

Outcomes/Epidemiology/Socioeconomics

UROLOGIC DISEASES IN AMERICA PROJECT: TRENDS IN RESOURCE USE FOR URINARY TRACT INFECTIONS IN WOMEN

TOMAS L. GRIEBLING*·†

From the Department of Urology and the Center on Aging, University of Kansas, Kansas City, Kansas

ABSTRACT

Purpose: Urinary tract infection (UTI) is one of the most common clinical diagnoses in women. In this study we examined epidemiological, economic and health care use trends for UTI in women in the United States.

Materials and Methods: The analytical methods used to generate these results have been described previously.

Results: The lifetime risk for UTI in women is high (greater than 50%). Between 1988 and 1994 the overall lifetime prevalence of UTI was estimated to be 53,067/100,000 women. Prescribing patterns demonstrated an increase in the trend toward using fluoroquinolones as first line therapy for UTI, which was associated with increased costs. Composite data revealed that overall expenditures for the treatment of UTIs in women in the United States, excluding spending on outpatient prescriptions, were approximately \$2.47 billion in 2000. Diagnosis and treatment of UTI in women is performed in various clinical settings. Inpatient hospitalization for UTI care has generally decreased in younger women but increased in elderly women. There has been a sharp increase in emergency room use by younger women, which may reflect disparities in access to health insurance or primary care providers. Most outpatient care of women with UTIs is performed in physician offices.

Conclusions: Analysis of health care use and economic data on UTIs in women revealed various interesting trends. These findings will help shape understanding of UTI treatment in relation to other urological disorders in women. The results raise various important future research questions.

KEY WORDS: urinary tract; urinary tract infections; economics, medical; health services; women

Urinary tract infection (UTI) is a common clinical condition that occurs in each sex. Women have a higher prevalence and incidence of UTI than men. Clinical variables, including anatomical differences, hormonal effects and behavioral patterns, influence this difference. Host factors, including alterations in normal vaginal flora and genetic factors such as the expression of HLA-A3 and Lewis blood group LE(a–b–) or LE(a+b–) antigens, may also put women at higher risk for recurrent UTIs.¹

Infections are typically classified by site of origin. The most common diagnoses are pyelonephritis, cystitis and urethritis. Recurrent UTIs involve re-infection from a source outside of the urinary tract or from bacterial persistence. Uncomplicated UTIs involve only the bladder and are not associated with anatomical abnormalities or foreign bodies. Complicated UTIs include pyelonephritis and urosepsis. Significant UTIs in elderly patients are often considered complicated because of the potential associated morbidity and mortality in this population.

The diagnosis of UTI may be made presumptively based on

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* Correspondence: Department of Urology, Mailstop 3016, University of Kansas, 3901 Rainbow Blvd., Kansas City, Kansas 66160 (telephone: 913-588-6147; FAX: 913-588-7625; e-mail: tgriebling@kumc.edu).

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clinical signs and symptoms, and urinalysis. Confirmatory cultures and antimicrobial susceptibility may be obtained. The increased prevalence of drug resistant bacteria has made susceptibility testing particularly important.

The high rates of UTI in women present significant challenges to the health care system. In this study we examined recent trends in health care use for the diagnosis and treatment of UTI in women in the United States. Antimicrobial prescribing trends and the economic impact of care were also reviewed.

MATERIALS AND METHODS

The analytic methods used to generate these results have been described previously.^{2,3}

RESULTS

Prevalence and incidence. UTI is an extremely common diagnosis in women and treatment incurs substantial costs. It is estimated that at least a third of all women in the United States are diagnosed with a UTI before they are 24 years old.⁴ In a random digit dialing telephone survey of 2,000 women Foxman et al found that 10.8% of women 18 years or older self-reported at least 1 UTI in the last year (95% CI 9.4 to 12.1).⁴ Using this information they calculated that the lifetime risk for UTI is 60.4% (95% CI 55.1 to 65.8). They estimated that at least 11.3 million women in the United

States had at least 1 UTI in 1995 and the overall cost of prescriptions to treat UTIs that year was more than \$218 million.

Similarly between 1988 and 1994 the overall lifetime prevalence of UTI in women was estimated to be 53,067/100,000 based on the National Health and Nutrition Examination Survey (NHANES-III) (table 1). Data from NHANES-III also showed that the incidence of UTI in 12 months was 13,320/100,000 women (table 2).

