Urologic Diseases in America

Interim Compendium

National Institute of Diabetes & Digestive & Kidney Diseases

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UROLOGIC DISEASES IN AMERICA

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National Institute of Diabetes & Digestive & Kidney Diseases

NATIONAL INSTITUTES OF HEALTH

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

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This book is dedicated to the memory of Dr. Dalia Spektor, 1944–2002.

UROLOGIC DISEASES IN AMERICA

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CHAPTER 6

Urinary Tract Infection in Women

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Urinary Tract Infection in Women

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INTRODUCTION

Urinary tract infection is an extremely common condition that occurs in both males and females of all ages. The prevalence and incidence of urinary tract infection is higher in women than in men, which is likely the result of several clinical factors including anatomic differences, hormonal effects, and behavior patterns.

DEFINITION

Urinary tract infection (UTI) is caused by pathogenic invasion of the urinary tract, which leads to an inflammatory response of the urothelium. Infections may be acute or chronic. The clinical manifestations of UTI depend on the portion of the urinary tract involved, the etiologic organism(s), the severity of the infection, and the patient's ability to mount an immune response to it. Signs and symptoms may include fever, chills, dysuria, urinary urgency, frequency, and cloudy or malodorous urine.

Bacteriuria refers to the presence of bacteria in the urine, but this is not equivalent to UTI. A UTI includes the inflammatory response and the associated signs and symptoms that result from the presence of the bacteria. Bacteriuria may be asymptomatic, particularly in elderly adults. *Pyuria* refers to the presence of white blood cells in the urine. It is a marker of inflammation in response to bacterial infection.

Infections in the urinary system are often classified by the anatomic site or organ involved, although the entire urinary tract may be affected. *Pyelonephritis* refers to a urinary tract infection involving the kidney. This may be an acute or chronic process. Acute pyelonephritis is characterized by fever, chills, and flank pain. Patients may also experience nausea and vomiting, depending on the severity of the infection and whether there is any obstruction to the flow of urine out of the renal collecting system. The risk of renal damage in most patients with uncomplicated UTI is low, even in those with uncomplicated acute pyelonephritis. Chronic pyelonephritis implies recurrent renal infections and may be associated with the development of renal scarring and impaired function if obstruction is present. A perinephric abscess may develop in severe cases of pyelonephritis. The clinical distinction between upper and lower UTI may be difficult, particularly in women.

Cystitis is an inflammatory process of the urinary bladder, typically caused by bacterial infection. It may be acute or chronic in nature. *Urethritis* refers to an inflammation or infection of the urethra. This often occurs in combination with cystitis and may be difficult to differentiate. Isolated bacterial urethritis is rare in women. Vaginitis and cervicitis, often related to sexually transmitted organisms, may also cause symptoms attributed to cystitis or urethritis.

Recurrent UTIs involve reinfection from a source outside the urinary tract or from bacterial persistence within it. In each case, the infections may be caused by the same or different organisms. The vast majority of recurrent UTIs in women are due to reinfection.

RISK FACTORS

Research has identified a number of risk factors for UTI in women. Women are at greater risk for UTI than men, partly because of the relatively short, straight anatomy of the urethra. Retrograde ascent of bacteria from the perineum is the most common cause of acute cystitis in women. Host factors such as changes in normal vaginal flora may also affect the risk of UTI. Genetic factors, including expression of HLA-A3 and Lewis blood group Le(a-b-) or Le(a+b-), may also put women at higher risk for recurrent UTI. Sexually active women are at greater risk for UTI than women who do not engage in sexual intercourse. Simple hygiene habits, including voiding before and after sexual intercourse and wiping from anterior to posterior, are often advocated to decrease the risk of UTI; however, a recent review found no advantage to these behavioral techniques (1). Contraceptive use may affect the rate of UTI, which appears to be greater in women who use certain types of spermicides. Hematogenous and lymphatic spread of bacteria to the urinary tract is uncommon in healthy patients.

Vesicoureteral reflux has been identified as a risk factor for the development of pyelonephritis. This is most commonly diagnosed in children, but it may also be identified in adults. Patients with recurrent pyelonephritis warrant anatomic evaluation, usually with a voiding cystourethrogram to identify evidence of reflux.

A foreign body in the urinary system may act as a nidus for infection and may be associated with recurrent infections. Common examples include urinary calculi and indwelling catheters. Indwelling urinary catheters are associated with chronic bacterial colonization, which occurs in almost all patients after five to seven days. This colonization significantly increases the risk for symptomatic UTI. Catheter modifications with antibiotic and silver impregnation have been developed in an effort to decrease the rate of infection in patients with indwelling catheters (2). Urea-splitting organisms are often associated with UTI in the presence of stones.

Post-menopausal women are at higher risk for UTI than younger women are, because they lack estrogen, which is essential to maintain the normal acidity of vaginal fluid. This acidity is critical to permit the growth of *Lactobacillus* in the normal vaginal flora, which acts as a natural host defense mechanism against symptomatic UTI. Restoration of the normal hormonal milieu in the vagina is not effective treatment for active urinary tract infections, but it may be useful for prevention. Other urologic factors potentially associated with an increased risk of UTI in post-menopausal women include urinary incontinence, cystocele, and elevated volumes of post-void residual urine.

Urinary tract infections are often characterized as *uncomplicated* if they involve only the bladder and are not associated with the presence of foreign bodies or anatomic abnormalities. *Complicated* UTIs may include pyelonephritis, urosepsis and the presence of foreign bodies or anatomic disorders. Significant UTIs in elderly patients are often classified as *complicated* due to the increased risk of associated morbidity and mortality in this population.

Urinary tract infections may be caused by a variety of different organisms, most commonly bacteria. The most frequent bacterial cause of UTI in adult women is *Escherichia coli*, which is part of the normal gut flora. This organism accounts for approximately 85% of community-acquired UTIs and 50% of hospital-acquired UTIs. Other common organisms include *Enterococcus faecalis, Klebsiella pneumoniae*, and *Staphylococcus saprophyticus*. Nosocomial infections and those associated with foreign bodies may involve more aggressive organisms such as *Pseudomonas aeruginosa, Serratia, Enterobacter, and Citrobacter species*.

Nonbacterial infections are less common and tend to occur more often in immunosuppressed individuals or those with diabetes mellitus. Fungal infections with *Candida spp* are the most common nonbacterial infections. Other less common urinary tract pathogens include *Mycobacterium tuberculosis* and a variety of anaerobic organisms. The overall role of anaerobic urinary infections is controversial; however, anaerobes may be especially dangerous in immunocompromised patients due to an increased risk of severe infections such as emphysematous pyelonephritis or cystitis. Bilharzial cystitis is uncommon in the United States but may be seen in patients who have recently immigrated or traveled to areas of the world where schistosomes are endemic.

Research on the physiology and microbiology of urinary tract infections has identified a number

Table 1. Codes used in the diagnosis and management of female urinary tract infection

Females 18 years or older with one of the following ICD-9 diagnosis codes:	
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.0	Acute cystitis
595.1	Chronic interstitial cystitis
595.2	Other chronic cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.9	Cystitis, unspecified
646.6	Infections of genitourinary tract in pregnancy
760.1	Maternal renal and urinary tract diseases affecting fetus or newborn
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Other	
597.89	Other urethritis
599.0	Urinary tract infection site not specified
646.5	Asymptomatic bacteriuria in pregnancy

of organism and host factors that may increase the risk for UTI. Disruption of the urothelium due to trauma or other irritation may increase the ability of organisms to adhere to tissue and cause infection. Bacteria may develop a number of mechanisms such as pili, fimbriae, and chemical adhesins that increase their ability to adhere to host tissues.

DIAGNOSIS

The standard ICD-9 diagnostic codes for UTI (Table 1) were used for the analyses presented in this chapter. These codes are categorized primarily on the basis of the site and type of infection involved. The primary categories include cystitis, pyelonephritis, and other infections. Common definitions are used here to permit comparisons among datasets.

The diagnosis of UTI may be made presumptively on the basis of clinical signs and symptoms in combination with urinalysis results. A urinalysis that reveals both bacteriuria and pyuria is considered clinically diagnostic of UTI. Traditionally, confirmatory cultures have been obtained to verify the infection and identify the specific organism(s) involved; however, this standard is evolving. If a culture is obtained, the presence of at least 10^5 colony-forming units (CFU) of bacteria on a voided specimen has classically been used as the culture-based definition of UTI. Lower colony counts (100 CFU) may be used to establish a clinical diagnosis in catheterized or aspirated specimens from symptomatic patients. Bacterial colonization of indwelling catheters is common, and it may be difficult to distinguish between this phenomenon and symptomatic UTI requiring therapy. Drug susceptibility data are typically obtained to verify that appropriate therapy has been selected. The increased prevalence of drug-resistant bacteria has made susceptibility testing particularly important.

PREVALENCE AND INCIDENCE

Urinary tract infection is an extremely common diagnosis in women, and treatment incurs substantial costs. It is estimated that at least one-third of all women in the United States are diagnosed with a UTI by the time they reach 24 years of age (3). In a random-digit-dialing telephone survey of 2,000 women, Foxman and colleagues found that 10.8% of women 18 years of age or older self-reported at least one UTI in the previous 12 months (95% CI, 9.4–12.1) (Figure 1). Using this information, the authors calculated the lifetime risk for UTI in their sample to be 60.4% (95% CI, 55.1–65.8). Using these data, the authors estimated that at least 11.3 million women in the United States had at least one 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 was estimated to be 53,067 cases per 100,000 adult women, based on the National Health and Nutrition Examination Survey (NHANES-III) (Table 2). The prevalence in women was significantly higher than that estimated in men (13,689 cases per 100,000) in this study (Chapter 7, Table 2). Data from NHANES-III also shows the incidence of UTI in the past 12 months to be 13,320 per 100,000 adult women (Table 3).

Data from US Veterans Health Administration (VA) facilities revealed a similar disparity in the numbers of women and men seeking care for UTIs (Table 4). In 2001, the rate of women seeking outpatient care for cystitis was 626 cases per 100,000 (with 469 as the primary diagnosis), compared with 161 cases per 100,000 (111 as the primary diagnosis) in men. In contrast to cystitis, the overall prevalence of women seeking outpatient care for pyelonephritis was only slightly higher in women than in men: 78

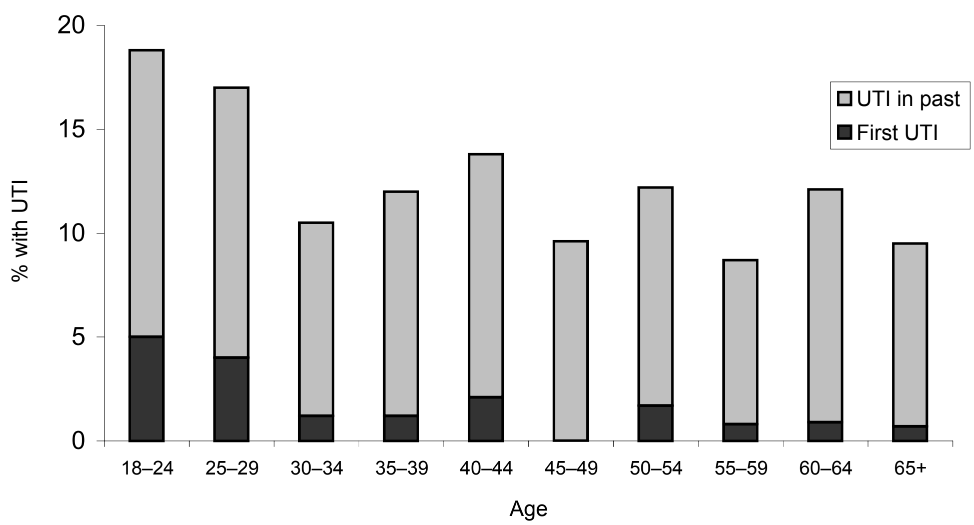


Figure 1. Self-reported incidence of physician-diagnosed urinary tract infection during the previous 12 months by age and history of urinary tract infection among 2000 United States women participating in a random digit dialing survey. The average standard error for the total incidences in each of the age groups is 2.3%.

SOURCE: Adapte -
ed incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

Table 2. Female lifetime prevalence of urinary tract infections, by sociodemographic group, count, rate[a]

	Incidence	
	Count	Rate
Total count[b]	50,810,018	53,067
1–2 bladder infections ever	26,871,194	28,065
3+ bladder infections ever	23,938,824	25,002
Mean number of infections in the last 12 months of those ever having UTI	0.40	
Race/ethnicity		
White non-Hispanic	41,641,569	55,937
Black non-Hispanic	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		
MSA	24,236,785	34,135
Non-MSA	26,573,233	107,393

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]The data in this table are 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?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 3. Female incidence of UTIs in past 12 months, by sociodemographic group, count, rate[a]

	Incidence	
	Count	Rate
Total count[b]	12,753,035	13,320
1 or more bladder infections in the last 12 months	12,753,035	13,320
Mean number of infections in the last 12 months	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+	187,365	11,770
Race/ethnicity		
White non-Hispanic	9,949,997	13,366
Black non-Hispanic	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
Non-MSA	6,327,198	25,571

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]The data in this table are 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?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 4. Frequency of urinary tract infection (including cystitis, pyelonephritis, orchitis, and other) as a diagnosis in VA patients seeking outpatient care, rate[a]

	1999		2000		2001	
Sub-Conditions	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Male UTI[b]	2,082	2,705	1,963	2,591	1,719	2,334
Cystitis	136	177	131	175	111	161
Pyelonephritis	48	65	41	57	40	60
Orchitis	314	378	297	360	99	334
Other	1,649	2,187	1,555	2,097	1,351	1,868
Female UTI[b]	4,793	6,015	4,589	5,904	4,265	5,552
Cystitis	512	670	517	684	469	626
Pyelonephritis	72	81	55	71	64	78
Other	4,378	5,521	4,187	5,409	3,883	5,075

[a]Rate is defined ▯
same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).
[b]Represents unique cases of UTI (i.e., patients with more than one UTI subtype are counted only once).
SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

cases per 100,000 (64 as the primary diagnosis) vs 60 cases per 100,000 (40 as the primary diagnosis). In the three years for which data are available (1999 to 2001), the overall frequency of an outpatient primary diagnosis of UTI in US female VA outpatient clinic patients gradually declined, from 4,793 per 100,000 to 4,265 per 100,000 (Table 5). Also, note that the prevalence rates in the VA data are much lower than those in NHANES because the VA identifies only UTIs for which patients sought medical attention in one year, whereas NHANES relies on self-reported UTI over a lifetime and hence presents a true population prevalence.

MORBIDITY AND MORTALITY

Urinary tract infections may be associated with significant morbidity and even mortality. This is particularly true in the frail elderly and in those with associated urinary incontinence, where UTI may be related to skin breakdown and ulceration. Complicated UTIs may lead to urosepsis and death; however, the risk of UTI-related mortality in the elderly and comorbid population is unknown. It is generally believed that asymptomatic bacteriuria in elderly patients does not need to be treated, although this issue is controversial (4). More commonly, UTI is associated with bothersome urinary symptoms that can lead to work absence and decreased ability to engage in activities of daily living.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Medications

Antimicrobial therapy remains the mainstay of treatment for patients with UTIs. Bacterial urine cultures with appropriate drug susceptibility data should guide the selection of antimicrobials. However, most symptomatic patients require selection of therapy prior to the identification of the etiologic organism. Initial therapy is usually empiric, with subsequent modifications made on the basis of urine culture and susceptibility results as necessary. The need for urine culture is also an area of debate. Many experts advocate empiric therapy for most patients, with urine cultures reserved for those who fail to respond to treatment or have recurrent infections. The Infectious Disease Society of America published guidelines in 1999 that recommended the use of trimethoprim-sulfamethoxazole (TMP-SMX) as first-line therapy for patients without an allergy to this compound (5). Specific fluoroquinolones were recommended as second-line agents. In geographic areas where resistance to TMP-SMX is high (>20%), fluoroquinolones are recommended as first-line

Table 5. Frequency of urinary tract infection[a] as a diagnosis in female VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	4,793	6,015	4,589	5,904	4,265	5,552
Age						
18–25	4,396	5,154	4,852	5,878	4,431	5,325
25–34	4,969	5,840	4,726	5,705	5,051	6,063
35–44	4,547	5,634	4,370	5,525	3,909	5,087
45–54	4,624	5,841	4,451	5,717	4,127	5,366
55–64	4,543	6,081	4,645	6,320	4,273	5,729
65–74	5,097	6,843	4,887	6,677	4,040	5,681
75–84	5,546	7,395	4,818	6,598	4,229	5,979
85+	5,484	6,567	5,269	7,446	5,088	6,416
Race/ethnicity						
White	6,094	7,697	5,764	7,484	5,322	6,937
Black	5,735	7,182	5,280	6,664	4,942	6,403
Hispanic	6,672	8,556	5,801	7,605	5,666	6,922
Other	4,787	6,080	6,722	7,665	3,630	13,299
Unknown	3,255	4,038	3,209	4,111	3,048	3,976
Region						
Eastern	4,008	4,965	3,781	4,823	3,623	4,591
Central	4,640	5,871	4,696	5,939	4,195	5,456
Southern	5,313	6,747	4,888	6,489	4,482	6,002
Western	4,778	5,887	4,720	5,865	4,512	5,707
Insurance status						
No insurance/self-pay	4,792	5,957	4,658	5,928	4,375	5,576
Medicare/Medicare supplemental	6,064	7,828	5,308	7,192	4,791	6,692
Medicaid	5,229	6,536	5,482	6,360	5,915	6,839
Private insurance/HMO/PPO	4,001	5,146	3,829	4,914	3,428	4,559
Other insurance	4,174	4,973	3,697	4,736	3,512	4,484
Unknown	5,594	6,993	1,493	1,493	1,914	1,914

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for female urinary tract infections (including cystitis, pyelonephritis, and other UTIs).

[b]Rate is defined
same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 6. Prescribing trends from 1989 through 1998[a]

Antibiotic Prescribed	1989–1990	1991–1992	1993–1994	1995–1996	1997–1998	Adjusted Odds Ratio (95% Confidence Interval) for Predictor, Year (per decade)[b]
Trimethoprim-sulfamethoxazole	48	35	30	45	24	0.32 (0.20–0.51)
Recommended uoroquinolones[c]	19	16	33	24	29	2.12 (1.26–3.56)
Nitrofurantoin	14	25	24	20	30	2.55 (1.50–4.31)
Overall non-recommended antibiotics[d]	33	49	36	32	46	1.57 (1.00–2.44)
No. of visits per 2-year period	208	178	181	192	227	n/a

[a]Unless otherwise indicated, data are percentages of patients.

[b]In all models, an
infection.

[c]Recommended uoroquinolones were defined as cipro oxacin, o oxacin, lome oxacin, enoxacin, and eroxacin.

[d]Non-recommended antibiotics were defined as all antibiotics other than trimethoprim or trimethoprim-sulfamethoxazole or recommended uoroquinolones.

SOURCE: Re
physicians, Archives Internal Medicine, 162, 41–47, *Copyright © 2002, with permission from the American Medical Association*. All rights reserved.

therapy.

The recommendation to use older agents such as TMP-SMX as initial therapy has strong merit. These medications cost less than newer antimicrobials such as fluoroquinolones. In addition, reserving fluoroquinolones and broad-spectrum antimicrobials for complicated infections or cases with documented resistance to first-line therapy may help reduce the incidence of bacterial resistance. However, a recent study on the national trends in prescribing patterns for UTI in women among ambulatory care physicians revealed that the use of TMP-SMX is decreasing and the use of fluoroquinolones is increasing (6). The proportion of TMP-SMX use dropped from 48% in 1989–1990 to 24% in 1997–1998 (adjusted OR, 0.33; 95% CI, 0.21–0.52 per decade). At the same time, fluoroquinolone use increased from 19% to 29% (adjusted OR, 2.28; 95% CI, 1.35–3.83 per decade) (Table 6). This indicates that there is a trend toward using more-expensive antimicrobials such as fluoroquinolones as initial therapy. This trend may be due in part to increased rates of outpatient care and increased availability and marketing of these products. However, it has the potential to increase both overall costs and antimicrobial resistance.

