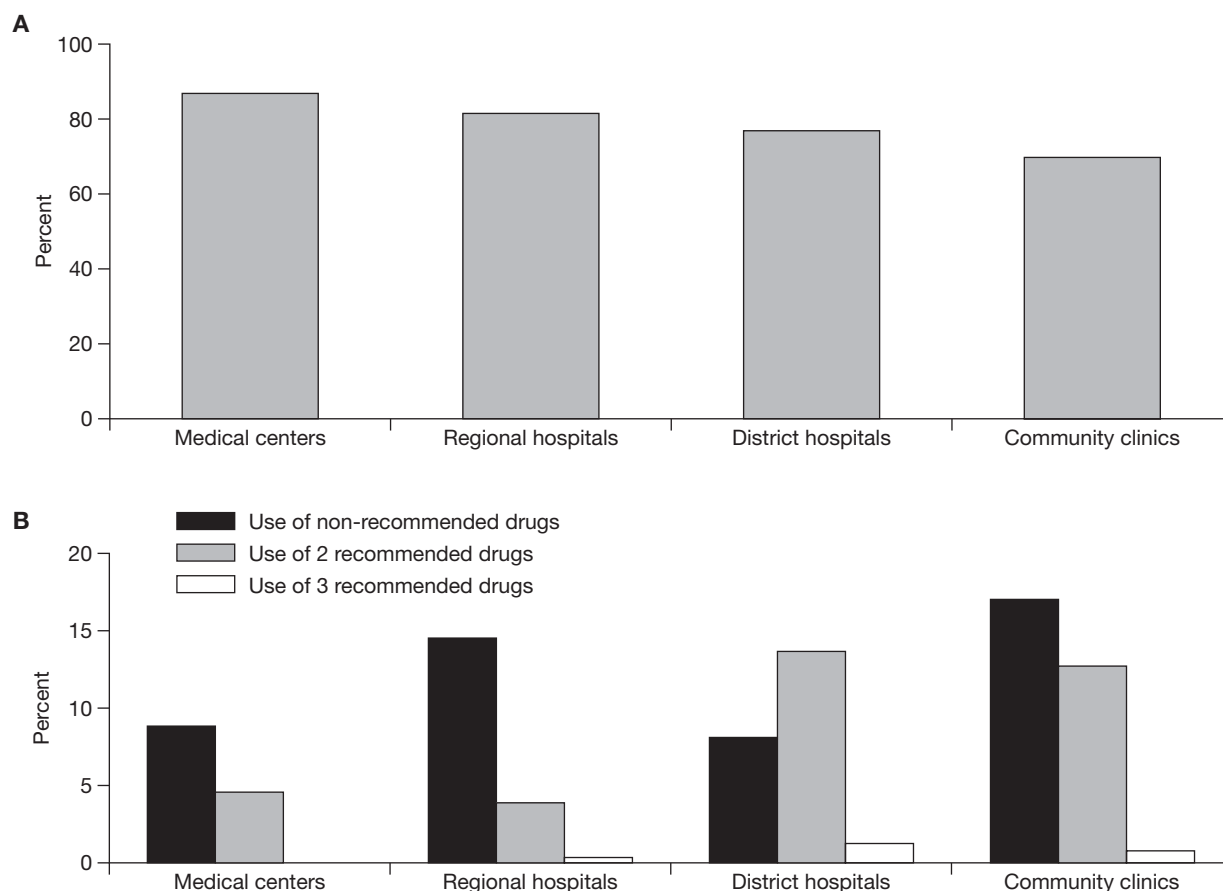


Fig. 1. Adherence rate (A) and non-adherence rate (B) to guidelines for urinary tract infection in hospitals and community clinics.

participate in research. The wider range of responsibilities among physicians at medical centers and regional hospitals, including teaching of medical students and residents, participation in medical research, and the treatment of more complicated or referred patients, may lead to greater awareness of the need for adherence to guidelines. The majority of practicing doctors who have not yet undergone any form of specialist training work in community clinics. These have no requirement to take part in continuous medical education programs in order to renew their specialist certificate.

The guideline adherence rate in different countries might be influenced by the availability of antibiotics for UTI and the feasibility of urine cultures and availability of susceptibility testing. [4,15]. In Israel, trimethoprim-sulfamethoxazole and nitrofurantoin are the drugs recommended in clinical guidelines for uncomplicated UTI in women [15]. Kahan et al reported that the guideline adherence rate was 40.5%, compared with 72.1% in our study [15]. All patients enrolled in the Kahan et al study were empirically treated as UTI with antibiotics that were not based on susceptibility results of urine

culture. By contrast, some of our patients with UTI were treated with antibiotics according to culture results.

This study had two limitations. First, the duration of antibiotic prescriptions was not evaluated [16]. The Taiwan guidelines for antimicrobial therapy of UTIs do not specify the duration of treatment [4]. Second, the assumption that the recorded diagnosis was a definitive diagnosis of UTI might be incorrect [17]. Although the use of NHI claims data has a number of limitations, it does provide an accurate description of nationwide prescription patterns for antibiotics [17].

This study found that physicians in community clinics were less likely to adhere to guidelines in the treatment of ambulatory cases of UTI than physicians in any of the various levels of accredited hospitals in Taiwan. Compulsive medical education should be designed for doctors practicing in community clinics, and wide distribution of these guidelines to all related medical societies is necessary to improve guideline awareness. The relationship between adherence to antibiotic treatment guidelines and outcome of patients with UTI remains to be explored in Taiwan.

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