Trends in health care resource use. Medications: Antimicrobial therapy remains the mainstay of treatment in patients with UTIs. Initial therapy is usually empirical with subsequent modifications based on culture and susceptibility results. The need for routine urine culture is debatable. Many experts advocate empirical therapy in most patients with urine cultures reserved for those in whom initial treatment fails or infection recurs. The Infectious Disease Society of America published guidelines in 1999 that recommended the use of trimethoprim-sulfamethoxazole (TMP-SMZ) as first line therapy in patients without an allergy to this compound.⁵ Specific fluoroquinolones were recommended as second line agents. In geographic areas where TMP-SMX resistance is high (greater than 20%) fluoroquinolones are recommended as first line therapy.

The recommendation to use older agents such as TMP-SMZ as initial therapy has strong merit. These medications cost less than newer antimicrobials. In addition, reserving fluoroquinolones and broad-spectrum antimicrobials for complicated infections or cases with documented drug resistance may help decrease the incidence of bacterial resistance. However, a recent study of national prescribing trends for UTI by ambulatory care physicians revealed that the use of TMP-SMZ is decreasing and the use of fluoroquinolones is increasing.⁶ The proportion of TMP-SMZ use decreased from 48% in 1989 to 24% in 1997 to 1998 (adjusted OR 0.33, 95% CI 0.21 to 0.52 per decade). At the same time fluoroquinolone use increased from 19% to 29% (adjusted OR 2.28, 95% CI 1.35 to 3.83 per decade, table 3). This indicates a trend to use more expensive antimicrobials such as fluoroquinolones as first-line therapy. This trend may be due in part to increased rates of outpatient care and increased availability and mar-

TABLE 2. Female incidence of UTIs in last 12 months by sociodemographic group, count and rate (NHANES-III, 1988 to 1994)

	Incidence	
	Count	Rate
Total count	12,753,035	13,320
1 or More UTIs/last 12 mos	12,753,035	13,320
Mean No. UTIs/last 12 mos	1.7	
Age:		
18-24	2,741,548	21,732
25-34	3,274,713	15,196
35-44	2,338,316	11,925
45-54	1,531,348	11,550
55-64	1,129,215	10,105
65-74	930,627	9,225
75-84	619,903	10,577
85 or Older	187,365	11,770
Race/ethnicity:		
White nonHispanic	9,949,997	13,366
Black nonHispanic	1,572,606	14,096
Hispanic	1,017,401	14,501
Other	213,032	6,805
Region:		
Midwest	2,518,030	10,907
Northeast	2,346,347	11,607
South	5,037,597	15,273
West	2,851,061	14,649
Urban/rural:		
MSA	6,425,838	9,050
NonMSA	6,327,198	25,571

Rate per 100,000 population based on 1991 CPS population estimates for relevant demographic categories of American female adult civilian noninstitutionalized population with data in this table based on the weighted number of persons who responded 1 or more to question HAK5, "How many of these infections did you have during the past 12 months?" (counts may not sum to total due to rounding).

keting of these products. However, it has the potential to increase overall costs and antimicrobial resistance.

Inpatient Care: Complicated UTIs, particularly those associated with acute pyelonephritis, may require inpatient hospitalization for intravenous antimicrobial administration. In 2000 inpatient services represented 55% of all expenditures for UTI treatment (table 4). According to data from the Centers for Medicare and Medicaid Services there was a gradual increase in the age unadjusted rate of inpatient hospitalization for UTI treatment in women between 1992 (579/100,000) and 1998 (674/100,000) (fig. 1). While the overall rate of inpatient stays for women 84 years or younger has remained relatively constant, there has been a dramatic increase in the rate of inpatient hospital stays by more elderly women. The rate for 85 to 94-year-old women increased from 1,527/100,000 in 1992 (95% CI 1,510 to 1,544) to 1,774/100,000 in 1998 (95% CI 1,756 to 1,791). The rate was even higher for women older than 95 years, increasing from 1,706/100,000 in 1992 to 2,088/100,000 in 1998. Complicated UTIs in elderly women with other comorbidities may necessitate more aggressive treatment with intravenous antimicrobial therapy. Black American women had a 1.1 to 2.95 higher rate of inpatient treatment compared to that in other ethnic groups. The reason for this difference is unclear.