Inpatient Care

Severe UTIs, particularly those associated with acute pyelonephritis, may require inpatient hospitalization for treatment with intravenous antimicrobials. In 2000, inpatient services constituted 55% of all expenditures for the treatment of UTI (Table 7). According to data from the Centers for Medicare and Medicaid Services (CMS), there was a

Table 7. Expenditures for female urinary tract infection (in millions of $) and share of costs, by site of service

	1994	1996	1998	2000
Total[a]	1,885.0	1,944.3	2,211.9	2,474.0
Share of total				
Inpatient	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 outpatient	126.3 (6.7%)	105.0 (5.4%)	165.9 (7.5%)	163.3 (6.6%)
Emergency room	280.9 (14.9%)	289.7 (14.9%)	318.5 (14.4%)	413.2 (16.7%)

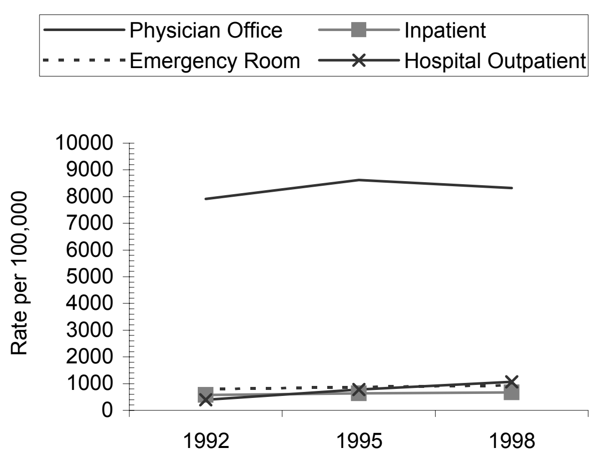
[a]Total unadjusted expe
for

SOURCES: Nati
and Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

Table 8. Inpatient stays by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	114,640	579 (575–582)	127,460	632 (628–635)	128,380	674 (670–677)
Total < 65	8,480	355 (347–363)	9,400	350 (343–357)	11,200	403 (396–411)
Total 65+	106,160	609 (606–613)	118,060	675 (671–679)	117,180	720 (716–724)
Age						
65–74	27,880	303 (300–307)	27,300	303 (300–307)	24,760	313 (309–317)
75–84	42,180	715 (708–722)	46,980	785 (778–792)	46,480	796 (788–803)
85–94	31,700	1,527 (1,510–1,544)	37,660	1,694 (1,677–1,711)	39,460	1,774 (1,756–1,791)
95+	4,400	1,706 (1,656–1,757)	6,120	2,161 (2,108–2,215)	6,480	2,088 (2,038–2,139)
Race/ethnicity						
White	94,780	565 (561–568)	105,120	606 (602–609)	104,420	645 (642–649)
Black	13,540	803 (790–816)	17,280	939 (925–953)	17,180	974 (959–988)
Asian	…	…	300	318 (282–354)	740	418 (388–448)
Hispanic	…	…	1,660	826 (786–866)	3,040	827 (798–857)
N. American Native	…	…	200	1,238 (1,064–1,411)	380	1,457 (1,311–1,603)
Region						
Midwest	28,800	574 (567–580)	31,040	602 (595–609)	31,040	629 (622–636)
Northeast	21,000	463 (457–470)	23,980	534 (527–540)	23,660	604 (596–612)
South	50,760	726 (720–733)	56,420	781 (774–787)	57,940	826 (819–832)
West	12,780	448 (440–456)	14,420	504 (495–512)	14,040	517 (508–525)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.



SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

gradual overall increase in the age-unadjusted rate of inpatient hospitalization for treatment of UTI in adult women between 1992 (579 per 100,000) and 1998 (674 per 100,000) (Table 8 and Figure 2). While the overall rate of inpatient stays for women 84 years of age and younger has remained relatively constant, there has been a dramatic increase in the rate of inpatient hospital stays for very elderly women. The rate for women 85 to 94 years of age increased from 1,527 per 100,000 in 1992 (95% CI, 1,510–1,544) to 1,774 per 100,000 in 1998 (95% CI, 1,756–1,791). The rate was even higher for women over 95, increasing from 1,706 per 100,000 in 1992 to 2,088 in 1998. Urinary tract infections may be more severe in frail elderly women due to additional comorbidity, and this may necessitate more aggressive treatment with inpatient hospitalization and intravenous antimicrobial therapy. African American women had higher rates of inpatient treatment than did other ethnic groups (1.1 to 2.95 times higher). Patients living in the South had higher rates of inpatient care than did women living in other regions.

Data from the Healthcare Cost and Utilization Project (HCUP) for the years from 1994 to 2000 indicate that the rate of inpatient hospitalization for a primary diagnosis of UTI has been generally decreasing for young and middle-aged women (18 to 54 years of age) and has been relatively stable overall for those aged 55 to 74 (Table 9). In addition, the overall rate of inpatient hospitalization is relatively low for young women, increasing approximately twofold when women reach the 65 to 74 age group. However, these data also demonstrate that there has been a gradual increase in the rate of inpatient hospitalizations for women 75 to 84 years of age when UTI is the primary admitting diagnosis. The most striking finding in the data is that women 85 and older had inpatient hospitalization rates 2.82 to 3.27 times higher than those of women in the 75 to 84 age range. This may be a reflection of the degree of associated morbidity and potential health impairment caused by UTI in elderly women. Nosocomial infections may also influence the rates of hospitalization in this patient group. It is unclear why estimated inpatient utilization rates are lower in HCUP data than in CMS data.

Acute pyelonephritis is a serious UTI often treated with intravenous antimicrobials, historically requiring inpatient care, although newer approaches include primary management with oral antimicrobials. Analysis of HCUP data for women admitted to the hospital for a primary diagnosis of pyelonephritis indicates that there was a gradual decline in the rate of admissions between 1994 and 2000 (Table 10). Pyelonephritis accounted for 28% of the female UTI hospitalizations in 1994 and 21% in 2000. The overall rate of admissions for pyelonephritis among women gradually declined from 65 per 100,000 (95% CI, 62–68) in 1994 to 49 per 100,000 (95% CI, 46–51) in 2000. This trend is reflected across essentially all age strata analyzed. It likely reflects increased use of oral antimicrobials and home-based intravenous therapy in the treatment of women with pyelonephritis. The decline in age-unadjusted rates of hospitalization for women with pyelonephritis was most noticeable in African American and Caucasian women. Rates were relatively stable in Hispanic and Asian women. Rates of hospitalization declined in all geographic areas, and no distinct regional differences were noted.

The overall length of hospital stay of women who require inpatient hospitalization for the management of UTI has decreased, consistent with the general trend toward decreased length of stay (LOS) for all conditions (Table 11). Nationwide HCUP data reveal that the mean LOS for women with UTI decreased from 6.2 days in 1994 to 4.9 days in 2000. This trend was seen across all age groups, although elderly women continued to have a somewhat greater LOS than younger women, probably due to the more-severe infections or associated comorbidity in older adults. The decrease in LOS was more pronounced for women who have Medicare or Medicaid as their primary insurer than it was for women with either private insurance or HMO coverage.

Outpatient Care

Outpatient care for UTI is provided in a variety of settings, which are analyzed separately below.

Hospital Outpatient Care

The overall rate of hospital outpatient visits for women with UTI generally increased from 1994 to 2000, according to data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), both when UTI was listed as the primary diagnosis (Table 12) and when UTI was listed as one of any diagnoses at the time of visit (Table 13). The most

Table 9. Inpatie a (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	223,256	232 (223–240)	235,055	234 (226–243)	243,584	238 (230–246)	245,879	235 (227–242)
Age								
18–24	16,748	135 (126–144)	15,205	122 (114–130)	13,496	108 (101–115)	12,300	93 (87–99)
25–34	21,873	106 (99–113)	20,183	98 (92–105)	17,495	88 (83–94)	15,629	82 (76–87)
35–44	17,367	85 (80–90)	18,445	85 (80–89)	17,842	80 (75–84)	17,009	75 (71–79)
45–54	14,592	99 (93–105)	15,324	94 (88–100)	15,630	90 (85–94)	16,633	89 (85–93)
55–64	16,336	154 (145–163)	17,036	155 (146–164)	17,263	149 (142–156)	18,375	150 (144–157)
65–74	33,529	339 (324–355)	34,216	340 (324–356)	36,552	370 (353–387)	34,686	356 (342–370)
75–84	53,966	920 (881–960)	59,660	931 (892–970)	64,687	957 (922–992)	66,664	968 (935–1001)
85+	48,844	2,593 (2,477–2,709)	54,984	2,844 (2,725–2,962)	60,618	3,162 (3,038–3,286)	64,584	3,078 (2,975–3,182)
Race/ethnicity								
White	131,419	180 (172–187)	139,026	185 (177–193)	136,003	180 (173–187)	137,718	180 (174–187)
Black	26,970	234 (214–253)	28,841	239 (221–258)	24,887	200 (187–213)	23,177	180 (169–191)
Asian/Pacific Islander	1,856	68 (55–80)	1,914	56 (48–64)	2,423	64 (48–80)	3,351	83 (73–92)
Hispanic	12,829	156 (140–172)	14,359	159 (135–183)	15,865	162 (142–183)	16,430	154 (138–170)
Region								
Midwest	48,859	213 (197–228)	51,308	218 (204–233)	54,813	231 (215–247)	52,991	222 (209–236)
Northeast	47,668	235 (217–253)	44,923	223 (205–242)	47,095	232 (216–249)	47,204	229 (213–244)
South	92,109	281 (263–299)	98,838	277 (260–294)	101,638	280 (265–295)	103,304	278 (263–294)
West	34,620	170 (155–186)	39,986	189 (173–206)	40,038	182 (168–196)	42,380	183 (170–195)
MSA								
Rural	52,366	216 (200–232)	55,871	248 (230–265)	55,038	240 (225–255)	57,804	251 (236–265)
Urban	170,356	236 (226–246)	178,730	230 (220–239)	187,699	237 (227–246)	187,848	230 (221–238)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000
categories of US female adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 10. Inpatient hospital stays by adult females with pyelonephritis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	62,223	65 (62–68)	61,949	62 (59–65)	54,933	54 (51–56)	50,881	49 (46–51)
Age								
18–24	12,008	97 (90–104)	11,075	89 (83–95)	9,607	77 (71–82)	8,645	65 (60–70)
25–34	14,709	72 (67–76)	13,483	66 (61–70)	11,131	56 (52–60)	9,613	50 (46–54)
35–44	9,765	48 (45–51)	10,267	47 (44–50)	9,364	42 (39–45)	8,664	38 (36–41)
45–54	6,656	45 (41–49)	7,075	44 (40–47)	6,339	36 (34–39)	6,380	34 (32–36)
55–64	5,045	48 (44–52)	5,328	48 (44–53)	4,686	40 (38–43)	4,870	40 (37–43)
65–74	6,420	65 (59–71)	6,348	63 (58–69)	5,694	58 (53–62)	5,220	54 (49–58)
75–84	5,078	87 (79–94)	5,661	88 (80–96)	5,433	80 (74–87)	4,999	73 (66–79)
85+	2,541	135 (118–151)	2,712	140 (124–157)	2,679	140 (123–156)	2,490	119 (106–132)
Race/ethnicity								
White	34,772	48 (45–51)	33,882	45 (43–47)	28,732	38 (36–40)	25,448	33 (32–35)
Black	7,718	67 (60–74)	7,792	65 (59–70)	5,493	44 (40–48)	4,712	37 (33–40)
Asian/Pacific Islander	754	28 (22–33)	636	19 (15–22)	824	22 (15–29)	918	23 (18–28)
Hispanic	4,711	57 (50–64)	5,374	60 (47–72)	5,151	53 (44–61)	5,206	49 (42–55)
Region								
Midwest	14,047	61 (56–66)	13,962	59 (54–65)	11,931	50 (46–55)	11,378	48 (44–52)
Northeast	11,335	56 (51–61)	10,185	51 (46–56)	9,490	47 (41–53)	8,246	40 (36–43)
South	24,287	74 (67–81)	24,009	67 (62–73)	21,362	59 (55–63)	19,969	54 (50–58)
West	12,554	62 (55–68)	13,793	65 (57–74)	12,150	55 (50–60)	11,288	49 (44–54)
MSA								
Rural	15,155	63 (56–70)	14,555	64 (58–71)	13,410	58 (54–63)	12,252	53 (49–57)
Urban	46,844	65 (62–68)	47,282	61 (57–64)	41,186	52 (49–55)	38,552	47 (45–50)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996,
demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 11. Trends in mean inpatient length of stay (days) for adult females hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	6.2	5.3	4.9	4.9
Age				
18–24	3.4	3.0	3.0	2.8
25–34	3.9	3.3	3.2	3.2
35–44	4.4	3.9	3.7	3.5
45–54	5.0	4.4	4.4	4.1
55–64	6.1	5.0	4.8	4.8
65–74	6.5	5.6	5.2	5.1
75–84	7.3	6.0	5.6	5.4
85+	7.7	6.3	5.7	5.5
Race/ethnicity				
White	6.2	5.3	5.0	4.9
Black	6.9	5.9	5.6	5.7
Asian/Pacific Islander	5.1	4.9	4.6	5.3
Hispanic	5.9	4.7	4.9	4.4
Other	6.6	5.7	4.4	5.2
Region				
Midwest	5.5	4.8	4.8	4.4
Northeast	8.4	6.9	6.0	5.6
South	5.8	5.0	4.8	4.9
West	5.2	4.7	4.4	4.4
MSA				
Rural	5.5	4.8	4.3	4.4
Urban	6.4	5.4	5.1	5.0
Primary payor				
Medicare	7.1	6.0	5.5	5.4
Medicaid	5.7	4.8	4.6	4.4
Private insurance/HMO	4.2	3.8	3.7	3.6
Self-pay	4.6	3.8	3.5	3.3
No charge	*	3.7	3.7	4.5
Other	5.2	3.8	4.1	3.6

*Figure does not meet standard for reliability or precision.
MSA, metropolitan statistical area; HMO, health maintenance organization.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

striking increases were observed in young women 18 to 34 years of age. Overall rates of hospital outpatient visits by young women for any reason were 1.64 times greater in 2000 than they were in 1994. Race/ethnicity appears to play some role in the rate of outpatient visits for UTI: Hispanic and African American women had higher age-unadjusted visit rates where reliable estimates are available. Some regional fluctuations were noted, but no consistent trends were observed. Rates of outpatient hospital visits for female UTI have been generally stable in metropolitan statistical areas (MSAs), that is, urban settings, but have been increasing acutely in non-MSA, or rural, settings. This may reflect increased availability of hospital-based outpatient services in nonmetropolitan areas.

An analysis of Medicare data for the years 1992, 1995, and 1998 also reflects the trend toward increased hospital outpatient utilization for the management of female UTIs (Table 14). The overall utilization rate across all ages was 395 per 100,000 (95% CI, 392–397) in 1992. It rose to 780 per 100,000 (95% CI, 776–784) in 1995, and to 1,072 per 100,000 (95% CI, 1,068–1,077) in 1998. These trends were similar when stratified by age (< 65 or ≥ 65 years). Very elderly women (≥ 95 years) had the smallest overall increase in hospital outpatient utilization, which corresponds to the larger increase in inpatient hospitalization previously described for this age group.

Physician Office Care

The outpatient physician office is the most widely utilized site of service for the treatment of female UTIs (Figure 3). According to data from the National Ambulatory Medical Care Survey (NAMCS), there were more than 6,300,000 physician office visits for a primary diagnosis of female UTI in the United States in 2000 (Table 15). The rates of utilization have remained relatively stable for all patients when UTI is among any of the reasons listed for the visit (Table 16), but they increased between 1996 and 2000 when UTI was the primary diagnosis (Table 15). These increases in physician outpatient services occurred in the 35 to 64 and ≥ 65 year old age groups, but not in 18- to 34-year-old groups. Regional variations were observed during the years analyzed, with a generally higher rate of physician office visits for UTI in the South and the West.

Ta [a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	432,626	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+	*	*	*	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)	*	*	*	*
Hispanic	*	*	60,153	667 (294–1,041)	62,288	638 (269–1,006)	*	*
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)	*	*	*	*
MSA								
MSA	318,193	441 (329–553)	293,441	377 (246–508)	372,958	470 (349–591)	309,400	379 (274–483)
Non-MSA	*	*	*	*	190,546	830 (568–1,092)	250,006	1,084 (690–1,479)

*Figure does not meet standard for reliability or precision.
MSA, metropolitan statistical area.
[a]Rate per 100,000 based on 1994, 1996, 1998, 2000
categories of US female adult civilian non-institutionalized population.
[b]Persons of other races are included in the totals.
NOTE: Counts may not sum to totals due to rounding.
SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 13. Hospital outpatient visits by adult females with urinary tract infection listed as any reason for visit, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	568,202	590 (469–711)	566,676	565 (436–693)	784,752	767 (634–900)	816,459	779 (627–932)
Age								
18–34	216,162	656 (428–885)	215,041	653 (445–861)	296,592	917 (673–1,161)	349,866	1,079 (776–1,382)
35–64	233,678	510 (357–664)	213,031	434 (302–567)	281,648	548 (388–708)	282,465	527 (351–703)
65+	118,362	671 (359–984)	*	*	206,512	1,113 (714–1,512)	184,128	983 (537–1,428)
Race/ethnicity								
White	375,156	513 (396–629)	361,243	481 (332–629)	564,054	746 (591–901)	613,429	804 (622–985)
Black	75,811	658 (322–994)	92,769	769 (425–1,114)	92,170	740 (371–1,108)	110,994	861 (377–1,345)
Hispanic	*	*	103,775	1,151 (614–1,687)	115,176	1,179 (664–1,694)	85,076	797 (330–1,264)
Region								
Midwest	236,759	1,031 (610–1,452)	245,751	1,045 (571–1,520)	128,220	540 (301–778)	281,994	1,183 (787–1,580)
Northeast	80,917	399 (269–529)	133,440	664 (464–864)	233,853	1,154 (787–1,521)	177,027	858 (467–1,248)
South	195,507	596 (434–759)	104,439	293 (202–384)	313,752	864 (623–1,106)	238,542	643 (432–854)
West	55,019	271 (142–400)	83,046	393 (209–578)	108,927	495 (287–704)	118,896	513 (240–786)
MSA								
MSA	432,852	600 (471–728)	470,464	605 (454–756)	566,770	714 (563–865)	496,653	608 (456–759)
Non-MSA	135,350	560 (267–852)	*	*	217,982	950 (669–1,230)	319,806	1,387 (950–1,824)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000
categories of US female adult civilian non-institutionalized population.

[b]Persons of other races are included in the totals.

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 14. Outpatient hospital visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages	78,180	395 (392–397)	157,420	780 (776–784)	204,360	1,072 (1,068–1,077)
Total < 65	8,960	375 (367–383)	21,980	818 (807–829)	28,620	1,030 (1,019–1,042)
Total 65+	69,220	397 (394–400)	135,440	774 (770–778)	175,740	1,080 (1075–1,085)
Age						
65–74	31,200	339 (336–343)	64,600	718 (712–723)	74,920	948 (941–955)
75–84	28,360	481 (475–486)	50,480	843 (836–851)	70,680	1,210 (1,201–1,219)
85–94	8,740	421 (412–430)	18,940	852 (840–864)	28,000	1,259 (1,244–1,273)
95+	920	357 (334–380)	1,420	501 (475–528)	2,140	690 (661–719)
Race/ethnicity						
White	60,120	358 (355–361)	126,480	729 (725–733)	169,320	1,047 (1,042–1,052)
Black	11,000	652 (640–665)	20,240	1,100 (1,085–1,115)	20,080	1,138 (1,123–1,154)
Asian	…	…	240	254 (222–286)	860	486 (454–518)
Hispanic	…	…	2,760	1,374 (1,323–1,424)	6,240	1,698 (1,656–1,740)
N. American Native	…	…	1,360	8,416 (7,989–8,843)	2,320	8,896 (8,551–9,241)
Region						
Midwest	23,000	458 (452–464)	42,500	824 (816–832)	59,980	1,216 (1,206–1,226)
Northeast	15,080	333 (327–338)	20,280	451 (445–457)	25,660	655 (647–663)
South	27,440	393 (388–397)	72,820	1,008 (1,001–1,015)	90,520	1,290 (1,282–1,298)
West	11,960	419 (412–427)	21,020	734 (724–744)	27,640	1,017 (1,005–1,029)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

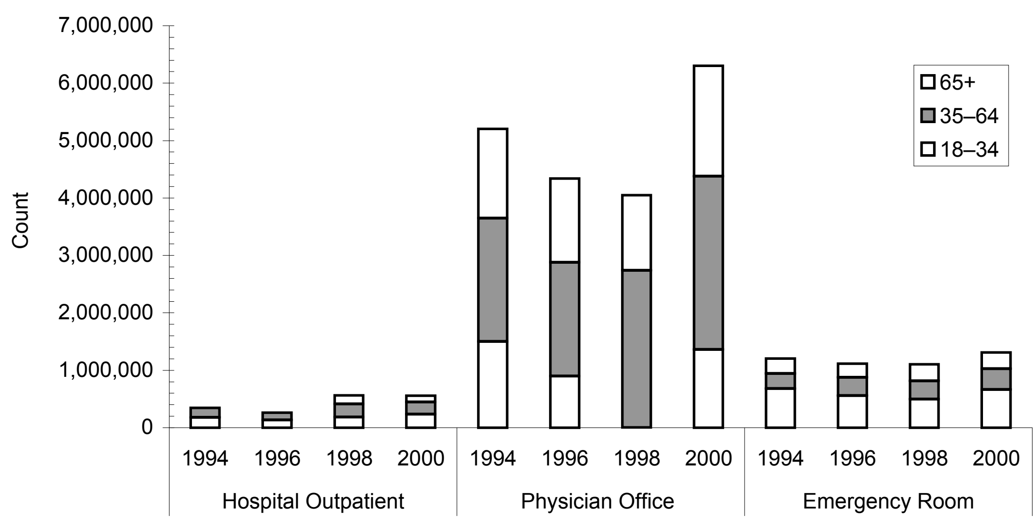


Figure 3. National trends in visits by females for urinary tract infection by patient age and site of service.