Outpatient Care (Hospital Outpatient Care): The overall rate of hospital outpatient visits by women with UTI has generally increased from 1994 to 2000 according to data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) (table 5). The most striking increases were observed in 18 to 34-year-old women. Overall rates of hospital outpatient visits by young women were 1.64 times greater in 2000 than in 1994. Race/ethnicity appears to have some role in the rate of outpatient visits for UTI. Hispanic and black American women had higher age unadjusted visit rates when reliable estimates were available. Some regional fluctuations were noted but no consistent trends were observed. Rates of outpatient hospital visits for female UTI have been generally

TABLE 1. Female lifetime prevalence of UTIs by sociodemographic group, count and rate (NHANES-III, 1988 to 1994)

	Incidence	
	Count	Rate
Total count	50,810,018	53,067
1-2 UTIs ever	26,871,194	28,065
3 or Greater UTIs ever	23,938,824	25,002
Mean No. UTIs/last 12 mos in pts ever having UTI	0.40	
Race/ethnicity:		
White nonHispanic	41,641,569	55,937
Black nonHispanic	5,129,383	45,976
Hispanic	3,195,829	45,550
Other	843,238	26,937
Region:		
Midwest	12,081,920	52,335
Northeast	9,508,670	47,039
South	18,116,413	54,924
West	11,103,015	57,048
Urban/rural:		
Metropolitan statistical area (MSA)	24,236,785	34,135
NonMSA	26,573,233	107,393

Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS) (CPS Utilities, Unicon Research Corp., College Station, Texas) for relevant demographic categories of American female adult civilian noninstitutionalized population with data in this table based on the weighted number of persons who responded 1 or more to question HAK4, "How many times have you had a bladder infection, also called urinary tract infection, UTI or cystitis?" (counts may not sum to total due to rounding).

TABLE 3. Prescribing trends from 1989 through 1998 (Huang, E. S. and Stafford, R. S.: National patterns in the treatment of urinary tract infections in women by ambulatory care physicians. *Arch Intern Med*, 162: 41, 2002. Reprinted with permission from American Medical Association)

Antibiotic Prescribed	% 1989–1990	% 1991–1992	% 1993–1994	% 1995–1996	% 1997–1998	Adjusted Predictor OR (95% CI) (yr/decade)
TMP-SMX	48	35	30	45	24	0.32 (0.20–0.51)
Recommended fluoroquinolones	19	16	33	24	29	2.12 (1.26–3.56)
Nitrofurantoin	14	25	24	20	30	2.55 (1.50–4.31)
Overall nonrecommended antibiotics	33	49	36	32	46	1.57 (1.00–2.44)
No. visits/2-yrs	208	178	181	192	227	Not applicable

In all models antibiotic prescribing was the dependent variable and all trends were adjusted for age younger than 45 years and UTI history with recommended fluoroquinolones defined as ciprofloxacin, ofloxacin, lomefloxacin, enoxacin and fleroxacin, and nonrecommended antibiotics defined as all antibiotics other than TMP, TMP-SFX or recommended fluoroquinolones.

TABLE 4. Expenditures for female UTI and share of costs by service site (National Ambulatory Medical Care Survey, NHAMCS, Healthcare Cost and Utilization Project, and Medical Expenditure Panel Survey, 1994, 1996, 1998 and 2000)

	\$ Million (%)			
	1994	1996	1998	2000
Total	1,885.0	1,944.3	2,211.9	2,474.0
Total share:				
Inpt	1,168.7 (62.0)	1,254.1 (64.5)	1,322.7 (59.8)	1,360.7 (55.0)
Physician office	309.1 (16.4)	295.5 (15.2)	404.8 (18.3)	536.8 (21.7)
Hospital outpt	126.3 (6.7)	105.0 (5.4)	165.9 (7.5)	163.3 (6.6)
ER	280.9 (14.9)	289.7 (14.9)	318.5 (14.4)	413.2 (16.7)

Total unadjusted expenditures exclude spending on outpatient prescription drugs for UTI treatment with average drug spending for male and female UTI related conditions estimated at \$96 million to \$146 million annually for period 1996 to 1998.

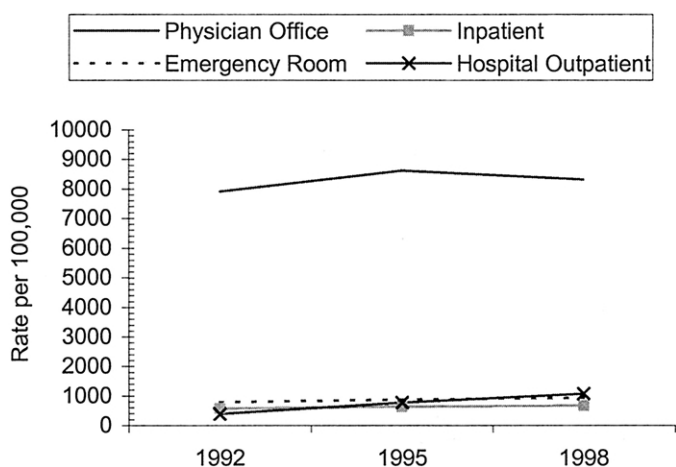


FIG. 1. Trends in visits by females with urinary tract infection listed as primary diagnosis by service site and year (Centers for Medicare and Medicaid Services, 1992, 1995 and 1998).

stable in urban areas but they have been increasing acutely in rural settings. This may reflect the increased availability of hospital based outpatient services in nonmetropolitan areas.