SOURCE: National Hospital Ambulatory Medical Care Survey (hospital outpatient and emergency room); National Ambulatory Medical Care Survey (physician office).

Table 15. Physician office visits by adult females with urinary tract infection listed as primary reason for visit, count, rate[a] (95% CI)

	Count	Rate	Count	Rate	Count	Rate
	1992		1994		1996	
Total	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)
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)
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)
65+	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)
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)
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)
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)
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)
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)
Non-MSA	1,679,536	6,841 (4,157–9,525)	*	*	1,000,221	4,432 (2,662–6,202)
Specialty						
Urology	1,103,291	1,143 (929–1,356)	731,871	760 (617–902)	780,023	777 (588–966)
GFP	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)
All others	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)
	1998		2000			
Total	5,288,958	5,169 (4,050–6,288)	6,300,754	6,013 (4,840–7,186)		
Age						
18–34	*	*	1,361,644	4,200 (2,479–5,921)		
35–64	2,738,069	5,325 (3,672–6,978)	3,015,698	5,624 (4,046–7,201)		
65+	1,313,974	7,081 (4,056–10,105)	1,923,412	10,265 (6,551–13,979)		
Region						
Midwest	*	*	1,377,591	5,781 (3,377–8,186)		
Northeast	*	*	1,344,803	6,514 (3,837–9,192)		
South	2,158,702	5,948 (4,030–7,865)	1,963,660	5,290 (3,449–7,131)		
West	*	*	1,614,700	6,963 (4,202–9,724)		
MSA						
MSA	3,879,002	4,888 (3,640–6,136)	4,630,497	5,666 (4,388–6,944)		
Non-MSA	1,409,956	6,143 (3,642–8,645)	1,670,257	7,245 (4,437–10,053)		
Specialty						
Urology	547,954	536 (363–708)	783,389	748 (553–942)		
GFP	2,388,058	2,334 (1,569–3,099)	2,821,067	2,692 (1,815–3,569)		
All others	2,352,946	2,300 (1,505–3,094)	2,696,298	2,573 (1,826–3,320)		

GFP, general and family practice; MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per
Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 16. Physician office visits by adult females with urinary tract infection listed as any reason for visit, count, rate[a] (95% CI)

	Count	Rate	Count	Rate	Count	Rate
	1992		1994		1996	
Total	7,302,802	7,563 (6,307–8,819)	6,505,167	6,752 (5,757–7,747)	6,295,860	6,272 (5,276–7,268)
Age						
18–34	2,564,452	7,610 (5,280–9,941)	1,800,179	5,466 (3,963–6,970)	1,737,586	5,275 (3,765–6,786)
35–64	2,775,830	6,159 (4,523–7,795)	2,591,923	5,662 (4,286–7,037)	2,509,412	5,117 (3,817–6,417)
65+	1,962,520	11,030 (7,900–14,161)	2,113,065	11,984 (8,999–14,969)	2,048,862	11,135 (7,941–14,329)
Region						
Midwest	1,462,687	6,341 (4,114–8,567)	1,264,608	5,507 (3,746–7,269)	1,562,287	6,644 (4,413–8,876)
Northeast	1,232,828	6,101 (3,698–8,503)	1,247,926	6,155 (3,936–8,373)	939,584	4,673 (2,873–6,473)
South	2,909,465	8,708 (6,485–10,931)	2,357,740	7,193 (5,516–8,869)	2,301,628	6,455 (4,806–8,104)
West	1,697,822	8,545 (5,284–11,805)	1,634,893	8,044 (5,583–10,504)	1,492,361	7,071 (4,715–9,427)
MSA						
MSA	5,010,454	6,958 (5,651–8,266)	5,526,106	7,659 (6,438–8,880)	4,828,440	6,205 (5,086–7,325)
Non-MSA	2,292,348	9,337 (6,223–12,451)	979,061	4,047 (2,488–5,607)	1,467,420	6,502 (4,329–8,675)
Specialty						
Urology	1,280,128	1,326 (1,104–1,547)	849,076	881 (731–1,031)	895,705	892 (696–1,089)
GFP	3,022,128	3,130 (2,185–4,075)	2,840,667	2,948 (2,210–3,686)	2,629,808	2,620 (1,915–3,324)
Intern. Med.	1,208,039	1,251 (720–1,782)	1,442,635	1,497 (986–2,009)	1,344,616	1,340 (842–1,837)
All other	1,792,507	1,856 (1,286–2,427)	1,372,789	1,425 (1,046–1,804)	1,425,731	1,420 (981–1,859)
	1998		2000			
Total	7,645,826	7,473 (6,146–8,800)	8,150,279	7,778 (6,464–9,093)		
Age						
18–34	2,025,391	6,263 (4,184–8,342)	1,875,092	5,784 (3,776–7,792)		
35–64	3,431,071	6,673 (4,874–8,472)	3,693,141	6,887 (5,146–8,628)		
65+	2,189,364	11,798 (7,849–15,747)	2,582,046	13,780 (9,635–17,925)		
Region						
Midwest	1,689,897	7,111 (4,244–9,979)	1,572,822	6,601 (4,145–9,057)		
Northeast	*	*	1,615,468	7,826 (4,949–10,702)		
South	3,401,109	9,371 (6,980–11,762)	2,486,626	6,699 (4,670–8,728)		
West	1,812,256	8,241 (5,090–11,391)	2,475,363	10,674 (7,242–14,106)		
MSA						
MSA	6,001,991	7,563 (6,033–9,092)	6,242,476	7,638 (6,16– 9,113)		
Non-MSA	1,643,835	7,162 (4,509–9,816)	1,907,803	8,275 (5,380–11,170)		
Specialty						
Urology	704,268	688 (498–879)	1,077,581	1,028 (785–1,272)		
GFP	3,377,733	3,301 (2,396–4,207)	3,569,977	3,407 (2,437–4,377)		
Intern. Med.	2,335,343	2,283 (1,494–3,071)	1,914,448	1,827 (1,171–2,483)		
All other	*	*	1,588,273	1,516 (1,001–2,031)		

GFP, general and family practice; MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 1 -
search Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 17. Physician office visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	1,568,800	7,918 (7,907–7,930)	1,740,660	8,625 (8,613–8,638)	1,585,360	8,319 (8,307–8,332)
Total < 65	102,780	4,303 (4,277–4,329)	145,780	5,425 (5,398–5,453)	144,520	5,204 (5,177–5,230)
Total 65+	1,466,020	8,414 (8,401–8,427)	1,594,880	9,117 (9,103–9,130)	1,440,840	8,851 (8,837–8,865)
Age						
65–74	720,880	7,843 (7,826–7,861)	767,800	8,530 (8,512–8,548)	641,100	8,113 (8,094–8,132)
75–84	571,020	9,681 (9,657–9,705)	619,480	10,348 (10,324–10,373)	599,440	10,261 (10,236–10,285)
85–94	165,460	7,970 (7,933–8,007)	197,260	8,871 (8,834–8,909)	189,900	8,536 (8,499–8,573)
95+	8,660	3,359 (3,289–3,428)	10,340	3,652 (3,582–3,721)	10,400	3,352 (3,288–3,415)
Race/ethnicity						
White	1,403,820	8,363 (8,350–8,377)	1,555,680	8,965 (8,952–8,979)	1,403,340	8,674 (8,660–8,688)
Black	95,360	5,655 (5,621–5,690)	102,840	5,590 (5,557–5,624)	91,440	5,183 (5,150–5,216)
Asian	…	…	8,480	8,983 (8,801–9,165)	12,740	7,200 (7,080–7,321)
Hispanic	…	…	26,300	13,090 (12,942–13,237)	42,340	11,520 (11,417–11,623)
N. American Native	…	…	1,080	6,683 (6,300–7,067)	1,400	5,368 (5,096–5,640)
Region						
Midwest	364,120	7,255 (7,232–7,278)	394,540	7,652 (7,629–7,675)	358,200	7,261 (7,238–7,284)
Northeast	250,720	5,532 (5,511–5,553)	270,300	6,015 (5,993–6,037)	244,060	6,230 (6,206–6,253)
South	710,660	10,170 (10,148–10,193)	782,420	10,829 (10,807–10,852)	717,800	10,229 (10,206–10,251)
West	218,240	7,654 (7,623–7,685)	257,100	8,979 (8,946–9,012)	228,500	8,407 (8,374–8,440)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

When physician outpatient services are stratified by provider specialty, some interesting trends emerge. The overall rates of visits to urologists are 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 their primary care providers. The patients seen by urologists may be those with more complex or severe infections, recurrent UTI, acute pyelonephritis, or other concomitant urologic diagnoses. There was a larger growth in physician office visits for a primary diagnosis of UTI in nonmetropolitan service areas than in metropolitan areas. The significance of this is unclear, but the trend may reflect increased access to providers in less urban areas.

An analysis of CMS data for outpatient physician office visits for the treatment of UTI in women reveals a general increase in utilization between 1992 and 1995, which remained relatively stable in 1998 (Table 17). The most striking observation in this analysis is the peak in utilization among women between 75 and 84 years of age (Figure 4). Rates of utilization in this age group have been consistently higher than those in either older or younger patient populations. The reason for the spike in this age group is not immediately apparent. Most studies demonstrate a continued increase in the overall incidence and prevalence of UTI with increasing age. However, this likely represents the segment of the community-dwelling 75- to 84-year-old population who are treated as outpatients. Patients in the oldest age groups may be more likely to require inpatient treatment, but this accounts for only part of their lower rates of ambulatory care visits for which UTI is listed as the

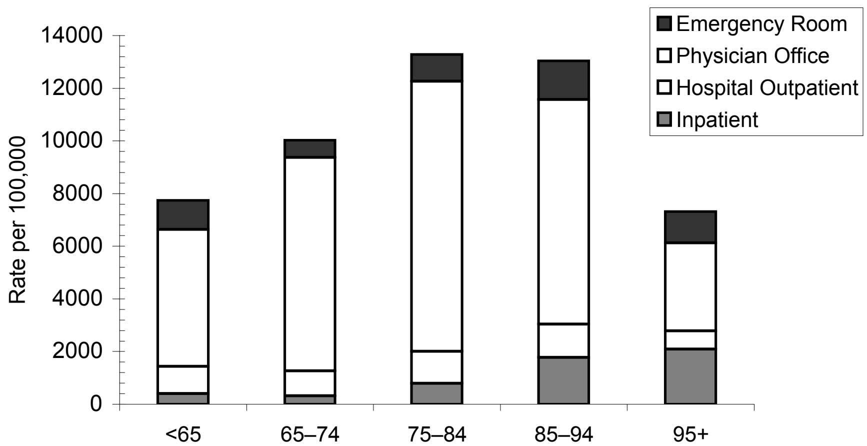


Figure 4. Distribution of urinary tract infection by site of visit, by age, 1998.

SOURCE: Centers for Medicare and Medicaid Services, 1998.

primary diagnosis (Tables 8–11). Outpatient visits by elderly women are likely to be for multiple conditions, any of which may be listed as the primary diagnosis.

An additional observation is the sizable geographic disparity between the South and other regions in the rate of physician office visits for UTI among female Medicare beneficiaries. Although this trend has been observed in some of the other analyses, it is most pronounced in this comparison. This difference appears to have been stable between 1992 and 1998. The reason for the sharply greater utilization in the South is unclear but may be associated with a higher prevalence of UTI in this region.

Ambulatory Surgery Care

Some women with UTIs may be treated in the ambulatory surgery setting. Data from Medicare beneficiaries treated for a diagnosis of UTI in ambulatory surgery centers (Table 18) revealed that the overall rate of utilization of this service site for a primary diagnosis of UTI was quite low, ranging from 108 cases per 100,000 (95% CI, 107–110) in 1992 to 96 cases per 100,000 (95% CI, 94–97) in 1998 (Figure 2). This most likely reflects the fact that UTI is not generally a primary surgical diagnosis. Many of these patients may have been scheduled for other operations and were subsequently found to have a UTI at the time of their presentation for surgery or were identified as having a UTI at the time of their pre- or post-operative visit. Utilization 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 Care

The emergency room (ER) represents a significant site of care for many women with a primary diagnosis of UTI. According to NHAMCS data, approximately 1.3 million ER visits were made by women in the United States for evaluation and treatment of UTI in 2000 (Table 19). This represents a utilization rate of 1,252 visits per 100,000 adult women (95% CI, 1,077–1,426). Rates of use were highest for women 18 to 34 years of age (Figure 3). This trend was apparent in almost all the years analyzed (1994–2000). Utilization rates for young women ranged from 2.5 to 3.6 times those for 35- to 64-year-old women. Women 65 and over had higher utilization rates, but they were still lower than those of the youngest stratum. There was a slight decrease in the rate of ER utilization in all age groups between 1994 and 1998; however, the rates increased again for all patients in 2000.

Race/ethnicity appears to be an important factor in the ER utilization rates for treatment of UTI in women. The age-unadjusted rate of ER use

Table 18. Visits to ambulatory surgery centers by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	21,420	108 (107–110)	20,080	100 (98–101)	18,240	96 (94–97)
Total < 65	1,540	64 (61–68)	2,040	76 (73–79)	2,040	73 (70–77)
Total 65+	19,880	114 (113–116)	18,040	103 (102–105)	16,200	100 (98–101)
Age						
65–74	10,920	119 (117–121)	9,620	107 (105–109)	8,020	101 (99–104)
75–84	7,120	121 (118–124)	6,440	108 (105–110)	6,540	112 (109–115)
85–94	1,700	82 (78–86)	1,880	85 (81–88)	1,580	71 (68–75)
95+	140	54 (45–63)	100	35 (28–42)	60	19 (15–24)
Race/ethnicity						
White	18,860	112 (111–114)	17,820	103 (101–104)	16,080	99 (98–101)
Black	1,480	88 (83–92)	1,580	86 (82–90)	1,400	79 (75–83)
Asian	…	…	…	…	…	…
Hispanic	…	…	180	90 (77–103)	320	87 (78–97)
N. American Native	…	…	0	0.0	20	77 (42–111)
Region						
Midwest	7,300	145 (142–149)	6,260	121 (118–124)	6,140	124 (121–128)
Northeast	4,600	101 (99–104)	4,020	89 (87–92)	3,900	100 (96–103)
South	7,880	113 (110–115)	8,780	122 (119–124)	6,700	95 (93–98)
West	1,640	58 (55–60)	980	34 (32–36)	1,480	54 (52–57)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

by African American women was approximately twice that for Caucasians or other ethnic groups in all the years analyzed (Figure 5). This may reflect the general propensity toward increased ER utilization among African Americans for most clinical problems. Less regional variation was observed, although the overall rates of ER use among nonmetropolitan areas were higher than those in urban areas.

Analysis of Medicare data for ER use reveals similar trends (Table 20). Overall ER visits for female Medicare patients with UTI increased gradually between 1992 and 1998. When patients are stratified by age, little variation in utilization rates is seen over this time period. However, women over age 85 had a consistently higher rate of ER use than did younger women. The rate of ER use for Medicare beneficiaries was higher in the South than in other regions of the country. Caucasian women had lower rates of ER utilization than did 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 utilization unnecessarily drives up the overall cost of health care.

Nursing Home Care

Data from the National Nursing Home Survey (NNHS) indicate that UTI as either an admitting or current diagnosis among female nursing home residents declined from 9,252 per 100,000 in 1995 to 7,111 per 100,000 in 1999 (Table 21). No clear association with age was observed over this time period. The decline in the identification of asymptomatic UTI in this population may result from the fact that screening for bacteriuria in nursing home residents is no longer widely practiced. Nursing

Table 19. Emergency room visits by adult females with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	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+	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)
Non-MSA	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)

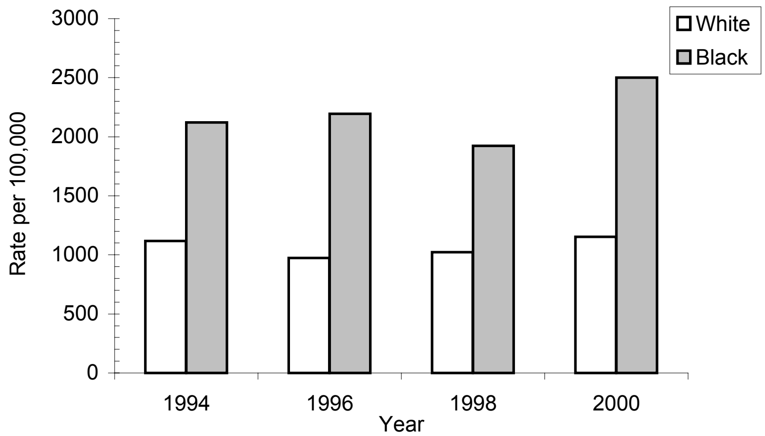
MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000
categories of US female adult civilian non-institutionalized population.

[b]Persons of other races are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

Source: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.



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and year.

SOURCE: Healthcare Cost and Utilization Project, 1994, 1996, 1998, 2000.

Table 20. Emergency room visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	157,180	793 (789–797)	177,700	881 (876–885)	177,780	933 (929–937)
Total < 65	21,620	905 (893–917)	28,180	1,049 (1,037–1,061)	30,840	1,110 (1,098–1,123)
Total 65+	135,560	778 (774–782)	149,520	855 (850–859)	146,940	903 (898–907)
Age						
65–74	53,720	584 (580–589)	56,500	628 (623–633)	51,080	646 (641–652)
75–84	53,300	904 (896–911)	56,760	948 (940–956)	59,480	1,018 (1,010–1,026)
85–94	25,640	1,235 (1,220–1,250)	32,120	1,445 (1,429–1,460)	32,680	1,469 (1,453–1,485)
95+	2,900	1,125 (1,084–1,165)	4,140	1,462 (1,418–1,506)	3,700	1,192 (1,154–1,231)
Race/ethnicity						
White	125,180	746 (742–750)	141,780	817 (813–821)	141,220	873 (868–877)
Black	22,640	1,343 (1,325–1,360)	27,380	1,488 (1,471–1,506)	26,340	1,493 (1,475–1,511)
Asian	…	…	600	636 (585–686)	740	418 (388–448)
Hispanic	…	…	2,720	1,354 (1,303–1,405)	4,880	1,328 (1,291–1,365)
N. American Native	…	…	340	2,104 (1,881–2,327)	400	1,534 (1,384–1,683)
Region						
Midwest	35,540	708 (701–715)	42,220	819 (811–827)	43,360	879 (871–887)
Northeast	27,300	602 (595–609)	29,660	660 (653–668)	26,860	686 (677–694)
South	73,280	1,049 (1,041–1,056)	83,120	1,150 (1,143–1,158)	84,300	1,201 (1,193–1,209)
West	19,380	680 (670–689)	20,780	726 (716–736)	21,000	773 (762–783)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 21. Female nursing home residents with an admitting or current diagnosis of urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total[b]	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+	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)

[a]Rate per 100,000 nursing home residents in the same demographic stratum.
[b]Persons of unspecified race are included in the totals.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

home residents with UTI had higher rates of urinary incontinence than did women in the general nursing home population (Tables 22 and 23). As expected, the proportion of women with indwelling foley catheters or ostomies nearly double in women with UTI than it was in the female nursing home population in general.

Overall trends in nursing home patients indicate that 56 to 58% of female residents have problems with urinary incontinence (Table 23). At least half of these residents also require some form of assistance to use the toilet, usually from another person. The overall rate of indwelling catheter use in nursing homes appears low (7.9% to 9.1%), according to these data. This reflects a widespread trend toward minimizing the use of indwelling catheters in nursing home residents to help minimize the risk of UTI.