Outpatient Care (Physician Office Care): The outpatient physician office is the most widely used service site for female UTI treatment. According to data from the National Ambulatory Medical Care Survey there were more than 6,300,000 physician office visits for a primary diagnosis of female UTI in the United States in 2000 (table 6). Increases in physician outpatient services occurred in the 35 to 64 and 65 year or older age groups but not in the 18 to 34 year old age groups. Regional variations were observed with a generally higher rate of physician office visits in the South and West.

When physician outpatient services were stratified by provider specialty, some interesting trends emerged. The overall rates of visits to urologists were consistently lower than those for visits to family practitioners and general practitioners. This indicates that the majority of women with UTI are being

treated by primary care providers. Patients seen by urologists may have complicated infections, recurrent UTIs, acute pyelonephritis or other concomitant urological diagnoses. There was larger growth in physician office visits for a primary diagnosis of UTI in nonmetropolitan areas than in urban areas. The significance of this is unclear but the trend may reflect increased access to providers in less populated areas.

Outpatient Care (Ambulatory Surgery Care): Some women with UTIs may be treated in the ambulatory surgery setting. Data on Medicare beneficiaries diagnosed with UTI at ambulatory surgery centers revealed that the overall rate of use of this service site was quite low at 108 cases/100,000 (95% CI 107 to 110) in 1992 to 96/100,000 (95% CI 94 to 97) in 1998 (fig. 1). This reflects that UTI is not generally a primary surgical diagnosis. These women may have been diagnosed with UTI at presentation for surgery, or at the preoperative or postoperative visits. Use rates were generally low regardless of age, geographic region or patient race/ethnicity. These data indicate that ambulatory surgery centers are not significant service sites for the treatment of UTI in women.

Emergency Room (ER) Care: The ER represents a significant site of care for many women with a diagnosis of UTI. According to NHAMCS data women made approximately 1.3 million ER visits in the United States for the evaluation and treatment of UTI in 2000 (table 7). This represents a use rate of 1,252 visits/100,000 women (95% CI 1,077 to 1,426). Rates were highest in 18 to 34-year-old women (fig. 2). This trend was apparent in almost all years analyzed from 1994 to 2000. Use rates in young women were 2.5 to 3.6 times those in 35 to 64-year-old women. Women 65 years or older had higher use rates but they were still lower than those of the youngest stratum. There was a slight decrease in ER use rates in all age groups between 1994 and 1998, although the rates increased again in all patients in 2000. Race/ethnicity appears to be an important factor in ER use rates for the treatment of UTI in women. The age unadjusted rate of ER use by black American women was approximately twice that by white or other ethnic groups in all years analyzed.

Analysis of Medicare data for ER use revealed similar trends. Overall ER visits by female Medicare patients with UTI increased gradually between 1992 and 1998. When pa-

TABLE 5. Hospital outpatient visits by adult females with UTI listed as primary reason for visit (NHANES-Outpatient, 1994, 1996, 1998 and 2000)

	1994			1996			1998			2000		
	Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)	
Total	492,626	449 (339-559)		358,850	357 (247-468)		563,504	551 (440-661)		559,406	534 (414-653)	
Age:												
18-34	178,349	542 (327-757)		135,538	411 (233-590)		181,772	562 (384-741)		233,033	719 (485-952)	
35-64	167,763	366 (236-497)		128,161	261 (168-355)		228,773	445 (297-593)		212,682	397 (243-550)	
65 or Older	*	*		*	517 (73-961)		152,959	824 (497-1,152)		113,691	607 (305-909)	
Race/ethnicity:												
White	279,795	382 (282-482)		250,135	333 (199-466)		420,367	556 (427-685)		445,892	584 (434-734)	
Black	*	*		386 (123-649)		62,288				*	*	
Hispanic	*	*		60,153	667 (294-1,041)					*	*	
Region:												
Midwest	181,728	791 (403-1,180)		*	*		*	*		194,503	816 (494-1,139)	
Northeast	52,869	261 (153-369)		69,047	343 (192-495)		160,350	791 (488-1,094)		102,854	498 (244-752)	
South	147,905	451 (310-592)		69,346	194 (122-267)		252,082	695 (484-906)		181,573	489 (309-669)	
West	50,124	247 (120-373)		64,839	307 (135-479)		*	*		*	*	
Metropolitan statistical area (MSA):												
MSA	318,193	441 (329-553)		293,441	377 (246-508)		372,958	470 (349-591)		309,400	379 (274-483)	
NonMSA	*	*		*	*		190,546	830 (568-1,092)		250,006	1,084 (690-1,479)	