ECONOMIC IMPACT

The economic burden of UTIs in adult women is significant. A substantial number of inpatient hospitalizations, outpatient hospital and clinic visits, and ER visits for the diagnosis and management of female UTI occur each year. The associated direct and indirect costs are also large and include substantial out-of-pocket expenses for the patients. Composite data suggest that the overall expenditures for treatment of UTIs among women in the United States were approximately $2.47 billion in 2000, excluding spending on outpatient prescription drugs (Table 7). Inpatient services accounted for the majority of treatment costs, although the fraction of expenditures devoted to inpatient care declined over time. Total spending on UTIs for women, after adjustment for inflation, increased about 1% per year between 1994 and 2000. The biggest percentage increases in spending were for services provided in physician offices and ERs. Most of the UTI-related expenditures in Medicare beneficiaries were for inpatient services (Table 24). The bulk of this spending was for women over 65, although UTI-related expenditures exceeded $100 million in 1998 among Medicare enrollees under 65, primarily the disabled. This does not include expenditures for complementary and alternative therapies, which may be substantial, given widespread beliefs in such remedies as cranberry juice (7).

The mean annual health care expenditures for privately insured women with a diagnosis of UTI in 1999 were approximately 1.4 times higher than those for women without UTI ($5,407 vs $3,833) (Table 25). Although similar across regions, the estimated overall costs in the South were the highest in the 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 the fluoroquinolones disproportionately, rather than TMP-SMX or other less expensive agents (Table 26). The average cost for a course of a fluoroquinolone is more than six times that for a course of TMP-SMX. This finding is consistent with the well-documented

Table 22. Special needs of female nursing home residents with urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	17,818	17,116 (13,818–20,415)	13,302	13,958 (10,735–17,180)	14,210	17,077 (13,211–20,943)
No	85,707	82,331 (78,993–85,669)	81,772	85,803 (82,556–89,050)	68,998	82,923 (79,057–86,789)
Question left blank	575	553 (0–1,183)	228	240 (0–711)	0	0
Requires assistance using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,710	60,555 (56,034–65,076)	42,226	50,748 (45,705–55,791)
No	16,430	15,783 (12,601–18,966)	13,238	13,890 (10,729–17,052)	14,070	16,909 (13,018–20,800)
Question skipped for allowed reason	25,329	24,331 (20,585–28,078)	23,883	25,060 (21,041–29,079)	26,212	31,501 (26,771–36,231)
Question left blank	217	208 (0–617)	471	495 (0–1,181)	700	842 (0–1,716)
Requires assistance from equipment when using the toilet						
Yes	17,219	16,541 (13,311–19,770)	15,682	16,456 (13,032–19,879)	15,008	18,037 (14,290–21,784)
No	43,542	41,827 (37,564–46,089)	40,082	42,058 (37,479–46,637)	25,973	31,215 (26,578–35,852)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	1,580	1,518 (465–2,571)	2,417	2,536 (1,093–3,979)	1,945	2,338 (865–3,810)
Requires assistance from another person when using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,119	59,935 (55,403–64,468)	42,695	51,311 (46,267–56,356)
No	0	0	214	225 (0–667)	156	188 (0–557)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	217	208 (0–617)	847	889 (12–1,767)	76	91 (0–269)
Has difficulty controlling urine						
Yes	65,954	63,356 (59,162–67,550)	62,266	65,336 (60,922–69,749)	54,497	65,495 (60,622–70,369)
No	25,656	24,645 (20,917–28,373)	24,155	25,345 (21,327–29,363)	19,204	23,079 (18,709–27,450)
Question skipped for allowed reason	11,767	11,303 (8,485–14,121)	8,484	8,903 (6,208–11,597)	9,354	11,242 (7,983–14,501)
Question left blank	724	696 (0–1,501)	397	416 (0–996)	153	184 (0–546)

[a]Rate per 100,000 adult female nursing home residents with urinary tract infection in the NNHS for that year.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 23. Special needs of female nursing home residents regardless of urinary tract infection diagnosis, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	101,827	9,050 (8,281–9,819)	90,855	7,859 (7,151–8,566)	96,151	8,218 (7,484–8,951)
No	1,020,886	90,732 (89,954–91,510)	1,061,282	91,796 (91,072–92,520)	1,064,024	90,937 (90,162–91,712)
Question left blank	2,450	218 (89–347)	3,997	346 (182–510)	9,890	845 (571–1,120)
Requires assistance using the toilet						
Yes	659,035	58,572 (57,256–59,888)	652,615	56,448 (55,131–57,765)	670,006	57,262 (55,935–58,590)
No	286,946	25,503 (24,334–26,671)	280,242	24,240 (23,104–25,375)	273,104	23,341 (22,202–24,480)
Question skipped for allowed reason	173,839	15,450 (14,484–16,417)	216,408	18,718 (17,680–19,756)	218,971	18,714 (17,670–19,759)
Question left blank	5,343	475 (297–652)	6,870	594 (394–794)	7,983	682 (430–935)
Requires assistance from equipment when using the toilet						
Yes	182,812	16,248 (15,274–17,221)	180,518	15,614 (14,659–16,569)	178,305	15,239 (14,293–16,185)
No	460,230	40,903 (39,592–42,215)	433,640	37,508 (36,220–38,795)	467,351	39,942 (38,631–41,254)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	21,336	1,896 (1,536–2,257)	45,327	3,921 (3,391–4,450)	32,334	2,763 (2,303–3,224)
Requires assistance from another person when using the toilet						
Yes	652,088	57,955 (56,636–59,274)	640,137	55,369 (54,048–56,689)	661,927	56,572 (55,242–57,901)
No	6,109	543 (345–741)	8,603	744 (511–977)	6,800	581 (384–779)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	6,180	549 (357–741)	10,745	929 (681–1,178)	9,263	792 (527–1,056)
Has difficulty controlling urine						
Yes	633,123	56,269 (54,943–57,596)	672,699	58,185 (56,875–59,496)	685,747	58,608 (57,288–59,927)
No	424,287	37,709 (36,411–39,006)	422,839	36,574 (35,293–37,854)	422,162	36,080 (34,793–37,367)
Question skipped for allowed reason	64,822	5,761 (5,124–6,398)	57,080	4,937 (4,370–5,504)	55,713	4,761 (4,201–5,322)
Question left blank	2,931	260 (114–407)	3,517	304 (154–454)	6,444	551 (323–778)

[a]Rate per 100,000 adult female nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 24. Expenditures for female Medicare beneficiaries for treatment of urinary tract infection (in millions of $), by site of service, 1998

Site of Service	Total Annual Expenditures: Age < 65	Age 65+
Inpatient	71.6	687.6
Outpatient		
Physician office	17.2	171.0
Hospital outpatient	2.9	15.5
Ambulatory surgery	3.4	24.0
Emergency room	9.8	58.4
Total	104.9	956.5

SOURCE: Centers for Medicare and Medicaid Services, 1998.

increases in health care costs driven by prescription drug utilization. This is also of concern 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 the success of treatment or whether prescriptions were based on culture and susceptibility results. Nor does this analysis account for any subsequent savings that may occur incident to the use of fluoroquinolones. Use of the basic therapeutic guidelines discussed earlier might alleviate some of these risks and costs. The estimated direct costs for female UTI are substantially lower in other studies (Table 27).

In addition to the direct medical costs of treatment, UTIs can affect labor market factors such as absenteeism and work limitations (Tables 28 and 29). Although cystitis is more common among women, pyelonephritis is associated with the greatest burden of work loss. Data from Medstat's 1999 Health and Productivity Management survey suggest that 24% of women with a medical claim for pyelonephritis missed some work time related to treatment of the condition, the average being 7.7 hours lost per year.

SPECIAL CONSIDERATIONS

HCUP data on women hospitalized for UTI suggest that diabetes may be a risk factor for the development of infection (Table 30). This may be due to changes in voiding physiology in diabetic patients

Table 25. Estimated annual expenditures of privately insured workers with and without a medical claim for a urinary tract infection in 1999[a] (in $)

	Annual Expenditures (per person): Persons without UTI (N=267,520)	Persons with UTI (N=11,430)		
	Total	Total	Medical	Rx Drugs
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
Gender				
Male	2,715	5,544	4,528	1,016
Female	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

Rx, prescription.

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled
▯
retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

Table 26. Average annual spending and use of outpatient prescription drugs for treatment of urinary tract infection (male and female), 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Cipro®	774,067	60.27	46,652,998
Macrobid®	477,050	26.80	12,784,949
Triple antibiotic	329,253	8.44	2,778,898
Floxin®	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
Bactrim	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
Total	3,306,559		96,430,407

Rx, prescription.

[a]Estimates include prescription drug claims with a corresponding diagnosis for urinary tract infection (both males and females) and exclude drug claims for which there was insufficient data to produce reliable estimates. Including expenditures on these excluded medications would increase total outpatient drug spending for urinary tract infections by approximately 52%, to $146 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 27. Annual cost of female urinary tract infection, 1995

	Cost ($ millions)
Direct costs	
Medical expenses	
Clinic charges	385
Prescriptions	89
Nonmedical expenses	
Travel and childcare for visits	77
Output lost due to time spent for visits	108
Total direct costs	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 costs	936
Total costs	1,594

SOURCE: Reprinted from Annals of Epidemiology, 10, Foxman B, Barlow R, D'Arcy, H, Gillespie B, Sobel JD, Urinary tract infection: self-reported incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

that lead to an increase in urinary retention, which in turn provides a nidus for infection. In addition, there may be alterations in the overall immune status of diabetic patients that predispose them to UTI. Assuming a prevalence of diabetes in the 40- to 70-year-old general population of 12.9% (8), the observed UTI rate of approximately 26% (63,662 per 245,879 in 2000) in this population suggests a relationship between the two disorders. Other data from the National Health Interview Survey also support this observation (9). However, the role of diabetes in the risk of UTI development remains controversial, and additional research is needed to clarify the associations.

SUMMARY

Urinary tract infection remains one of the most common urologic diseases of women in the United States. The overall lifetime risk of developing a UTI is high (>50% of all adult women), and appropriate diagnosis and treatment are essential to quality care. This analysis has revealed several interesting trends. There appears to have been some decrease in the use of inpatient hospitalization for the treatment of UTI in younger women, although it is still a significant source of health care expenditures for elderly women with this diagnosis. There has been an overall trend toward increased use of outpatient care in a variety of settings for acute pyelonephritis and selected cases of complicated infections. Analysis of prescribing patterns reveals great reliance on fluoroquinolones over more traditional first-line antimicrobials. This could have a variety of significant impacts in terms of both cost and biology. Efforts to slow the development of drug-resistant pathogens will depend heavily on future prescribing patterns.

RECOMMENDATIONS

This analysis raises a number of 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 UTI in women, given the general observation that the

Table 28. Average annual work loss of persons treated for urinary tract infection (95% CI)

Condition	Number of Persons[a]	% Missing Work	Average Work Absence (hrs)		
			Inpatient	Outpatient	Total
Cystitis					
Males	116	18%	0.1 (0.0–0.4)	10.3 (0.0–24.5)	10.5 (0.0–24.7)
Females	426	16%	0.0	4.8 (3.0–6.6)	4.8 (3.0–6.6)
Pyelonephritis					
Males	71	21%	1.6 (0–4.7)	9.4 (2.6–16.2)	11.0 (3.6–18.4)
Females	79	24%	2.1 (0.0–4.2)	5.6 (2.0–9.1)	7.7 (3.7–11.7)
Other UTIs					
Males	779	15%	0.9 (0.0–2.6)	5.5 (3.7–7.3)	6.5 (4.0–8.9)
Females	1,846	17%	0.0	7.4 (5.5–9.3)	7.5 (5.6–9.3)
Orchitis	398	14%	1.5 (0.7–3.7)	6.1 (1.3–10.9)	7.6 (2.3–12.9)

[a]Individu
based on
SOURCE: MarketScan, 1999.

rates of infection are higher in the South than in other regions?

Economic research related to female UTI will also be important in the future. The costs of caring for women with UTI are high, and methods to reduce costs while maintaining high-quality care are needed. The role of innovative methods for prevention and treatment will be important. For example, self-start therapy, in which a woman keeps a supply of antimicrobials for use when she develops symptoms of a UTI, has been proposed for women with recurrent UTI. Additional studies will be needed to identify the clinical efficacy and cost-utility of this approach. Additional research is also needed on the debate over definitions of UTI vs pyuria, the role of empirical therapy, and the need for routine urine culture and susceptibility testing, given the current controversies in the field. In addition, issues related to access to care will need to be explored. There has been a sharp rise in ER visits for UTI, particularly among young women. The cause of this utilization pattern needs to be identified and addressed. Answers to these research questions and others will contribute to the continued improvement of health care for women with UTI.

Table 29. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary tract infection (95% CI)

	Inpatient Care		Outpatient Care	
Condition	Number of Hospitalizations[a]	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
Cystitis				
Males	*	*	157	7.6 (0.0–18.1)
Females	*	*	629	3.2 (2.2–4.3)
Pyelonephritis				
Males	*	*	87	7.7 (2.1–13.2)
Females	*	*	105	4.2 (2.0–6.4)
Other UTIs				
Males	*	*	1,047	4.1 (2.8–5.4)
Females	*	*	2,669	5.1 (3.9–6.4)
Orchitis	*	*	633	3.8 (1.2–6.5)

*Figure does not meet standard for reliability or precision.

[a]Uni

dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 30. Diabetes diagnosis as a comorbidity in adult females hospitalized for urinary tract infection, count (% of total), rate[a]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	223,256	232	235,055	234	243,584	238	245,879	235
Without diabetes as listed diagnosis	176,150 (79%)	183	179,391 (76%)	179	182,659 (75%)	179	182,217 (74%)	174
With diabetes as listed diagnosis	47,105 (21%)	49	55,663 (24%)	56	60,925 (25%)	60	63,662 (26%)	61

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

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CHAPTER 7

Urinary Tract Infection in Men

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Contents

Urinary Tract Infection in Men

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INTRODUCTION

Although urinary tract infections (UTI) occur in both men and women, clinical studies suggest that the overall prevalence of UTI is higher in women. Basic concepts related to the definition and diagnosis of UTI, associated risks of morbidity and mortality, and general treatment principles are reviewed in the introduction to the chapter on UTI in Women. This chapter addresses resource utilization, epidemiology, and costs of UTI in adult men.

CLINICAL PERSPECTIVE AND RISK FACTORS

Unlike the epidemiology of UTI in females, rates are much lower in young adults and rise dramatically in older men. Indeed, several potential risk factors for the development of UTI are unique to men. Bladder outlet obstruction due to benign prostatic hyperplasia (BPH) may be associated with urinary stasis. Even though a causal relationship has been difficult to prove, chronic prostatic obstruction is thought to increase the risk of UTI in older men with BPH. Instrumentation of the urinary tract may lead to iatrogenic UTI, either from cystoscopy or catheterization, both of which are common in the evaluation of men with obstructive voiding symptoms. UTI is an uncommon complication of transrectal prostate biopsy. Complications may range from acute prostatitis and cystitis to more complex infections, including pyelonephritis, osteomyelitis, and systemic urosepsis. The most common associated organisms are gastrointestinal flora, including anaerobes. Most clinicians utilize antimicrobial prophylaxis around the time of the procedure. Fluoroquinolones are particularly effective for this condition.

Bacterial prostatitis, which may be acute or chronic, is an uncommon clinical problem. Several forms of prostatitis are recognized in the National Institutes of Health (NIH) classification system (1). Acute bacterial prostatitis (Type I) is characterized by rapid onset of symptoms, including fever and associated constitutional signs and symptoms. Urine cultures are typically positive, and intravenous antimicrobial therapy is often indicated. In contrast, chronic bacterial prostatitis (Type II) tends to be less pronounced in onset, with patients remaining asymptomatic between recurrent episodes. Recurrent cystitis is common. This is most likely due to persistence of pathogenic organisms in the prostatic secretory system. Coliform bacterial species, particularly *Enterococcus fecalis* and *Escherichia coli*, are the most common organisms in cases of chronic bacterial prostatitis. Nonbacterial prostatitis (Type III), also known as chronic pelvic pain syndrome, is a condition characterized by chronic pelvic pain that is attributed to the prostate. Patients may also complain of obstructive and irritative urinary symptoms, sexual dysfunction, and penile, testicular, or groin pain. Chronic pelvic pain syndrome may be associated with increased concentrations of inflammatory cells in prostatic secretions, despite the absence of documentable bacterial infection.

The pathogenesis of prostatitis may be multifactorial. Reflux of infected urine into the prostatic ducts in the posterior urethra occurs in some patients, while ascending urethral infection plays a role in others. Hematogenous and lymphatic spread have also been hypothesized as possible causes. Reflux of noninfected urine may be associated with cases of nonbacterial prostatitis. It is hypothesized that this intraprostatic reflux of urine may lead to histochemical inflammatory changes in the absence of bacteria.

Prostatic abscess is a localized infection in the prostate. Patients at increased risk for development of prostatic abscesses include diabetics and men who are immunocompromised. Urethral instrumentation and chronic indwelling catheters may also increase risk. Historically, prostatic abscesses were caused by *Neisseria gonorrhea*. Today, however, most cases are associated with coliform organisms, *Pseudomonas spp*., and anaerobic organisms.

Urethritis and epididymitis are generally painful conditions caused by bacterial infection of the urethra and epididymis, respectively. Both disorders may be acute or chronic. These are considered separately in the chapter on sexually transmitted diseases (STDs).

Orchitis is often associated with bacterial epididymitis. Isolated bacterial orchitis is less common. Mumps orchitis represents a specific form of the disease; it occurs in about 30% of mumps cases in postpubertal boys. The acute inflammation that occurs in these cases may lead to testicular atrophy and subsequent infertility. Other forms of orchitis include tuberculous orchitis, gangrenous orchitis, and testicular inflammation associated with infected hydroceles. In older men, most orchitis is probably related to bacterial UTI; however, in younger men, it usually represents a complication of sexually transmitted urethritis. These differences explain some of the demographic differences in hospitalization rates for orchitis noted later in this chapter. Orchitis is also addressed in the chapters on STDs and pediatric UTIs.

Scrotal infections may involve only the scrotal skin or may also include deeper structures. Fournier's gangrene is a severe form of scrotal infection associated with necrotizing fasciitis. Predisposing risk factors include diabetes, immunosuppression, poor perineal hygiene, and perirectal or perianal infections. Cultures typically yield mixed flora with both aerobic and anaerobic species. The risk of mortality with Fournier's gangrene is high because the infection can spread quickly along the layers of the abdominal wall that are contiguous with the scrotum. Aggressive surgical debridement and intravenous antimicrobial therapy are indicated.

DEFINITIONS

Clinical

The clinical definitions of general UTI, including bacteriuria, cystitis, and pyelonephritis, are reviewed in the introduction to the chapter on UTI in women. As described above, male anatomic structures that may be involved with infectious processes include the prostate, testis, scrotum, and epididymis.

Analytic

Analyses presented in this chapter used ICD-9 diagnostic codes for UTI (Table 1). These codes are based primarily on the site and type of infection involved.

PREVALENCE AND INCIDENCE

Approximately 20% of all UTIs occur in men. Between 1988 and 1994, the overall lifetime prevalence of UTI in men was estimated to be 13,689 cases per 100,000 adult men, based on the National Health and Nutrition Examination Survey (NHANES-III) (Tables 2 and 3). In comparison, the estimate for women was 53,067 cases per 100,000 adult women during the same time period (Chapter 6, Table 2).

Data from US Veterans Health Administration (VA) facilities supports the higher prevalence of UTI in women compared to men (Chapter 6, Figure 1 and Table 4). Between 1999 and 2001, the overall prevalence of UTI as a primary diagnosis in veterans seeking outpatient care was 2.3 to 2.48 times greater in women than it was in men. Rates of orchitis were generally higher than either cystitis or pyelonephritis when considered as either the primary or any diagnosis. Rates of UTI increased with age in this cohort and were higher in African American men than in other racial/ethnic groups (Table 4). The VA data show that overall rates of outpatient visits associated with a primary diagnosis of UTI among

Table 1. Codes used in the diagnosis and management of male urinary tract infection

Males 18 years or older with one of the following ICD-9 codes:

Orchitis	
016.5	Tuberculosis of other male genital organs
072.0	Mumps orchitis
603.1	Infected hydrocele
604.0	Orchitis epididymitis and epididymo-orchitis with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess
604.90	Orchitis and epididymitis, unspecified
604.99	Other orichitis epididymitis and epididymo-orchitis without abscess
608.4	Other in ammatory disorders of male genital organs
608.0	Seminal vesiculitis
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.0	Acute cystitis
595.1	Chronic interstitial cystitis
595.2	Other chronic cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.9	Cystitis, unspecified
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of renal medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Other	
597.8	Other urethritis
599.0	Urinary tract infection site not specified
607.2	Other in ammatory disorders of penis
607.1	Balanoposthitis

Table 2. Male lifetime prevalence of urinary tract infections, by socio-demographic group, count, rate[a]

	Count	Rate
Total count[b]	11,892,613	13,689
1–2 Bladder infections ever	8,983,769	10,341
3+ Bladder infections ever	2,908,845	3,348
Mean number of infections in the last 12 months of those ever having UTI	0.26	
Race/ethnicity		
White non-Hispanic	9,864,439	14,458
Black non-Hispanic	932,376	10,326
Hispanic	909,324	13,229
Other	186,474	6,782
Region		
Midwest	3,327,654	15,899
Northeast	2,379,704	13,285
South	4,319,184	14,625
West	1,866,072	10,085
Urban/rural		
MSA	5,585,151	8,688
Non-MSA	6,307,463	27,919

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]The data in this table are 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?”