Rate per 100,000 population based on 1994, 1996, 1998 and 2000 CPS population estimates for relevant demographic categories of American female adult civilian noninstitutionalized population with persons of other races included in totals (counts may not sum to totals due to rounding).

* Value does not meet standard for reliability or precision.

TABLE 6. Physician office visits by adult females with UTI listed as primary reason for visit (NHANES 1992, 1994, 1996, 1998 and 2000)

	1992			1994			1996			1998			2000		
	Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)	
Totals	5,665,211	5,867 (4,766-6,968)		5,205,024	5,403 (4,513-6,292)		4,340,795	4,324 (3,493-5,156)		5,288,958	5,169 (4,050-6,288)		6,300,754	6,013 (4,840-7,186)	
Age:															
18-34	2,167,103	6,431 (4,314-8,549)		1,502,309	4,562 (3,255-5,869)		895,243	2,718 (1,749-3,687)		*	*		1,361,644	4,200 (2,479-5,921)	
35-64	2,171,942	4,819 (3,391-6,248)		2,147,659	4,691 (3,413-5,969)		1,983,960	4,045 (2,874-5,217)		2,738,069	5,325 (3,672-6,978)		3,015,698	5,624 (4,046-7,201)	
65 or Older	1,326,166	7,454 (4,906-10,001)		1,555,056	8,819 (6,236-11,403)		1,461,592	7,943 (5,146-10,741)		1,313,974	7,081 (4,056-10,105)		1,923,412	10,265 (6,551-13,979)	
Region:															
Midwest	1,200,957	5,206 (3,157-7,255)		841,952	3,667 (2,385-4,948)		1,013,390	4,310 (2,460-6,159)		*	*		1,377,591	5,781 (3,377-8,186)	
Northeast	864,968	4,280 (2,362-6,199)		981,042	4,838 (2,927-6,750)		769,391	3,827 (2,271-5,383)		*	*		1,344,803	6,514 (3,837-9,192)	
South	2,437,343	7,295 (5,264-9,326)		2,042,634	6,231 (4,656-7,806)		1,386,711	3,889 (2,626-5,152)		2,158,702	5,948 (4,030-7,865)		1,963,660	5,290 (3,449-7,131)	
West	1,161,943	5,848 (3,112-8,584)		1,339,396	6,590 (4,227-8,953)		1,171,303	5,550 (3,392-7,707)		*	*		1,614,700	6,963 (4,202-9,724)	
MSA:															
MSA	3,985,675	5,535 (4,377-6,694)		4,447,400	6,164 (5,074-7,253)		3,340,574	4,293 (3,351-5,235)		3,879,002	4,888 (3,640-6,136)		4,630,497	5,666 (4,388-6,944)	
NonMSA	1,679,536	6,841 (4,157-9,525)		*	*		1,000,221	4,432 (2,662-6,202)		1,409,956	6,143 (3,642-8,645)		1,670,257	7,245 (4,437-10,053)	
Specialty:															
Urology	1,103,291	1,143 (929-1,356)		731,871	760 (617-902)		780,023	777 (588-966)		547,954	536 (363-708)		783,389	748 (553-942)	
General + family practice	2,357,447	2,441 (1,599-3,284)		2,277,566	2,364 (1,702-3,026)		1,861,398	1,854 (1,261-2,447)		2,388,058	2,334 (1,569-3,099)		2,821,067	2,692 (1,815-3,569)	
Other	2,204,473	2,283 (1,623-2,943)		2,195,587	2,279 (1,711-2,847)		1,699,374	1,693 (1,151-2,234)		2,352,946	2,300 (1,505-3,094)		2,696,298	2,573 (1,826-3,320)	

Rate per 100,000 population based on 1992, 1994, 1996, 1998 and 2000 CPS population estimates for relevant demographic categories of American female adult civilian noninstitutionalized population (counts may not sum to totals due to rounding).

* Value does not meet standard for reliability or precision.