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 3. Male incidence of UTI in past 12 months, by socio-demographic group, count, rate[a]

	Count	Rate
Total count[b]	2,013,448	2,318
1 or more bladder infections in the last 12 months	2,013,448	2,318
Mean number of infections in the last 12 months	1.5	0
Age		
18–24	111,205	920
25–34	374,050	1,789
35–44	251,245	1,336
45–54	302,969	2,419
55–64	239,659	2,394
65–74	432,123	5,303
75–84	242,354	6,693
85+	59,842	7,754
Race/ethnicity		
White non-Hispanic	1,505,602	2,207
Black non-Hispanic	209,061	2,315
Hispanic	180,689	2,629
Other	118,096	4,295
Region		
Midwest	495,025	2,365
Northeast	334,275	1,866
South	846,422	2,866
West	337,725	1,825
Urban/rural		
MSA	837,678	1,303
Non-MSA	1,175,769	5,204

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]The data in this table are 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?”

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988-1994.

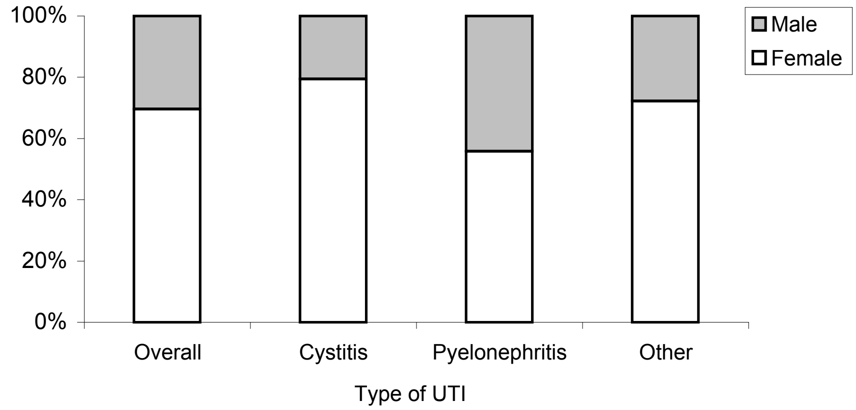

Figure 1. Percent contribution of males and females to types of urinary tract infections, 1999–2001.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY 1999–2001.

adult male veterans dropped steadily between 1999 and 2001; this trend was most pronounced for older men and occurred across all racial/ethnic groups and geographic regions.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Antimicrobial therapy is the primary mode of treatment for most patients with UTI. Antimicrobial selection is tailored on the basis of culture and susceptibility data following the initiation of empiric therapy. Selection of antimicrobials is guided by the severity and location of the individual infection and by consideration of regional and local epidemiological data on bacterial resistance.

Health care providers treat patients with UTI in a variety of clinical settings. This section examines trends in treatment patterns for male UTI at different sites of service.

Inpatient Care

Inpatient care with administration of intravenous antimicrobials may be required to treat men with severe UTI. Increased patient age appears to be associated with an increased rate of inpatient treatment for UTI in men. Data from the Centers for Medicare and Medicaid Services (CMS) from 1992 to 1998 reveal that across all years of study, the rates of inpatient care for men 65 years of age and older are approximately 1.7 times those of men younger than 65 (Table 5). The younger group comprises primarily those who qualified for Medicare because of disability or end-stage renal disease. The risk appears to increase significantly with age; rates more than double in men aged 85 and older. For example, the rate of inpatient care in 1992 for men 85 to 94 years of age was 1,678 per 100,000 (95% CI, 1649–1706) compared with 777 per 100,000 (95% CI, 768–786) for men aged 75 to 84, and 308 per 100,000 (95% CI, 304–312) for men 65 to 74. This trend was similar in 1995 and 1998. Increased use of inpatient care may be associated with more severe infections in older men due to increased comorbidity and changes in immune response associated with increased age. In the time period covered by the Medicare data, rates of inpatient hospitalization for male UTI care were about 1.5 times higher in African Americans than in Caucasians or Hispanics (counts in Asians and North American Natives were too low to produce reliable estimates of rates). The rate of inpatient utilization was somewhat higher in the South than in other regions.

Data for 1994 to 2000 from the Healthcare Cost and Utilization Project (HCUP) reveal that the rates of inpatient hospital care for men with a primary diagnosis of UTI at any anatomic location have been relatively stable for young and middle-aged men (18 to 64 years) and for men between ages 65 and 74 (Table 6). In contrast, the rates of hospitalization for men in the 75- to 84-year age group have slowly declined,

Table 4. Frequency of urinary tract infection[a] as a diagnosis in male VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	2,082	2,705	1,963	2,591	1,719	2,334
Age						
18–24	1,351	1,475	1,429	1,620	1,586	1,731
25–34	1,524	1,803	1,545	1,796	1,415	1,673
35–44	1,663	2,022	1,634	1,995	1,492	1,867
45–54	1,725	2,179	1,707	2,184	1,538	2,017
55–64	2,013	2,623	1,894	2,499	1,695	2,267
65–74	2,172	2,901	1,986	2,698	1,654	2,308
75–84	2,695	3,581	2,361	3,211	1,979	2,786
85+	3,983	5,317	3,540	4,733	2,975	4,321
Race/ethnicity						
White	2,553	3,311	2,411	3,167	2,139	2,881
Black	3,313	4,287	3,172	4,077	2,912	3,841
Hispanic	3,111	4,118	2,935	3,989	2,888	4,052
Other	2,088	2,642	1,763	2,351	1,764	2,338
Unknown	1,101	1,438	1,058	1,430	925	1,295
Region						
Midwest	1,989	2,606	1,892	2,503	1,578	2,132
Northeast	1,784	2,304	1,646	2,128	1,449	1,910
South	2,349	3,104	2,188	2,966	1,918	2,681
West	2,103	2,640	2,043	2,608	1,861	2,471
Insurance status						
No insurance/self-pay	1,994	2,552	1,929	2,486	1,716	2,271
Medicare/Medicare supplemental	2,560	3,412	2,254	3,087	1,928	2,702
Medicaid	2,455	2,972	2,188	2,846	2,287	2,998
Private insurance/HMO/PPO	1,700	2,234	1,534	2,036	1,280	1,760
Other insurance	1,830	2,338	1,868	2,361	1,519	2,039
Unknown	5,540	7,405	4,692	5,768	1,168	1,550

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for male UTIs (including cystitis, pyelonephritis, orchitis, and other UTIs).

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 5. Inpatient stays by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	74,320	505 (501–508)	72,820	478 (475–482)	70,480	487 (483–490)
Total < 65	9,960	322 (316–329)	10,940	318 (312–323)	10,840	315 (310–321)
Total 65+	64,360	553 (549–557)	61,880	526 (521–530)	59,640	540 (536–544)
Age						
65–74	22,300	308 (304–312)	19,980	278 (274–282)	17,320	269 (265–274)
75–84	27,440	777 (768–786)	26,180	716 (707–724)	26,180	715 (706–724)
85–94	13,260	1,678 (1,649–1,706)	14,560	1,716 (1,689–1,744)	14,760	1,705 (1,678–1,732)
95+	1,360	1,752 (1,659–1,844)	1,160	1,415 (1,334–1,495)	1,380	1,579 (1,496–1,661)
Race/ethnicity						
White	60,820	490 (486–494)	59,680	459 (455–463)	57,180	468 (464–471)
Black	9,780	768 (752–783)	10,100	729 (715–744)	9,800	734 (720–749)
Asian	…	…	180	247 (211–283)	380	277 (249–305)
Hispanic	…	…	1,000	504 (472–535)	1,560	465 (442–488)
N. American Native	…	…	140	696 (582–810)	340	1,216 (1,087–1,345)
Region						
Midwest	18,200	491 (484–498)	18,720	486 (479–493)	18,480	500 (493–507)
Northeast	15,460	488 (480–495)	13,900	437 (430–444)	13,820	497 (489–506)
South	31,620	604 (597–610)	30,720	560 (554–566)	28,500	531 (525–537)
West	8,260	368 (360–376)	8,340	360 (352–367)	8,260	369 (361–377)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

while the rates for men over 85 have gradually increased over time. The rates of inpatient care increase steadily with age, more than doubling with each decade beyond age 55. In this analysis, Asian men had the lowest rates of inpatient hospitalization for UTI care, followed by Hispanics and Caucasians. African American men had the highest rates of inpatient utilization. When analyzed by region, the lowest rates of inpatient care were seen in the West, while rates were similar in other geographic regions. Rates of inpatient care were similar in urban and rural settings. It is unclear why estimated inpatient utilization rates are lower in HCUP data than in CMS data.

Data from HCUP also reveal that approximately 10% of all inpatient care for UTI in men is for the treatment of orchitis (Table 7). Between 1994 and 2000, the overall rate of inpatient care for the treatment of orchitis was relatively stable, ranging from 12 to 14 per 100,000 population. Rates appear to rise gradually with age, the most significant increases occurring between 65 and 85 years of age. Inpatient utilization rates for elderly men decreased somewhat in 2000 compared to prior years. African American men had the highest rates of inpatient utilization for treatment of orchitis, and Asian men had the lowest rates. Inpatient utilization rates were slightly lower in the West than in other regions, and there was no significant difference between rates in urban and rural locations. The mean length of stay for inpatient hospitalizations in men with a primary diagnosis of UTI decreased from 6.5 days in 1994 to

Table 6. Inpat a (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	115,258	131 (126–135)	111,680	121 (117–126)	118,193	125 (121–130)	121,367	126 (122–130)
Age								
18–24	2,475	20 (18–23)	2,129	17 (15–20)	2,139	17 (15–19)	1,983	15 (13–17)
25–34	6,670	33 (31–36)	6,124	31 (28–33)	5,344	28 (26–30)	5,045	28 (25–30)
35–44	8,525	43 (40–46)	9,114	43 (40–46)	8,956	41 (39–43)	8,764	40 (38–42)
45–54	9,830	70 (66–74)	9,748	63 (59–67)	10,324	62 (59–66)	11,165	63 (59–66)
55–64	12,394	129 (121–137)	11,840	119 (112–126)	13,327	126 (119–133)	13,360	120 (113–126)
65–74	25,188	320 (304–336)	23,215	284 (269–299)	24,256	301 (286–317)	24,374	303 (289–318)
75–84	32,866	867 (828–905)	32,246	765 (729–800)	33,885	747 (717–777)	35,667	738 (709–767)
85+	17,309	1,931 (1,830–2,031)	17,265	1,996 (1,890–2,101)	19,962	2,025 (1,932–2,119)	21,010	2,054 (1,968–2,140)
Race/ethnicity								
White	68,442	101 (97–105)	68,319	98 (94–102)	68,032	97 (93–101)	68,899	97 (93–100)
Black	13,583	147 (136–158)	13,334	138 (128–148)	12,935	130 (121–139)	12,488	122 (113–131)
Asian/Pacific Islander	813	33 (26–40)	919	29 (24–34)	1,153	34 (29–39)	1,629	46 (40–52)
Hispanic	5,699	69 (61–78)	6,067	67 (58–77)	6,947	69 (61–77)	7,982	77 (71–83)
Region								
Midwest	25,498	122 (112–132)	25,542	119 (111–126)	26,933	124 (114–133)	26,666	119 (111–127)
Northeast	24,955	138 (128–148)	23,501	130 (119–141)	23,233	128 (119–137)	24,625	136 (127–145)
South	47,476	160 (151–168)	44,858	141 (133–149)	48,656	147 (140–154)	49,021	144 (137–151)
West	17,329	88 (80–97)	17,779	87 (79–94)	19,371	91 (82–100)	21,055	98 (90–105)
MSA								
Rural	26,408	118 (109–127)	26,148	126 (117–135)	25,469	121 (113–129)	26,675	125 (117–133)
Urban	88,714	135 (129–140)	85,413	120 (115–125)	92,416	126 (121–131)	94,578	126 (122–131)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000
categories of US male adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 7. Inpatient hospital stays by adult males with orchitis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	12,322	14 (13–15)	11,363	12 (12–13)	11,941	13 (12–13)	12,174	13 (12–13)
Age								
18–24	614	5.0 (4.0–6.1)	454	3.7 (2.8–4.6)	584	4.7 (3.8–5.6)	532	4.1 (3.2–4.9)
25–34	2,058	10 (9.0–11)	1,548	7.8 (6.7–8.8)	1,428	7.4 (6.4–8.4)	1,312	7.2 (6.2–8.2)
35–44	2,207	11 (10–12)	2,390	11 (10–13)	2,481	11 (10–13)	2,469	11 (10–12)
45–54	1,848	13 (11–15)	1,928	12 (11–14)	2,100	13 (11–14)	2,446	14 (12–15)
55–64	1,610	17 (14–19)	1,431	14 (13–16)	1,710	16 (14–18)	1,786	16 (14–18)
65–74	1,964	25 (22–28)	1,896	23 (21–26)	1,674	21 (18–23)	1,865	23 (20–26)
75–84	1,570	41 (36–47)	1,305	31 (27–35)	1,509	33 (29–38)	1,384	29 (25–33)
85+	451	50 (37–64)	411	47 (36–59)	454	46 (36–57)	379	37 (28–46)
Race/ethnicity								
White	6,545	10 (8.9–10)	6,333	9.1 (8.5–9.8)	6,437	9.2 (8.5–9.8)	6,216	8.7 (8.0–9.4)
Black	1,896	21 (18–23)	1,647	17 (15–20)	1,571	16 (14–18)	1,613	16 (14–18)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	773	9.4 (7.1–12)	788	8.7 (7.3–10)	910	9.0 (7.0–11)	1,241	12 (10–14)
Region								
Midwest	2,720	13 (12–15)	2,874	13 (12–15)	2,752	13 (11–14)	2,650	12 (10–13)
Northeast	3,297	18 (16–20)	2,714	15 (13–17)	2,536	14 (12–16)	2,543	14 (12–16)
South	4,456	15 (13–17)	4,226	13 (12–14)	4,796	14 (13–16)	4,920	14 (13–16)
West	1,850	9.4 (8.1–11)	1,549	7.6 (6.5–8.6)	1,858	8.7 (7.1–10)	2,061	10 (8.1–11)
MSA								
Rural	2,686	12 (10–14)	2,527	12 (11–14)	2,551	12 (11–14)	2,397	11 (10–13)
Urban	9,589	15 (14–16)	8,829	12 (12–13)	9,340	13 (12–14)	9,759	13 (12–14)

*Figure does not meet standard of reliability or precision.
MSA, metropolitan statistical area.
[a]Rate per 100,000 based on 1994, 1996,
demographic categories of US male adult civilian non-institutionalized population.
[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.
NOTE: Counts may not sum to totals due to rounding.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 8. Trends in mean inpatient length of stay (days) for adult males hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	6.5	5.4	5.1	5.1
Age				
18–24	4.4	3.9	3.6	3.4
25–34	4.9	4.2	4.0	4.2
35–44	5.2	4.6	4.1	4.4
45–54	5.4	4.8	4.5	4.8
55–64	5.9	4.9	4.8	4.8
65–74	6.3	5.3	5.0	5.1
75–84	7.2	6.0	5.5	5.4
85+	7.8	6.3	5.8	5.6
Race/ethnicity				
White	6.3	5.4	5.0	5.1
Black	7.5	6.3	5.9	5.7
Asian/Pacific Islander	7.1	5.5	5.6	5.4
Hispanic	6.1	5.3	5.2	5.0
Other	5.9	6.5	4.7	5.4
Region				
Midwest	6.0	5.1	4.9	4.8
Northeast	8.2	7.0	5.9	5.7
South	6.0	5.1	4.9	5.2
West	5.9	4.8	4.6	4.5
MSA				
Rural	5.7	5.0	4.6	4.6
Urban	6.7	5.6	5.2	5.2

MSA, metropolitan statistical area.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

5.1 days in 2000 (Table 8). Consistent with the general trend toward decreased use of inpatient care, this observation in men with UTI was noted across all age groups and geographic regions, and in both rural and urban hospitals.

Outpatient Care

Outpatient care for UTI in men is administered in a variety of clinical settings, including hospital outpatient clinics, physician offices, ambulatory surgery centers, and emergency rooms. Each of these settings was analyzed separately.

Hospital Care

Data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) from 1994 to 2000 reveal that hospital outpatient visits by men with UTI listed as any of the reasons for the visit have been variable (Table 9), ranging from 91 to 175 per 100,000. When UTI was listed as the primary reason for the hospital patient visit, the rates increased from 80 per 100,000 (95% CI, 33–127) in 1996 to 136 per 100,000 (95% CI, 80–193) in 1998. The rate in 2000 dropped slightly, to 124 per 100,000 (95% CI, 62–186). These data suggest that there has been a general trend toward increased outpatient care for UTI in men. This complements the observed decreases in inpatient care noted above.

Table 9. National hospital outpatient visits by adult males with urinary tract infection, count, rate[a] (95% CI)

	Primary Reason		Any Reason	
	Count	Rate	Count	Rate
1994	73,571	83 (44–122)	154,900	175 (92–259)
1996	73,508	80 (33–127)	83,579	91 (44–138)
1998	128,629	136 (80–193)	163,573	173 (110–237)
2000	119,557	124 (62–186)	152,422	159 (91–226)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.
SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Hospital outpatient visit data from CMS reveal a similar increase in utilization during the past decade (Table 10). Among Medicare beneficiaries at least 65 years old, rates of hospital outpatient visits for men with UTI rose from 191 per 100,000 (95% CI, 189–194) in 1992 to 301 per 100,000 (95% CI, 298–304) in 1995, and 362 per 100,000 (95% CI, 358–365) in 1998. The most dramatic increases were observed in the oldest elderly men. In those 95 years of age and older, the rates of hospital outpatient visits more than doubled between 1992 and 1995 and doubled again between 1995 and 1998. Rates of hospital outpatient visits for UTI care in men were highest in the Midwest and South, and the rates in both regions have increased over time. In the years for which complete data regarding racial/ethnic differences in outpatient hospital utilization were available (1995 and 1998), Hispanic men had the highest rates of utilization, followed by African American men. In 1998, the rates for Hispanic men were 1.23 and 1.80 times higher than those for African Americans and Caucasians, respectively (counts in Asians were too low to

Table 10. Outpatient hospital visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	28,580	194 (192–196)	46,020	302 (300–305)	51,720	357 (354–360)
Total < 65	6,300	204 (199–209)	10,560	307 (301–312)	11,760	342 (336–348)
Total 65+	22,280	191 (189–194)	35,460	301 (298–304)	39,960	362 (358–365)
Age						
65–74	10,080	139 (137–142)	14,920	208 (204–211)	16,920	263 (259–267)
75–84	9,340	264 (259–270)	14,020	383 (377–390)	15,800	432 (425–438)
85–94	2,700	342 (329–355)	6,160	726 (708–744)	6,460	746 (728–764)
95+	160	206 (174–238)	360	439 (394–484)	780	892 (830–954)
Race/ethnicity						
White	18,540	149 (147–152)	33,160	255 (252–258)	40,560	332 (328–335)
Black	6,280	493 (481–505)	9,060	654 (641–668)	6,460	484 (472–496)
Asian	…	…	160	220 (185–254)	480	350 (319–381)
Hispanic	…	…	1,520	766 (727–804)	2,000	596 (570–622)
N. American Native	…	…	580	2,883 (2,649–3,116)	700	2,504 (2,321–2,686)
Region						
Midwest	8,460	228 (223–233)	12,780	332 (326–337)	15,160	410 (403–416)
Northeast	6,860	216 (211–221)	6,780	213 (208–218)	7,680	276 (270–283)
South	8,400	160 (157–164)	19,580	357 (352–362)	21,440	399 (394–405)
West	3,960	176 (171–182)	6,240	269 (262–276)	7,240	324 (316–331)

…data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

produce reliable estimates of rates). The reason for this observed difference is unclear.

Physician Offices

The majority of UTIs in both men and women are treated in physicians' offices. According to data from the National Ambulatory Medical Care Survey (NAMCS), more than 1,896,000 physician office visits that included a diagnosis of UTI were made in 2000 by men in the United States (Table 11). Of these visits, more than 1,290,000 were for a primary diagnosis of UTI. Fluctuations in rates of utilization have been observed over time, with peaks occurring in 1992 and 1996. In these years, the observed rates of physician office visits for UTI in men aged 55 and older were significantly higher than those for younger men. This likely reflects the higher incidence and prevalence of UTI in older men. The reasons for the dramatic increases in 1992 and 1996 are unclear but may be related to coding anomalies.

Medicare data for outpatient physician office visits for men with UTI indicate that rates of utilization remained relatively stable throughout the 1990s (Table 12). Rates were consistently highest in men in the 85- to 94-year age group, followed by those aged 75 to 84 (Figure 2). Rates in the most elderly cohort (95 and older) were similar to the overall mean. Regional variations in Medicare physician outpatient visits for men with UTI appear to have diminished over time and were least pronounced in 1998. As in the NHAMCS data, Hispanic men had the highest rates of physician office utilization among the racial/

Table 11. National physician office visits by adult males with urinary tract infection, count, rate[a] (95% CI)

	1992		1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
					Primary Reason for Visit					
Total	1,992,546	2,268 (1,598–2,938)	1,111,037	1,259 (889–1,629)	2,163,849	2,353 (1,601–3,105)	1,664,141	1,765 (1,060–2,470)	1,290,406	1,342 (854–1,830)
Age										
18–54	1,067,943	1,642 (964–2,320)	682,612	1,033 (652–1,414)	1,147,995	1,669 (913–2,425)	845,264	1,205 (582–1,828)	819,947	1,153 (568–1,738)
55+	924,603	4,050 (2,340–5,760)	428,425	1,932 (993–2,872)	1,015,854	4,379 (2,412–6,346)	*	*	470,459	1,879 (1,013–2,745)
					Any Reason for Visit					
Total	2,372,185	2,700 (1,997–3,402)	1,594,515	1,807 (1,368–2,245)	2,652,548	2,884 (2,093–3,675)	2,105,332	2,232 (1,447–3,018)	1,896,810	1,973 (1,377–2,568)
Age										
18–54	1,203,792	1,851 (1,149–2,553)	831,728	1,258 (843–1,674)	1,243,005	1,807 (1,041–2,574)	971,180	1,384 (731–2,038)	1,153,805	1,623 (915–2,330)
55+	1,168,393	5,118 (3,297–6,939)	762,787	3,441 (2,209–4,673)	1,409,543	6,076 (3,910–8,241)	*	*	743,005	2,967 (1,876–4,058)

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1992, 1994, 1996, 199[illegible] -
graphic categories of US male adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey — Outpatient, 1992, 1994, 1996, 1998, 2000.

Table 12. Physician office visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	524,880	3,564 (3,555–3,574)	540,200	3,549 (3,540–3,559)	498,620	3,444 (3,435–3,453)
Total < 65	62,880	2,035 (2,019–2,051)	75,040	2,178 (2,163–2,193)	71,420	2,078 (2,063–2,093)
Total 65+	462,000	3,970 (3,959–3,981)	465,160	3,951 (3,939–3,962)	427,200	3,869 (3,858–3,880)
Age						
65–74	231,780	3,202 (3,190–3,215)	231,720	3,224 (3,211–3,237)	197,840	3,078 (3,065–3,092)
75–84	177,880	5,037 (5,014–5,060)	180,140	4,925 (4,903–4,947)	173,720	4,744 (4,723–4,766)
85–94	49,700	6,289 (6,235–6,342)	50,300	5,929 (5,879–5,980)	52,980	6,119 (6,069–6,170)
95+	2,640	3,400 (3,273–3,528)	3,000	3,659 (3,530–3,787)	2,660	3,043 (2,928–3,157)
Race/ethnicity						
White	446,400	3,599 (3,589–3,610)	464,380	3,572 (3,562–3,582)	425,500	3,480 (3,469–3,490)
Black	47,140	3,700 (3,667–3,733)	48,560	3,507 (3,476–3,538)	40,760	3,054 (3,025–3,083)
Asian	…	…	2,400	3,293 (3,164–3,422)	4,700	3,427 (3,331–3,523)
Hispanic	…	…	9,740	4,906 (4,811–5,001)	14,980	4,463 (4,393–4,533)
N. American Native	…	…	520	2,584 (2,366–2,803)	440	1,574 (1,427–1,720)
Region						
Midwest	126,780	3,418 (3,399–3,436)	125,900	3,266 (3,248–3,284)	113,680	3,074 (3,056–3,092)
Northeast	86,280	2,721 (2,703–2,739)	93,300	2,934 (2,915–2,952)	83,440	3,002 (2,982–3,022)
South	223,640	4,270 (4,252–4,287)	220,600	4,021 (4,005–4,038)	210,400	3,920 (3,904–3,937)
West	76,500	3,405 (3,381–3,429)	83,260	3,590 (3,567–3,614)	76,820	3,435 (3,411–3,459)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

ethnic groups analyzed.

Ambulatory Surgery

Visits to ambulatory surgery centers represent a small percentage of Medicare visits for men with UTI (Table 13). Among Medicare beneficiaries at least 65 years old, rates ranged from 83 per 100,000 in 1992 (95% CI, 82–85) to 93 per 100,000 in 1995 (95% CI, 92–95) and 95 per 100,000 in 1998 (95% CI, 93–97). Rates were lower and more stable among younger Medicare beneficiaries who qualified because of disability or end-stage renal disease. As with Medicare physician office visits, the highest rates were observed in men 75 to 94 years of age. Rates were highest in the Midwest and Northeast and lowest in the South and West. The reasons for these geographic differences are unclear. No clear racial/ethnic differences were observed in this analysis. The low rates of utilization for ambulatory surgery centers indicate that this is not a primary site of service for men with UTI. The cases identified likely represent perioperative UTI in men scheduled for outpatient surgery.

Emergency Room

Patients with UTI may present to an emergency room (ER) for initial evaluation and management. Data from NHAMCS indicate approximately 424,700 ER visits by men with a primary diagnosis of UTI in 2000 (Table 14). The overall rate of utilization in 2000 was 442 per 100,000, which is similar to the rate of 420 per 100,000 observed in 1994. Lower rates of ER utilization in this population were observed

Table 13. Visits to ambulatory surgery centers by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	11,120	76 (74–77)	12,860	84 (83–86)	12,200	84 (83–86)
Total < 65	1,420	46 (44–48)	1,860	54 (52–56)	1,720	50 (48–52)
Total 65+	9,700	83 (82–85)	11,000	93 (92–95)	10,480	95 (93–97)
Age						
65–74	5,400	75 (73–77)	5,880	82 (80–84)	4,940	77 (75–79)
75–84	3,500	99 (96–102)	4,200	115 (111–118)	4,460	122 (118–125)
85–94	780	99 (92–106)	860	101 (95–108)	1,040	120 (113–127)
95+	20	26 (14–37)	60	73 (55–91)	40	46 (32–59)
Race/ethnicity						
White	9,680	78 (76–80)	11,280	87 (85–88)	10,820	88 (87–90)
Black	780	61 (57–66)	1,100	79 (75–84)	940	70 (66–75)
Asian	…	…	100	137 (110–165)	20	15 (8.0–21)
Hispanic	…	…	100	50 (40–60)	240	72 (63–80)
N. American Native	…	…	…	…	20	72 (39–104)
Region						
Midwest	3,420	92 (89–95)	3,960	103 (100–106)	3,880	105 (102–108)
Northeast	2,940	93 (89–96)	3,000	94 (91–98)	3,000	108 (104–112)
South	3,840	73 (71–76)	4,540	83 (80–85)	3,960	74 (71–76)
West	880	39 (37–42)	1,240	53 (50–56)	1,260	56 (53–59)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

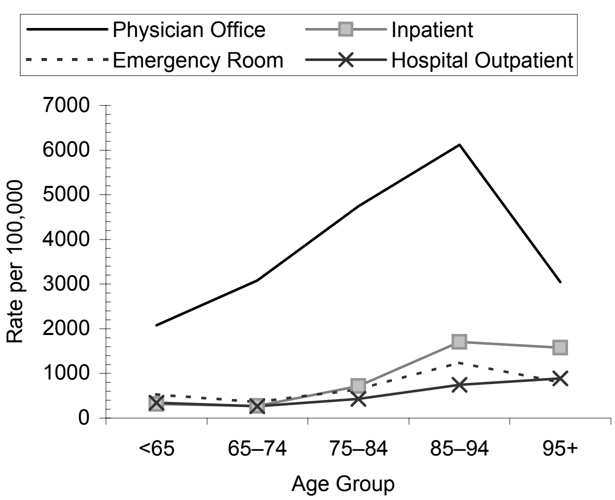

Figure 2. Trends in visits by males with urinary tract infection listed as primary diagnosis by patient age and site of service, 1998.

SOURCE: Centers for Medicare and Medicaid Services, 1998.

Table 14. National emergency room visits by adult males with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	Count	Rate
1994	370,637	420 (320–520)
1996	296,377	322 (232–412)
1998	322,937	342 (245–440)
2000	424,705	442 (325–559)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.

Table 15. Emergency room visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	74,500	506 (502–510)	78,220	514 (510–518)	76,280	527 (523–531)
Total < 65	15,100	489 (481–496)	17,680	513 (506–521)	18,320	533 (525–541)
Total 65+	59,400	510 (506–515)	60,540	514 (510–518)	57,960	525 (521–529)
Age						
65–74	26,440	365 (361–370)	24,200	337 (333–341)	23,000	358 (353–362)
75–84	22,960	650 (642–659)	25,040	685 (676–693)	23,540	643 (635–651)
85–94	9,140	1,156 (1,133–1,180)	10,360	1,221 (1,198–1,245)	10,720	1,238 (1,215–1,262)
95+	860	1,108 (1,034–1,181)	940	1,146 (1,073–1,220)	700	801 (741–860)
Race/ethnicity						
White	58,080	468 (464–472)	60,220	463 (460–467)	58,820	481 (477–485)
Black	12,200	958 (941–974)	14,820	1,070 (1,053–1,087)	13,040	977 (960–994)
Asian	…	…	140	192 (161–224)	300	219 (194–244)
Hispanic	…	…	1,300	655 (620–690)	2,240	667 (640–695)
N. American Native	…	…	120	596 (492–701)	300	1,073 (951–1,195)
Region						
Midwest	17,820	480 (473–487)	18,140	471 (464–477)	19,600	530 (523–537)
Northeast	12,720	401 (394–408)	13,660	430 (422–437)	12,140	437 (429–445)
South	33,080	632 (625–638)	36,740	670 (663–677)	34,240	638 (631–645)
West	9,680	431 (422–439)	8,500	367 (359–374)	8,980	402 (393–410)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

in 1996 and 1998. The rates of ER utilization by male Medicare beneficiaries were somewhat higher, ranging from 506 per 100,000 (95% CI, 502–510) in 1992 to 527 per 100,000 (95% CI, 523–531) in 1998 (Table 15). In this analysis, utilization rates were consistently highest in the next-to-oldest cohort (85 to 94 years of age), followed closely by the oldest men (those 95 and older). Rates of ER utilization by older men were nearly twice those of men younger than 85 years of age. This may represent increased severity of infection in elderly men prompting evaluation in the ER. Rates of ER utilization in this cohort were consistently highest in the South. Again, the reason for the geographic variation is unclear. African American men had rates of ER utilization twice as high as those of Caucasians in this analysis (Figure 3). The lowest rates were observed in Asian men.

Nursing Homes

Information regarding UTI in men living in nursing home facilities was obtained from the National Nursing Home Survey of 1995, 1997, and 1999 (Tables 16–18). The overall rates for men with either an admitting or current diagnosis of UTI in this sample appear stable over time, ranging from 5,642 per 100,000 in 1997 (95% CI, 4,641–6,642) to 5,803 per 100,000 in 1995 (95% CI, 4,794–6,812). It is interesting to note that the rates of UTI for men living in nursing homes are closer to those for women than are the rates for the community-dwelling cohorts, as discussed in the chapter on UTI in Women (see Chapter 6 , Tables 21–23). No clear trends were observed over time with regard to age in male nursing home residents. In all years studied, about half of male nursing home residents required special assistance using the toilet,

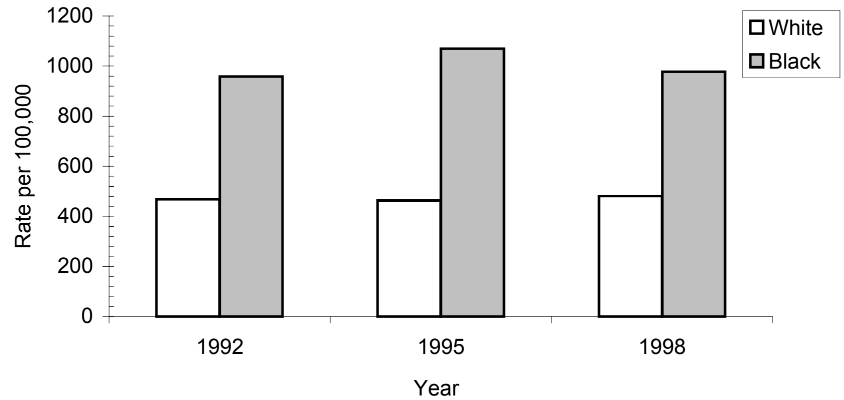

Figure 3. Rate of emergency room visits for males with urinary tract infection listed as primary diagnosis by patient race and year.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

regardless of whether they had a UTI (Table 18). In 1997, only 39% of men with UTI required special assistance using the toilet, but this survey item was skipped at a much higher rate that year, making its results difficult to interpret (Table 17). Men with UTI had higher rates of incontinence than did the general cohort of male nursing home residents. It is not clear whether UTI or urinary incontinence is the causal factor.

The rates of indwelling catheter and ostomy use in male nursing home residents have remained stable at 11.9% in 1995 and 11.3% in 1999 (Table 18). This is of concern because of the well-established association between indwelling catheter use and urinary tract colonization and infection. Although these rates of catheter and ostomy use are not dramatic, they are higher than the 7.9 to 9.1% range observed in female nursing home residents. (see Chapter 6, Table 23).

ECONOMIC IMPACT

Direct Costs

Urinary tract infections in men are associated with a significant economic cost. Adjusted mean

Table 16. Male nursing home residents with an admitting or current diagnosis of urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total[b]	24,404	5,803 (4,794–6,812)	25,063	5,642 (4,641–6,642)	26,229	5,743 (4,761–6,724)
Age						
18–74	8,223	5,746 (4,046–7,445)	9,158	6,011 (4,302–7,720)	9,552	5,860 (4,266–7,455)
75–84	8,017	5,554 (3,886–7,223)	7,082	4,408 (2,956–5,859)	9,438	6,311 (4,397–8,225)
85+	8,164	6,135 (4,244–8,026)	8,822	6,723 (4,629–8,817)	7,239	5,020 (3,440–6,600)
Race						
White	18,678	5,500 (4,403–6,597)	19,029	5,364 (4,258–6,470)	18,455	5,070 (4,052–6,087)
Other	5,508	6,973 (4,453–9,493)	5,704	6,637 (4,252–9,021)	7,558	8,349 (5,608–11,089)

[a]Rate per 100,000 male nursing home residents in the same demographic stratum.
[b]Persons of unspecified race are included in the total.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 17. Special needs of male nursing home residents with urinary tract infection, count, rate[a] (95% CI)

Category	1995 Count	1995 Rate	1997 Count	1997 Rate	1999 Count	1999 Rate
Has indwelling foley catheter or ostomy						
Yes	6,925	28,375 (20,204–36,546)	8,960	357,50 (26,693–44,806)	6,880	26,229 (18,779–33,680)
No	17,479	71,625 (63,454–79,796)	16,103	64,250 (55,194–73,307)	19,349	73,771 (66,320–81,221)
Question left blank	0	0	0	0	0	0
Requires assistance using the toilet						
Yes	12,388	50,761 (41,692–59,830)	9,869	39,377 (30,473–48,280)	14,214	54,192 (45,293–63,092)
No	4,465	18,295 (11,292–25,297)	5,885	23,483 (15,212–31,754)	4,151	15,828 (9,343–22,312)
Question skipped for allowed reason	7,329	30,032 (21,702–38,363)	9,068	36,183 (27,302–45,064)	7,513	28,643 (20,417–36,869)
Question left blank	223	912 (0–2,715)	240	957 (0–2,850)	351	1,337 (0–3,204)
Requires assistance from equipment when using the toilet						
Yes	2,546	10,433 (4,740–16,126)	2,749	10,970 (54,89–16,452)	3,038	11,581 (5,996–17,166)
No	9,629	39,458 (30,628–48,288)	6,303	25,149 (17,344–32,954)	10,352	39,467 (30,808–48,125)
Question skipped for allowed reason	11,794	48,327 (39,262–57,392)	14,954	59,666 (50,709–68,623)	11,664	44,470 (35,581–53,360)
Question left blank	435	1,782 (0–4,262)	1,056	4,215 (504–7,925)	1,176	4,482 (911–8,053)
Requires assistance from another person when using the toilet						
Yes	12,388	50,761 (41,692–59,830)	9,637	38,450 (29,602–47,298)	14,214	54,192 (45,293–63,092)
No	0	0	0	0	0	0
Question skipped for allowed reason	11,794	48,327 (39,262–57,392)	14,954	59,666 (50,709–68,623)	11,664	44,470 (35,581–53,360)
Question left blank	223	912 (0–2,715)	472	1,884 (0–4,505)	351	1,337 (0–3,204)
Has difficulty controlling urine						
Yes	14,667	60,102 (51,208–68,997)	14,705	58,673 (49,604–67,743)	14,550	55,472 (46,703–64,240)
No	5,311	21,762 (14,269–29,256)	4,728	18,865 (11,759–25,972)	6,723	25,631 (17,996–33,265)
Question skipped for allowed reason	4,210	17,250 (10,366–24,135)	5,629	22,461 (14,800–30,122)	4,957	18,898 (12,329–25,467)
Question left blank	216	885 (0–2,635)	0	0	0	0

[a]Rate per 100,000 male nursing home residents with urinary tract infection in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 18. Special needs of male nursing home residents regardless of urinary tract infection diagnosis, count, rate[a] (95% CI)

	1995		1997		1999	
Category	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	50,298	11,961 (10,569–13,352)	53,938	12,141 (10,731–13,552)	51,457	11,266 (9,941–12,591)
No	369,452	87,854 (86,453–89,254)	389,880	87,762 (86,348–89,176)	401,402	87,884 (86,497–89,271)
Question left blank	781	186 (3–368)	430	97 (0–210)	3,883	850 (385–1,315)
Requires assistance using the toilet						
Yes	207,587	49,363 (47,203–51,523)	221,599	49,882 (47,736–52,028)	241,558	52,887 (50,755–55,020)
No	141,870	33,736 (31,689–35,783)	133,378	30,023 (28,069–31,977)	128,251	28,080 (26,154–30,005)
Question skipped for allowed reason	69,267	16,471 (14,863–18,080)	86,814	19,542 (17,809–21,275)	81,977	17,948 (16,308–19,588)
Question left blank	1,807	430 (146–714)	2,459	553 (238–869)	4,956	1,085 (571–1,599)
Requires assistance from equipment when using the toilet						
Yes	57,463	13,664 (12,183–15,145)	59,329	13,355 (11,901–14,809)	67,782	14,840 (13,323–16,357)
No	143,213	34,055 (32,011–36,100)	149,218	33,589 (31,564–35,614)	162,895	35,665 (33,630–37,699)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	8,719	2,073 (1,466–2,680)	15,510	3,491 (2,702–4,281)	15,837	3,467 (2,650–4,285)
Requires assistance from another person when using the toilet						
Yes	203,490	48,389 (46,230–50,548)	217,556	48,972 (46,827–51,117)	238,252	52,163 (50,029–54,297)
No	2,350	559 (237–881)	2,571	579 (234–924)	2,690	589 (237–941)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	3,554	845 (451–1,239)	3,930	885 (482–1,287)	5,573	1,220 (681–1,759)
Has difficulty controlling urine						
Yes	218,491	51,956 (49,797–54,115)	232,536	52,344 (50,203–54,485)	242,189	53,025 (50,898–55,153)
No	170,988	40,660 (38,537–42,783)	175,090	39,413 (37,325–41,500)	177,128	38,781 (36,709–40,852)
Question skipped for allowed reason	29,338	6,976 (5,881–8,072)	36,416	8,197 (7,028–9,366)	34,206	7,489 (6,406–8,572)
Question left blank	1,715	408 (110–705)	207	47 (0–138)	3,220	705 (255–1,155)

[a]Rate per 100,000 adult male nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 19. Estimated annual expenditures of privately insured workers with and without a medical claim for a UTI in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without UTI (N=267,520)	Persons with UTI (N=11,430)		
	Total	Total	Medical	Rx Drugs
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
Gender				
Male	2,715	5,544	4,528	1,016
Female	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

Rx, prescription.

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control 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, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

health care expenditures for privately insured men diagnosed with a UTI was $5,544 in 1999, while the expenditure was $2,715 for men who did not experience a UTI (Table 19). In adults without a UTI, annual health care expenditures were lower for men than for women ($2,715 versus $3,833, respectively). However, there was little difference in total annual health care expenditures for men and women with UTI ($5,544 vs $5,407).