TABLE 7. ER visits by adult females with UTI listed as primary diagnosis (NHANES-ER, 1994, 1996, 1998 and 2000)

	1994			1996			1998			2000		
	Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)		Count	Rate (95% CI)	
Total	1,205,099	1,251 (1,086-1,415)		1,114,941	1,111 (951-1,270)		1,106,420	1,081 (916-1,247)		1,311,359	1,252 (1,077-1,426)	
Age:												
18-34	679,567	2,064 (1,697-2,430)		557,447	1,692 (1,351-2,034)		498,278	1,541 (1,192-1,890)		665,796	2,054 (1,655-2,452)	
35-64	262,839	574 (430-718)		317,112	647 (473-820)		316,118	615 (425-804)		362,324	676 (502-849)	
65 or Older	262,693	1,490 (1,049-1,931)		240,382	1,306 (893-1,719)		292,024	1,574 (1,143-2,004)		283,239	1,512 (1,038-1,985)	
Race/ethnicity:												
White	817,265	1,117 (932-1,301)		732,145	974 (795-1,153)		772,815	1,022 (831-1,213)		879,708	1,152 (951-1,354)	
Black	244,538	2,121 (1,531-2,711)		264,662	2,195 (1,576-2,815)		239,602	1,923 (1,304-2,542)		322,515	2,501 (1,833-3,170)	
Region:												
Midwest	265,481	1,156 (826-1,487)		241,660	1,028 (688-1,367)		277,562	1,168 (770-1,566)		410,628	1,723 (1,284-2,162)	
Northeast	309,787	1,528 (1,113-1,943)		254,887	1,268 (927-1,608)		208,294	1,028 (756-1,300)		150,389	729 (500-957)	
South	451,722	1,378 (1,088-1,668)		451,731	1,267 (963-1,571)		476,927	1,314 (991-1,637)		535,863	1,444 (1,112-1,775)	
West	178,109	876 (597-1,156)		166,663	790 (535-1,044)		143,637	653 (409-897)		214,479	925 (622-1,228)	
MSA:												
MSA	950,511	1,317 (1,127-1,507)		758,101	974 (817-1,132)		779,686	982 (809-1,156)		968,197	1,185 (1,003-1,367)	
NonMSA	254,588	1,052 (724-1,381)		356,840	1,581 (1,124-2,038)		326,734	1,424 (995-1,852)		343,162	1,488 (1,030-1,947)	

Rate per 100,000 population based on 1994, 1996, 1998 and 2000 CPS population estimates for relevant demographic categories of American female adult civilian noninstitutionalized population with persons of other races included in totals (counts may not sum to totals due to rounding).

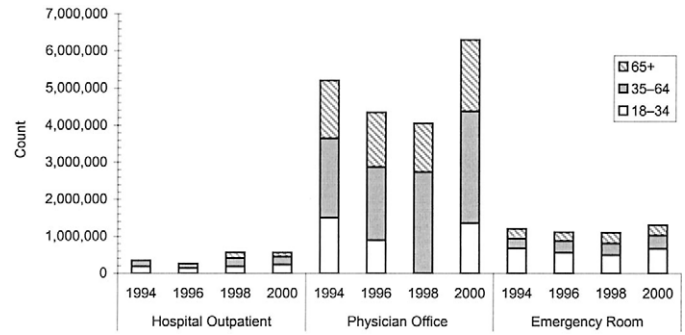


FIG. 2. National trends in visits by females for urinary tract infection by service site and patient age (National Hospital Ambulatory Medical Care Survey for hospital outpatient and emergency room, and National Ambulatory Medical Care Survey for physician office).

tients were stratified by age, little variation in use rates was seen. However, women older than 85 years had a consistently higher rate of ER use than younger women. The rate of ER use for Medicare beneficiaries was higher in the South than in other regions. White women had lower rates of ER use than other ethnic groups.

The notably higher overall rates of ER use by young women with UTI may reflect the relative lack of insurance in this segment of the population. These women may use the ER because they lack resources or have not identified a primary care provider. This pattern of use unnecessarily drives up the overall cost of health care.

Nursing Home Care: Data from the National Nursing Home Survey indicate that UTI as an admitting or current diagnosis in female nursing home residents decreased from 9,252/100,000 in 1995 to 7,111/100,000 in 1999 (table 8). No clear association with age was observed. This decrease in prevalence may have been due to the decreased rate of screening for asymptomatic bacteriuria in nursing homes. The overall rate of indwelling catheter use in nursing homes appears low (7.9% to 9.1%). This reflects a widespread trend toward minimizing the use of indwelling catheters in nursing home residents to help decrease the risk of UTI.

Economic impact. The economic burden of UTIs in women is significant. A substantial number of inpatient hospitalizations, outpatient hospital and clinical visits, and ER visits for UTI occur annually. Associated direct and indirect costs are large and they include substantial out of pocket expenses. Composite data suggest that overall expenditures for UTI treatment in women in the United States were approximately \$2.47 billion in 2000, excluding spending on outpatient prescription drugs (table 4). Inpatient services accounted for the majority of treatment costs, although the fraction of expenditures devoted to inpatient care decreased with time. Total spending on UTIs for women after adjustment for inflation increased about 1% annually between 1994 and 2000. The greatest percent increases in spending were for services provided at physician offices and ERs. Most UTI related expenditures in Medicare beneficiaries were for inpatient services (table 9). The bulk of this spending was in women 65 years or older. However, UTI related expenditures for Medicare enrollees younger than 65 years, mostly disabled women and those with end stage renal disease, exceeded \$100 million in 1998. This does not include expenditures for complementary and alternative therapies, which may be substantial, given widespread beliefs in such remedies as cranberry juice.⁷

Mean annual health care expenditures in privately insured women with a diagnosis of UTI in 1999 were approximately 1.4 times higher than those in women without UTI (\$5,407 vs \$3,833) (table 10). Although they were similar across regions, estimated overall costs in the South were the highest in the

TABLE 8. Female nursing home residents with admitting or current diagnosis of UTI (National Nursing Home Survey, 1995, 1997 and 1999)

	1995		1997		1999	
	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)
Total	104,100	9,252 (8,489–10,015)	95,302	8,243 (7,514–8,972)	83,208	7,111 (6,423–7,800)
Age:						
18–74	13,280	7,800 (5,883–9,717)	17,136	9,492 (7,518–11,465)	10,454	5,529 (4,042–7,015)
75–84	35,213	9,580 (8,223–10,938)	30,158	8,109 (6,829–9,388)	24,555	6,671 (5,494–7,848)
85 or Older	55,607	9,467 (8,415–10,520)	48,008	7,953 (6,962–8,943)	48,200	7,864 (6,857–8,872)
Race/ethnicity:						
White	93,253	9,330 (8,515–10,144)	84,602	8,379 (7,591–9,166)	71,181	7,125 (6,375–7,874)
Other	10,847	8,820 (6,604–11,036)	10,700	7,752 (5,735–9,770)	11,793	7,230 (5,435–9,024)

Rate per 100,000 nursing home residents in the same demographic stratum with persons of unspecified race included in totals.

TABLE 9. Expenditures for female Medicare beneficiaries for UTI treatment by service site in 1998*

Service Site	Total Annual Expenditures (\$ million)	
	Age Younger Than 65	Age 65 or Older
Inpt	71.6	687.6
Outpt:		
Physician office	17.2	171.0
Hospital	2.9	15.5
Ambulatory surgery	3.4	24.0
ER	9.8	58.4
Totals	104.9	956.5

* Centers for Medicare and Medicaid Services, 1998.

United States. Patient age did not appear to be a significant factor in health care expenditures in 1999.

An analysis of prescribing costs reflects a propensity to prescribe expensive medications such as fluoroquinolones disproportionately, rather than TMP-SMX or other less expensive agents (table 11). The average cost of a course of a fluoroquinolone is more than 6 times that of TMP-SMX. This finding is consistent with well documented increases in health care costs driven by prescription drug use. This is also concerning because of the increased risk of drug resistance. Conversely fluoroquinolone use may be warranted in areas where bacterial resistance to less expensive agents already exceeds 20% of cases. These data do not reflect treatment success or whether prescriptions were based on culture and susceptibility results. It also does not account for any subsequent savings that might be realized due to fluoroquinolone use. Use of the previously discussed therapeutic guidelines might alleviate some of these risks and costs. Estimated

direct costs for female UTI were substantially lower in other studies (table 12).

DISCUSSION

UTI remains one of the most common urological diseases of women in the United States. The overall lifetime risk of UTI is high (greater than 50% of all women), and appropriate diagnosis and treatment are essential to quality care. This analysis revealed several interesting trends. There appears to have been some decrease in inpatient hospitalization for UTI treatment in younger women, although it is still a significant source of health care expenditures in elderly women. There has been an overall trend toward the increased use of outpatient care in various settings for acute pyelonephritis and select cases of complicated UTIs.