The total annual estimated expenditures for outpatient prescription medication for the treatment of UTI in both men and women between 1996 and 1998 were estimated to exceed $96.4 million (Table 20). Fluoroquinolones accounted for a large portion of these expenditures, in terms of both costs and numbers of claims. This may reflect a growing trend toward the use of fluoroquinolones rather than other types of antimicrobials for the treatment of UTI. The extent to which fluoroquinolones were prescribed as first-line therapy for prostatitis and other appropriate indications could not be determined from this dataset.

Indirect Costs

Overall time lost from work due to UTI was similar in men and women. Although men had only slightly higher rates of work loss due to cystitis (18% of men vs 16% of women), men tended to miss more than twice as much work time (10.5 hours vs 4.8 hours) (Table 21). Men with pyelonephritis also missed more total time from work than did women (11.0 hours vs 7.7 hours), although the percentage of men missing work was slightly lower than the percentage of women (21% vs 24%). Of men diagnosed with orchitis in this sample, 14% reported missing work, for a mean total of 7.6 hours (95% CI, 2.3–12.9). For each ambulatory care visit or hospitalization for orchitis, men missed an average of 3.8 hours of work (95% CI, 1.2–6.5) (Table 22).

Based on composite data, the overall medical expenditures for men with UTI in the United States were estimated to be approximately $1.028 billion in 2000 (Table 23). This is approximately 2.4 times lower than the overall amount spent to care for women with UTI during the same time period (see UTI in Women,

Table 20. Average annual spending and use of outpatient prescription drugs for treatment of urinary tract infection (male and female), 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Cipro®	774,067	60.27	46,652,998
Macrobid®	477,050	26.80	12,784,949
Triple antibiotic	329,253	8.44	2,778,898
Floxin®	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
Bactrim	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
Total	3,306,559		96,430,407

Rx, prescription.
[a]Estimates include prescription drug claims with a corresponding diagnosis for urinary tract infection (both males and females) and exclude drug claims for which there was insufficient data to produce reliable estimates. Including expenditures on these excluded medications would increase total outpatient drug spending for urinary tract infections by approximately 52%, to $146 million.
SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 7). The costs of care for UTI in men appear to be increasing, as is the case with women (Table 23 and UTI in Women, Table 7). Inpatient care accounts for the largest portion of these expenditures, followed by physician office care and ER care. The total annual expenditures for male Medicare beneficiaries with UTI were approximately $480.2 million in 1998 (Table 24). This is significantly higher than the expenditures for younger male Medicare beneficiaries (total $91.1 million) but comparable on a per-person basis. Inpatient expenditures of older Medicare beneficiaries have remained constant over time after accounting for inflation (Table 25). However, spending on ambulatory services and emergency care has increased significantly in real terms between 1992 and 1998.

SPECIAL CONSIDERATIONS

Diabetes has been identified as a comorbid condition that may increase the risk of UTI. Some patients with diabetes develop voiding dysfunction, which predisposes them to an increased risk of UTI. Diabetes may also be associated with a component of immunosuppression. HCUP data from 1994 to 2000 indicate that the rates of diabetes as a comorbid condition in men hospitalized for UTI increased through the 1990s (Table 26). It is notable that diabetes is approximately twice as common among men hospitalized for UTI as it is in the general population (2).

Table 21. Average annual work loss of persons treated for urinary tract infection (95% CI)

Condition	Number of Persons[a]	% Missing Work	Average Work Absence (hr)		
			Inpatient	Outpatient	Total
Cystitis					
Males	116	18%	0.1 (0–0.4)	10.3 (0–24.5)	10.5 (0–24.7)
Females	426	16%	0.0	4.8 (3.0–6.6)	4.8 (3.0–6.6)
Pyelonephritis					
Males	71	21%	1.6 (0–4.7)	9.4 (2.6–16.2)	11.0 (3.6–18.4)
Females	79	24%	2.1 (0.0–4.2)	5.6 (2.0–9.1)	7.7 (3.7–11.7)
Other UTIs					
Males	779	15%	0.9 (0–2.6)	5.5 (3.7–7.3)	6.5 (4.0–8.9)
Females	1,846	17%	0.0	7.4 (5.5–9.3)	7.5 (5.6–9.3)
Orchitis	398	14%	1.5 (0.7–3.7)	6.1 (1.3–10.9)	7.6 (2.3–12.9)

[a]Individuals wit
contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.
SOURCE: MarketScan, 1999.

Table 22. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary tract infection (95% CI)

	Inpatient Care		Outpatient Care	
Condition	Number of Hospitalizations[a]	Average Work Absence (hr)	Number of Outpatient Visits	Average Work Absence (hr)
Cystitis				
Males	*	*	157	7.6 (0.0–18)
Females	*	*	629	3.2 (2.2–4.3)
Pyelonephritis				
Males	*	*	87	7.7 (2.1–13)
Females	*	*	105	4.2 (2.0–6.4)
Other UTIs				
Males	*	*	1,047	4.1 (2.8–5.4)
Females	*	*	2,669	5.1 (3.9–6.4)
Orchitis	*	*	633	3.8 (1.2–6.5)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 23. Expenditures for male urinary tract infection (in millions of $) and share of costs, by site of service

	Year			
	1994	1996	1998	2000
Total[a]	811.5	903.8	969.3	1,027.9
Share of total				
Inpatient	626.5 (77.2%)	629.9 (69.7%)	691.1 (71.3%)	733.9 (71.4%)
Physician office	81.2 (10.0%)	179.9 (19.9%)	157.0 (16.2%)	135.7 (13.2%)
Hospital outpatient	18.7 (2.3%)	18.1 (2.0%)	31.0 (3.2%)	28.8 (2.8%)
Emergency room	85.2 (10.5%)	75.9 (8.4%)	90.1 (9.3%)	129.5 (12.6%)

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of UTI. Average drug spending for UTI-related conditions (both male and female) is estimated at $96 million to $146 million annually for the period 1996 to 1998.

SOURCES: National Ambulatory Medical Care Survey, National Hospital Ambulatory Mecial Care Survey, Healthcare Cost and Utilization Project, Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

SUMMARY

Urinary tract infections are among the most common urological disorders in both men and women. A variety of forms of UTI are recognized, and they may differ significantly, by location and severity. Overall, approximately 20% of all UTIs occur in men. These infections result in significant financial and personal costs for both individual patients and the health care system.

The data analyses presented here reveal several specific trends in men diagnosed with UTI. The overall rates of UTI in men appear to have remained stable during the 1990s. Although inpatient care still accounts for a significant portion of medical care for male UTI, there has been a general trend toward greater utilization of outpatient care in various settings for treatment of UTI-related disorders. Per capita financial expenditures for UTI in men appear similar to those for UTI in women. However, the mean time lost from work by men is somewhat greater.

Table 24. Expenditures for male Medicare beneficiaries for the treatment of urinary tract infection (in millions of $), by site of service, 1998

Site of Service	Total Annual Expenditures	
	Age < 65	Age 65+
Inpatient	70.9	376.4
Outpatient		
Physician office	9.8	59.0
Hospital outpatient	1.3	4.7
Ambulatory surgery	2.8	17.7
Emergency room	6.4	22.4
Total	91.1	480.2

SOURCE: Centers for Medicare and Medicaid Services, 1998.

Table 25. Expenditures for male Medicare beneficiaries age 65 and over for treatment of urinary tract infection (in millions of $)

	Year		
	1992	1995	1998
Total	436.9	452.8	480.2
Inpatient	363.6 (83.2%)	364.2 (80.4%)	376.4 (78.4%)
Outpatient			
Physician office	41.4 (9.5%)	46.9 (10.4%)	59 (12.3%)
Hospital outpatient	2.8 (0.6%)	3.8 (0.8%)	4.7 (1.0%)
Ambulatory surgery	12.3 (2.8%)	17.4 (3.8%)	17.7 (3.7%)
Emergency room	16.8 (3.8%)	20.6 (4.5%)	22.4 (4.7%)

NOTE: Percentages may not add to 100% because of rounding.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

Table 26. Diabetes diagnosis as a comorbidity in adult males hospitalized for urinary tract infection, count (% of total), rate[a]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	115,258	131	111,680	121	118,193	125	121,367	126
Without diabetes as listed diagnosis	92,853 (81%)	105	87,403 (78%)	95	90,294 (76%)	96	91,046 (75%)	95
With diabetes as listed diagnosis	22,405 (19%)	25	24,277 (22%)	26	27,899 (24%)	30	30,321 (25%)	32

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

RECOMMENDATIONS

Analysis of these data raises several important research questions related to UTI in adult men. What is the relationship between comorbid urologic conditions such as benign prostatic hyperplasia, urinary incontinence, and urinary tract infection? What is the role of preventive care in men at risk for the development of UTI? How can the diagnosis and treatment of men with UTI be improved to minimize time lost from work and decrease overall medical expenditures? What roles do demographic factors, including race/ethnicity and geography, play in the risk for developing UTI? How can health care delivery be optimized to provide high-quality care while simultaneously decreasing costs and complications?

Many of these questions apply to both men and women with UTI. Additional research on health services, outcomes, economic impacts, and epidemiological factors is needed to answer these challenging questions.

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CHAPTER 8

Urinary Tract Infection in Children

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Contents

Urinary Tract Infection in Children

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SUMMARY

Urinary tract infection (UTI) affects 2.6% to 3.4% of children in the United States annually. Throughout childhood, the risk of UTI is 2% for boys and 8% for girls. UTIs are primarily managed in physicians' offices, where they account for more than 1 million visits (0.7% of all pediatric office visits) per year. The emergency room is also an important site of care, accounting for 5% to 14% of physician encounters for pediatric UTI. Inpatient hospitalization is required in 2% to 3% of cases, with UTI accounting for more than 36,000 admissions in 2000. More care is rendered to girls than to boys, at a ratio of 3–4 to 1. Hospitalization is more frequent for infants, but it is more expensive for adolescents. Overall costs for inpatient hospital care increased during the 1990s despite shorter lengths of stay. The cost of hospitalization for UTI amounts to more than $180 million annually. However, the true financial burden is probably much higher because it includes costs for outpatient services, imaging, other diagnostic evaluations, long-term complications, and management of associated conditions that increase the frequency and morbidity of UTI. The economic impact on the family due to parental work loss is largely unknown. Efforts to lessen the economic burden on patients, payers, and society include decreasing the length and frequency of inpatient hospitalizations, streamlining the post-UTI imaging evaluation, developing new antimicrobials to fight resistant organisms, and generating easy-to-implement nonantimicrobial strategies.

DEFINITION

Normally, the urinary tract proximal to the distal urethra is sterile, but it is constantly challenged by infectious pathogens fighting to gain access. A UTI, strictly speaking, occurs when an infectious agent is present within this sterile system; however, a more appropriate clinical definition is that UTI occurs when the infectious agent is not only present, but is also causing illness. This distinction underscores the inherent clinical difficulty of managing patients with UTI. In practice, a diagnosis of UTI is presumed when irritative urinary tract symptoms occur simultaneously with a positive test for infectious agents, such as bacteria, fungi, viruses, or parasites, in the urinary tract. Because other factors can cause similar symptoms, the presence of symptoms in the absence of a positive culture has historically been considered inadequate for diagnosis. Likewise, the presence of leukocytes in the urine is not proof of infection. Asymptomatic bacteriuria may represent colonization or contamination and should be differentiated from UTI. Thus, for clinical purposes, the definition of a UTI requires a combination of symptoms and laboratory findings.

Both the infectious agent and the anatomic location typically define the UTI. The urinary tract is commonly divided into the upper tract (kidneys and ureters) and the lower tract (bladder and urethra). In the male, infections such as prostatitis, epididymitis, and orchitis are frequently included as UTIs but are more accurately considered genital infections; they have a separate epidemiology and natural history.

In this chapter, genital infections are excluded from the definition of UTI, and non-sexually transmitted orchitis is discussed separately.

UTIs are also categorized as complicated or uncomplicated. Complicated UTIs are infections in which there is a comorbidity that predisposes a child either to infection or to greater morbidity due to the infection. Comorbidities include the presence of stones, neurological impairment affecting urinary tract functioning, and anatomic abnormalities such as obstruction, reflux, or enterovesical fistula.

UTI is a frequent complication of medical care, especially hospitalization. Unfortunately, the datasets analyzed for this chapter preclude distinguishing nosocomial from community-acquired infections.

In this compendium, children are defined as persons less than 18 years of age. Where possible, they are further subdivided into infants (under 3 years of age), older children (3 to 10), and adolescents (11 to 17). Most of the datasets analyzed for this chapter do not distinguish the site of the UTI, with the notable exception of data from the Healthcare Cost and Utilization Project (HCUP) and MarketScan, in which pyelonephritis and orchitis, respectively, are distinguished from UTIs in other sites. The method by which the site of UTI is determined in these datasets is based on diagnostic coding and likely varies across the population.

The vast majority of UTIs are caused by bacterial agents, the most important of which are the Enterobacteriaciae, a family of gram-negative bacilli. *Escherichia coli* accounts for more than 80% of acute UTIs in children. The rest of the cases are distributed primarily among *Proteus mirabilis*, *Klebsiella pneumonia*, and *Pseudomonsa aeruginosa*. Less common infectious agents include gram-positive cocci, such as *Enterococcus* and *Staphylococcus*. Fungal infections, particularly *Candida*, are usually seen in nosocomial infections, complicated UTIs, or catheter-associated UTIs. Viral infections are under-recognized because of difficulties with culture and identification, but they have clearly been associated with infectious bladder symptoms. Cytomegalovirus is frequently seen in immunocompromised patients, particularly following organ transplantation.

Analyses for this chapter are based on the ICD-9 codes defining UTI listed in Table 1.

DIAGNOSIS

The clinical diagnosis of UTI is usually based on a combination of symptoms, physical and radiographic findings, and laboratory results. Diagnostic methods vary markedly and depend on presentation, clinical suspicion, medical history, and local practice patterns. Children pose a unique challenge in the diagnosis of UTI, because they often are unable to provide an accurate history or description of symptoms. Obtaining adequate specimens may also be difficult, and clinical signs such as fever and leukocytosis may be unreliable in the very young.

A lower tract infection is typically suspected in the presence of dysuria, urgency, frequency, and, less commonly, suprapubic pain. Upper tract involvement is typically heralded by fever, flank pain, nausea, vomiting, and lethargy. In the young child, there can be significant overlap in the clinical presentations of upper and lower tract infections. Symptoms may not be verbalized, and the diaper may conceal the voiding pattern. Fever is frequently the presenting sign, although lethargy may be the sole indicator of significant infection in infants. Parents' perception of an odor is an unreliable sign of infection (1). Hence, the clinician must have a high index of suspicion to make an accurate diagnosis of UTI.

Diagnosis is further hindered by the difficulty of obtaining adequate samples for laboratory testing. Urinalysis, the standard initial screening test for UTI, ideally requires a midstream, clean catch of urine, but this may be impossible in the very young. Alternatively, urine can be obtained by sterile catheterization or suprapubic needle aspiration. However, both of these techniques are invasive and frequently met with parental disapproval. Urine may be obtained by the adherence of a sterile collection bag to the perineum, but this method has a high rate of contamination, limiting its reliability. Once obtained, urine is examined with a reagent dipstick for the presence of nitrates and leukocyte esterase. A finding that the urine is crystal clear to visual inspection has a 97% negative predictive value for UTI (2). The urine can also be microscopically examined after gram-stain, as well as cultured for the presence of bacteria or fungi. Other adjunctive laboratory tests include serum white blood cell count and C-reactive protein level (3).

Table 1. ICD-9 codes used in the diagnosis and management of pediatric urinary tract infection

Individuals under 18 with any one of the following ICD-9 codes:	
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.9	Cystitis, unspecified
595.1	Chronic interstitial cystitis
595.0	Acute cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.2	Other chronic cystitis
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of renal medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Orchitis	
016.5	Tuberculosis of other male genital organs
072.0	Mumps orchitis
603.1	Infected hydrocele
604.0	Orchitis epididymitis and epididymo-orchitis with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess
604.90	Orchitis and epididymitis, unspecified
604.99	Other orchitis epididymitis and epididymo-orchitis without abscess
608.0	Seminal vesiculitis
608.4	Other in ammatory disorders of male genital organs
Other	
597.89	Other urethritis
599.0	Urinary tract infection, site not specified
607.1	Balanoposthitis
607.2	Other in ammatory disorders of penis
646.5	Asymptomatic bacteriuria in pregnancy

Imaging studies can assist in diagnosis, but they play a more prominent role in elucidating underlying comorbid conditions that may increase the risk or morbidity of infection. Ultrasound, the most common imaging study employed in cases of pediatric UTI, is used to evaluate for the presence of obstruction or stones, which can greatly increase the severity and sequelae of infection. The ultrasonographic appearance of the kidney can also be altered by the presence of acute infection. Ultrasound can assist in localizing the site of infection in the presence of renal abscess, parenchymal edema (lobar nephronia), or pyonephrosis. Despite the many advantages of ultrasound (it has no ionizing radiation and is non-invasive, well-tolerated, relatively low-cost, and readily available), its usefulness for identifying acute UTI has recently been questioned, given its relatively low yield in an era of widespread prenatal screening (4). Indeed, significant controversy has arisen over the timing of imaging studies and their implications for therapy recommendations in children with UTIs (4).

The nuclear renal scan with dimercaptosuccinic acid (DMSA) has been proposed as the most sensitive means for documenting renal involvement in UTI (5). It has been reported to be the best method for confirming acute pyelonephritis and later for assessing the presence of scarring. Many advocate basing further evaluation and follow-up care on the results of the DMSA scan (6). Computed tomography (CT) can also be useful for identifying anatomic anomalies, stones, and intrarenal abscess, as well as for documenting renal involvement in UTIs. CT is often used to exclude alternate diagnoses, such as appendicitis, in the presence of fever and abdominal pain or hematuria. Intravenous pyelography (IVP) is rarely used in the evaluation of pediatric UTI, particularly in young children, in whom renal visualization is limited by poor renal concentrating ability and increased small bowel air. Voiding cystourethrography (VCUG) has no role in the diagnosis of acute UTI, although it is nearly universally recommended for identifying vesicoureteral reflux or other anatomic abnormalities that may contribute to future infection risk.

NATURAL HISTORY

The natural history of uncomplicated acute cystitis is generally benign and free of significant long-term morbidity. The course is typically characterized by discomfort and irritative voiding symptoms with rapid resolution following the initiation of appropriate antimicrobials. The primary risk is that of recurrence or persistence. Children with constipation or voiding dysfunction are particularly prone to recurrence; 10% of these children develop a rapid recurrence following the completion of a course of antimicrobials. However, most recurrences do not progress to severe infections in the absence of anatomic abnormalities, and recurrent childhood UTIs tend to disappear in adolescence.

The natural history of pyelonephritis carries greater potential for long-term morbidity. Pyelonephritis can result in irreversible scarring of the renal parenchyma due to interstitial inflammation and virulence factors from the pathogen. Renal scarring is frequently, although not exclusively, associated with the simultaneous presence of reflux and infection. The likelihood of scarring increases with the number of infectious episodes, but significant renal damage can occur after a single infection. Renal scarring can lead to renal insufficiency and subsequent hypertension. The actual incidence of renal insufficiency due to scarring is unknown, in part because of changing definitions of reflux nephropathy and changing clinical presentations that have resulted from the widespread use of prenatal ultrasound. Historically, reflux nephropathy was considered responsible for 3% to 25% of the ESRD cases in children (7).

RISK FACTORS

The urinary tract is challenged by the ubiquitous presence of pathogens in close proximity. Any factors that enhance bacterial virulence or detract from host defense can predispose to UTI. Bacterial virulence factors include adhesins, K-antigen, hemosysins, and colicin. Bacterial colonization of the perineum typically precedes acute infection in the susceptible host. Adhesins are specialized structures that enable the bacteria to adhere to specific receptors on the uroepithelium. Such attachment leads to ascension into the urinary tract and promotes tissue invasion, inflammation, and tissue injury. Adhesins may also help promote intestinal carriage of more virulent bacteria, leading to perineal colonization. K-antigen helps prevent phagocytosis of bacteria; hemosysins damage renal tubular cells; and colocin helps kill competing bacteria near the colocin-producing cell.

Successful host defense depends on the proper functioning of the urinary system. A primary function of the urinary tract is the frequent and complete emptying of urine in a low-pressure environment. This effectively flushes out bacteria prior to their establishment of clinical infection. Any breakdown in this process can tip the balance toward the pathogen and result in UTI. Host risk factors are thought to include vesicoureteral reflux, dysfunctional voiding, constipation, obstruction, and gender-specific anatomy (the short urethra in females and the prepuce in males).