Analysis of prescribing patterns revealed an increased reliance on fluoroquinolones over more traditional first line antimicrobials. This could have significant impacts in terms of economic and biological costs. Efforts to slow the emergence of drug resistant pathogens depend heavily on future prescribing patterns.

CONCLUSIONS

This analysis raises several significant research questions regarding the evaluation and treatment of UTI in women. To what degree should prevention be emphasized in UTI care? What are the best recommendations for prevention? What is the role of the environment in the development of UTIs in women, given the general observation that the rates of infection are higher in the South than in other regions?

Future economic research related to female UTI will also be important. The costs of care are high and methods to decrease these costs while maintaining high clinical quality

TABLE 10. Estimated annual expenditures of privately insured workers with and without medical claim for UTI in 1999*

	267,520 Without UTI (\$ total/pt)	11,430 With UTI		
		\$ Total/Pt	\$ Medical/Pt	\$ Prescription Drugs/Pt
All	3,099	5,470	4,414	1,056
Age:				
18–34	2,685	5,067	4,333	734
35–44	2,861	5,327	4,398	929
45–54	3,173	5,752	4,565	1,187
55–64	3,279	5,515	4,342	1,173
Sex:				
M	2,715	5,544	4,528	1,016
F	3,833	5,407	4,325	1,082
Region:				
Midwest	2,988	5,423	4,367	1,057
Northeast	2,981	5,197	4,157	1,040
South	3,310	5,838	4,757	1,080
West	3,137	5,762	4,716	1,046

Sample consists of primary beneficiaries 18 to 64 years old with employer provided insurance who were continuously enrolled in 1999 with estimated annual expenditures derived from multivariate models controlled for age, gender, work status (active/retired), median household income based on zip code, urban/rural residence, medical and drug plan characteristics (managed care, deductible and co-insurance/copayments) and 26 disease conditions.

* Ingenix Health Intelligence, Salt Lake City, Utah, 1999.

TABLE 11. Annual spending and use of outpatient prescription drugs to treat UTI in males and females in 1996 to 1998*

Drug Name	Av No. Prescription Claims	Av Mean Price (\$)	Av Total Expenditures (\$)
Ciprofloxacin (brand)	774,067	60.27	46,652,998
Nitrofurantoin monohydrate monocrystals (brand)	477,050	26.80	12,784,949
Triple antibiotic	329,253	8.44	2,778,898
Ofloxacin (brand)	279,564	54.10	15,124,394
Phenazopyridine	245,275	5.50	1,349,013
Amoxicillin	183,244	8.46	1,550,247
TMP-SMX	162,216	6.23	1,010,606
Co-trimoxazole (brand)	145,898	13.62	1,987,126
Nitrofurantoin	137,353	38.22	5,249,632
TMP-SMX DS	129,853	5.48	711,594
Oxybutynin	123,631	28.87	3,569,227
Cephalexin	118,985	19.06	2,267,854
Sulfacetamide	103,917	6.17	641,168
Sulfisoxazole	96,253	7.82	752,701
Totals	3,306,559		96,430,407

Estimates include prescription drug claims with a corresponding diagnosis for UTI in males and females and exclude drug claims for which there were insufficient data to produce reliable estimates, since including expenditures on these excluded medications would increase total outpatient drug spending for UTI by approximately 52% to \$146 million.

* Medical Expenditure Panel Survey, 1996 to 1998.

TABLE 12. Annual cost of UTI in 1995*

	Cost (\$ million)
Direct medical expenses:	
Clinic charges	385
Prescriptions	89
Direct nonmedical expenses:	
Travel + childcare for visits	77
Output lost due to time spent for visits	108
Total direct	659
Indirect costs (output lost due to disability):	
During bed days	300
During other days of restricted activity	300
During other days with symptoms	336
Total indirect	936
Total costs	1,595

* Foxman, B., Barlow, R., D'Arcy, H., Gillespie, B. and Sobel, J. D.: Urinary tract infection: self-reported incidence and associated costs. In: Annals of Epidemiology 10. New York: Elsevier Science, pp. 509-515, 2000. Reprinted with permission from Elsevier Science.

are needed. The role of innovative methods for prevention and treatment will be important. Additional research is also needed regarding the debate over definitions of UTI vs pyuria, the role of empirical therapy and the need for routine urine culture and susceptibility testing, given current controversies in the field. Issues related to access to care also must be explored. There has been a sharp increase in ER visits for UTI, particularly by young women. The cause of this use pattern must be identified and addressed. Answers

to these and other research questions will contribute to the continued improvement of health care in women with UTI.

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