Vesicoureteral reflux is a frequent finding in children presenting with febrile infections. Present in approximately 1% of the asymptomatic population and 35% of those with UTI, reflux increases the risk of infection, in part by increasing post-void residual. Reflux also bypasses one of the host defense mechanisms against upper tract invasion by allowing less virulent strains of bacteria to reach the kidney.

Obstruction at the ureteropelvic junction, ureterovesical junction, or urethra is an infrequent but important host risk factor that can contribute to increased morbidity, persistence, and recurrence. Obstruction is present in fewer than 1% of children with UTI.

Dysfunctional voiding and dysfunctional elimination (constipation or functional fecal retention) are increasingly recognized as important host risk factors for UTI, particularly recurrent infections in anatomically normal children. Dysfunctional voiding refers to a learned pattern of behavior surrounding voiding that frequently begins with voluntary holding. It can present clinically with irritative symptoms such as urgency, frequency, urge incontinence, pelvic pain, and signs of holding such as squatting. Alternatively, it can present as an atonic bladder with infrequent voiding and high post-void residuals. In both patterns, elevated intravesical pressure, infrequent voiding, and poor emptying enhance the risk of UTI. Frequently, dysfunctional voiding can be compounded by chronic constipation. The exact mechanism by which constipation exerts its influence on voiding is unclear, but it frequently coexists in children with recurrent UTIs, and its resolution is often associated with resolution of the UTIs.

The relatively short length of the female urethra has traditionally been blamed for the increased risk of UTIs in girls. In the past, there was concern that a tight ring narrowed the urethra, often prompting urethral dilation in girls with UTI. Current evidence indicates that urethral constriction is not a reproducible finding, nor does it cause infection. Urethral dilation should play no role in the contemporary management of UTI in girls.

In boys, the most widely discussed host risk factor for UTI is the presence of the prepuce. It is clear that male infants with an intact prepuce are at a significantly higher risk of UTI during their first year of life. Colonization of bacteria on the inner preputial mucosa occurs, but it is not clear whether this is the etiology of infection (8). Circumcision is protective against UTI, but it carries its own risks. Uncircumcised boys have an overall 12-fold increased risk of urinary infection during their first 6 months compared with circumcised boys, in addition to a significantly higher probability of hospital admission for UTI (7.02 of 1,000) as compared with circumcised boys (1.88 of 1,000; $P<0.0001$) (9). A fuller discussion of this controversial subject is beyond the scope of this chapter.

INCIDENCE

It is difficult to estimate accurately the incidence of UTI in the pediatric population. Contributing questions include whether the determination of infection is based on symptoms, positive culture, or both; how accurate the method of specimen collection is; how accurate the history is, especially in young children; whether evaluation is focused on a specific age group or gender; whether the data are prospective or retrospective; whether or not the infections are associated with fever; and what the baseline rate of circumcision is in the population.

Frequently quoted estimates place the incidence of UTI in infants at approximately 1% during the first year of life (boys and girls), cumulative incidence at approximately 2% at two years of life (boys and girls), and cumulative childhood risk at 2% for boys and 8% for girls (10). Beyond the age of 2, UTIs in boys are not common enough to alter the childhood incidence through age 17.

Boys are at the greatest risk for UTI in the first months of life, but the risk decreases significantly after age 2. Boys who are uncircumcised have a ten-fold higher risk of UTI in the first year of life than do circumcised boys (11, 12).

Girls have an increased risk of febrile infection in the first year of life, then the risk steadily declines throughout childhood. Their risk of nonfebrile infections is higher during childhood than during infancy.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Data from the Healthcare Cost and Utilization Project (HCUP) reveal that annual inpatient hospitalizations for UTI decreased slightly between 1994 and 2000, from 41,204 (60 per 100,000 children) to 36,568 (51 per 100,000 children) (Table 2). This declining trend was noted in both genders but was inconsistent across racial/ethnic groups and geographic regions. In 2000, hospitalization rates for UTI in infants (174 per 100,000) were substantially higher than those for older children (29 per 100,000) or adolescents (24 per 100,000). During the mid to late 1990s, girls were about 2.5 times more likely than boys to be hospitalized for UTI. Although not age-adjusted, the data from HCUP suggest that Hispanics were at much greater risk for UTI-related hospitalization than other racial/ethnic groups and that African Americans were at greater risk than Caucasians.

HCUP data also indicate that between 1994 and 2000, annual inpatient hospitalizations associated with pyelonephritis as a primary diagnosis remained stable at about 13,000 per year (18 to 20 per 100,000) (Table 3). Despite recent support for outpatient treatment of pediatric pyelonephritis (13), these data indicate no trend downward in hospitalization rates for this condition. From 1996 onward, the hospitalization rate was at least 2.5 times higher for infants than it was for older children or adolescents. The female-to-male ratio was at least 5:1 for each year analyzed. Racial/ethnic stratification suggested that African American children had a trend toward somewhat lower hospitalization rates for pyelonephritis, and that rates for Asian children were even lower. While the gender differences are consistent with clinical experience, the reasons for the racial/ethnic differences are not apparent. Hospitalization rates did not appear to vary by geographical region, but urban teaching hospitals had higher rates than did rural hospitals.

Age differences were most prominent among patients requiring hospitalization. The rate of inpatient hospital stays was 6.4 times higher among commercially insured infants than the rate among older children, and 11 times higher than the rate among adolescents (Table 4). This reflects the fact that UTIs in young children are more likely to involve the upper tract or to be complicated by comorbidities such as anatomic abnormalities. It also reflects more aggressive treatment patterns in the very young that tend to include parental antimicrobials.

Outpatient Care

Tables 4 and 5 present data from the Center for Health Care Policy and Evaluation (CHCPE) on visits by children insured commercially or through Medicaid for whom UTI was listed as the primary diagnosis. In both groups, the most common site of care for UTI was physicians' offices. Overall rates of visits to physicians' offices for UTI remained stable throughout the 1990s at approximately 2,400 per 100,000 (2.4%) for children with commercial insurance (Table 4) and 2,800 per 100,000 (2.8%) for children with Medicaid (Table 5). Among other settings—all much less commonly used than physicians' offices—emergency room (ER) visits were three times more common than inpatient hospitalizations. Of all encounters for which UTI was listed as the primary diagnosis, the rates of ER visits were substantially higher for those insured by Medicaid (Table 5) than the rates for those insured commercially (Table 4). Hospital outpatient clinics and ambulatory surgical centers contributed minimally, especially in the Medicaid population. Children with Medicaid visited physicians' offices, ERs, and ambulatory surgery centers more often than did children with commercial insurance.

That children with Medicaid visited emergency rooms for UTI-related care 2.8 times more frequently in 2000 than did those with commercial insurance

Table 2. Inpatient hospital stays by children with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	41,204	60 (54–67)	40,378	57 (51–63)	39,822	56 (50–61)	36,568	51 (46–55)
Age								
0–2	21,128	177 (150–203)	22,797	191 (163–219)	22,591	194 (166–222)	20,372	174 (153–195)
3–10	11,629	38 (34–41)	10,185	32 (28–35)	9,987	31 (27–34)	9,323	29 (26–31)
11–17	8,447	33 (30–36)	7,396	27 (25–30)	7,245	26 (24–28)	6,874	24 (23–26)
Gender								
Male	12,516	36 (30–42)	12,341	34 (28–40)	11,317	31 (26–36)	10,258	28 (24–31)
Female	28,678	86 (79–94)	28,037	81 (73–89)	28,501	81 (75–88)	26,306	75 (68–81)
Race/ethnicity								
White	18,579	41 (38–44)	17,276	38 (34–41)	16,339	36 (33–39)	14,504	32 (28–35)
Black	5,954	55 (48–62)	5,601	50 (43–57)	4,373	39 (33–46)	3,364	30 (25–36)
Asian/Pacific Islander	549	28 (20–37)	411	14 (8–20)	900	29 (20–39)	851	28 (19–38)
Hispanic	6,872	74 (50–97)	8,452	82 (56–107)	7,159	66 (45–86)	8,032	69 (58–80)
Region								
Midwest	8,394	51 (45–56)	7,393	44 (37–51)	7,443	44 (39–48)	7,666	44 (37–51)
Northeast	7,553	59 (49–68)	7,600	58 (48–67)	8,231	64 (51–76)	6,044	46 (39–54)
South	17,204	75 (61–90)	16,756	69 (57–80)	16,453	66 (55–77)	15,036	61 (52–71)
West	8,053	50 (38–63)	8,630	52 (34–69)	7,695	45 (35–56)	7,822	45 (37–53)
MSA								
Rural	7,946	46 (41–52)	7,738	48 (42–53)	6,780	41 (38–45)	6,938	44 (40–48)
Urban	33,114	65 (57–73)	32,595	59 (51–67)	32,794	59 (53–66)	29,594	52 (47–58)
Hospital type								
Rural	7,946	12 (10–13)	7,738	11 (10–12)	6,780	9 (9–10)	6,938	10 (9–10)
Urban non-teaching	16,230	24 (21–27)	16,764	24 (20–27)	10,929	15 (13–17)	11,435	16 (14–18)
Urban teaching	16,885	25 (20–30)	15,831	22 (17–27)	21,865	31 (26–35)	18,159	25 (21–29)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 199 -
graphic categories of US civilian non-institutionalized population under age 18.

[b]Persons of missing ge

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 3. Inpatient hospital stays by children with pyelonephritis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	13,334	20 (18–21)	13,536	19 (17–21)	13,226	18 (17–20)	12,926	18 (16–20)
Age								
0–2	3,372	28 (23–33)	4,537	38 (31–45)	4,206	36 (29–43)	4,466	38 (32–45)
3–10	5,268	17 (15–19)	4,818	15 (13–17)	4,728	15 (12–17)	4,450	14 (12–15)
11–17	4,695	18 (17–20)	4,181	15 (14–17)	4,292	16 (14–17)	4,010	14 (13–16)
Gender								
Male	2,229	6.4 (5.3–7.4)	2,200	6.0 (4.7–7.4)	2,024	5.5 (4.5–6.6)	2,206	6.0 (4.9–7.0)
Female	11,099	33 (30–36)	11,336	33 (30–36)	11,201	32 (29–35)	10,720	30 (27–33)
Race/ethnicity								
White	7,150	16 (14–17)	6,869	15 (13–16)	6,647	14 (13–16)	5,934	13 (11–15)
Black	1,398	13 (11–15)	1,297	12 (10–14)	928	8.3 (6.5–10.1)	940	8.4 (6.2–10.6)
Asian/Pacific Islander	178	9.2 (5.2–13)	*	*	185	6.0 (3.2–8.8)	171	5.7 (3.2–8.2)
Hispanic	1,390	15 (12–18)	2,170	21 (15–27)	1,443	13 (9–17)	1,942	17 (13–20)
Region								
Midwest	3,032	18 (16–21)	3,036	18 (15–21)	3,066	18 (15–21)	3,263	19 (15–22)
Northeast	2,422	19 (14–23)	2,476	19 (15–22)	2,227	17 (14–20)	1,881	14 (12–17)
South	5,019	22 (19–25)	4,630	19 (16–22)	4,860	20 (17–23)	4,701	19 (15–23)
West	2,861	18 (14–21)	3,394	20 (14–27)	3,073	18 (13–23)	3,080	18 (14–22)
MSA								
Rural	3,314	19 (16–22)	2,903	18 (16–20)	3,104	19 (17–21)	2,846	18 (16–21)
Urban	9,964	20 (17–22)	10,589	19 (17–22)	10,025	18 (16–20)	10,067	18 (16–20)
Hospital type								
Rural	3,314	4.9 (4.1–5.6)	2,903	4.1 (3.6–4.6)	3,104	4.3 (3.8–4.9)	2,846	3.9 (3.4–4.5)
Urban nonteaching	5,450	8.0 (7.1–8.8)	5,552	7.8 (6.8–8.8)	3,933	5.5 (4.8–6.2)	4,169	5.8 (5.0–6.6)
Urban teaching	4,514	6.6 (5.3–8.0)	5,037	7.1 (5.5–8.6)	6,092	8.5 (6.8–10.2)	5,898	8.2 (6.6–9.7)

*Figure does not meet standard of reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996,
demographic categories of US civilian non-institutionalized population under age 18.

[b]Perso

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 4. Visits for urinary tract infections listed as primary diagnosis among children having commerical health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
				Physician Office Visits				
Total	7,600	2,395	10,801	2,382	16,206	2,425	17,101	2,374
Age								
<3	1,234	3,033	1,802	3,078	3,001	3,383	3,033	3,181
3–10	4,105	2,816	5,923	2,841	9,059	2,950	9,338	2,864
11–17	2,261	1,727	3,076	1,651	4,146	1,522	4,730	1,582
Gender								
Male	1,474	906	2,057	887	2,988	872	3,087	835
Female	6,126	3,961	8,744	3,950	13,218	4,059	14,014	3,997
				Emergency Room Visits				
Total	431	136	575	127	958	143	1,079	150
Age								
<3	81	199	97	166	197	222	183	192
3–10	185	127	271	130	422	137	459	141
11–17	165	126	207	111	339	124	437	146
Gender								
Male	85	52	132	57	176	51	218	59
Female	346	224	443	200	782	240	861	246
				Inpatient Visits				
Total	147	46	206	45	370	55	367	51
Age								
<3	68	167	104	178	178	201	202	212
3–10	54	37	67	32	115	37	108	33
11–17	25	*	35	19	77	28	57	19
Gender								
Male	32	20	41	18	56	16	88	24
Female	115	74	165	75	314	96	279	80
				Hospital Outpatient Visits				
Total	27	*	75	17	185	28	153	21
Age								
<3	2	*	16	*	58	65	40	42
3–10	16	*	48	23	94	31	79	24
11–17	9	*	11	*	33	12	34	11
Gender								
Male	3	*	14	*	28	*	28	*
Female	24	*	61	28	157	48	125	36
				Ambulatory Surgery Visits				
Total	49	15	63	14	211	32	139	19
Age								
<3	6	*	13	*	70	79	49	51
3–10	31	21	40	19	105	34	69	21
11–17	12	*	10	*	36	13	21	*
Gender								
Male	19	*	16	*	44	13	32	8.7
Female	30	19	47	21	167	51	107	31

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

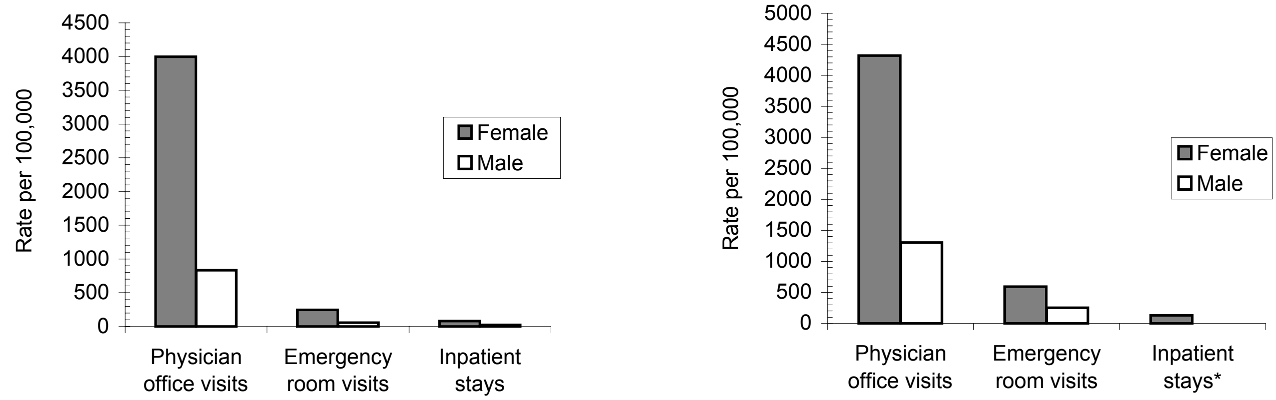
[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 5. Visits for urinary tract infections listed as primary diagnosis among children having Medicaid, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
				Physician Office Visits				
Total	910	2,842	1,428	2,420	1,096	2,893	1,309	2,806
Age								
<3	193	2,427	350	2,569	312	3,551	335	3,232
3–10	554	3,035	838	2,576	572	2,955	733	3,147
11–17	163	2,804	240	1,868	212	2,177	241	1,855
Gender								
Male	214	1,334	337	1,140	271	1,424	305	1,304
Female	696	4,355	1,091	3,704	825	4,378	1,004	4,318
				Emergency Room Visits				
Total	193	603	303	514	155	409	197	422
Age								
<3	52	654	93	683	56	637	80	772
3–10	95	520	125	384	65	336	75	322
11–17	46	791	85	662	34	349	42	323
Gender								
Male	40	249	68	230	33	173	59	252
Female	153	957	235	798	122	647	138	594
				Inpatient Stays				
Total	36	112	59	100	43	114	44	94
Age								
<3	22	*	39	286	31	353	32	309
3–10	12	*	16	*	11	*	7	*
11–17	2	*	4	*	1	*	5	*
Gender								
Male	10	*	17	*	14	*	14	*
Female	26	*	42	143	29	*	30	129
				Hospital Outpatient Visits				
Total	7	*	23	*	13	*	7	*
Age								
<3	1	*	10	*	2	*	6	*
3–10	4	*	11	*	9	*	0	0.0
11–17	2	*	2	*	2	*	1	*
Gender								
Male	4	*	5	*	2	*	0	0.0
Female	3	*	18	*	11	*	7	*
				Ambulatory Surgery Visits				
Total	4	*	3	*	59	156	31	66
Age								
<3	0	0.0	1	*	31	353	15	*
3–10	4	*	1	*	26	*	16	*
11–17	0	0.0	1	*	2	*	0	0.0
Gender								
Male	2	*	2	*	15	*	7	*
Female	2	*	1	*	44	233	24	*

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.



Medicaid (right) by visit setting and gender.
***The rate for males in this category was too low to produce a reliable national estimate.**

SOURCE: Center for Health Care Policy and Evaluation, 2000.

(422 per 100,000 vs 150 per 100,000) is consistent with well-known patterns of care in socioeconomically disadvantaged populations. The slight decrease in the use of ERs by those insured through Medicaid from 1994 to 2000 may reflect improved access to primary care physicians or increasing dissatisfaction with the availability of ER care.

As expected, girls had much higher visit rates than boys did (Tables 4 and 5, Figure 1). The female-to-male ratio for physicians' office visits by commercially insured children rose from 4.4:1 in 1994 to 4.8:1 in 2000 (Table 4), but it remained stable at about 3.3: 1 for children insured through Medicaid during the same time period (Table 5). The differences in these ratios are difficult to explain, but they may be due in part to the fact that boys covered by Medicaid are less likely to be circumcised. Caucasians are considerably more likely to be circumcised than are African Americans or Hispanics (81% vs 65% or 54%); these differences remain significant when other variables are controlled (14). Circumcision is not a covered service, and families insured through Medicaid may not be able to afford to pay for it out-of-pocket; the cost of circumcision typically ranges from $250 to $750. Families insured through Medicaid may also be more likely to have social norms that do not include routine circumcision. In the office setting, adolescents had lower visit rates than did either infants or older children, regardless of insurance status (Tables 4 and 5).

Data from the National Ambulatory Medical Care Survey showed that during 1992, 1994, 1996, 1998, and 2000, there were there were more than 1.1 million annual physician office visits (1,590 per 100,000 in each year) associated with UTI as the primary diagnosis and 1.4 million annual physician office visits (2,051 per 100,000 in each year) associated with UTI as any listed diagnosis (Table 6). Because counts were low for this diagnosis in children, these counts and rates were derived by first collapsing data from the even years in 1992–2000 and then dividing by 5. As a primary diagnosis, UTI accounted for 0.7 % of all physician office visits by children during those years. Data from the National Hospital Ambulatory Medical Care Survey showed that during 1994, 1996, 1998, and 2000, approximately 94,000 annual hospital outpatient visits (132 per 100,000 in each year) were associated with UTI as a primary diagnosis, representing 0.5% of all hospital outpatient visits by children (Table 7). Because counts were low for this diagnosis in children, these counts and rates were derived by first collapsing data from the even years in 1994–2000 and then dividing by 4.

NON-SEXUALLY TRANSMITTED ORCHITIS

Isolated orchitis is extremely rare in the prepubertal male and in most cases is due to the extension of acute epididymitis into epididymo-orchitis. Most cases occur in adolescents and present

Table 6. National physician office visits by children with urinary tract infections, count (95% CI), number of visits, percentage of visits, rate[a] (95% CI)

	5-Year Count (95% CI)	Total No. Visits by Male/Females <18, 1992–2000	% of Visits	5-Year Rate (95% CI)
Primary diagnosis	5,556,971 (4,502,468–6,611,474)	809,286,031	0.7	7,949 (6,440–9,457)
Any diagnosis	7,171,390 (5,995,021–8,347,759)	809,286,031	0.9	10,258 (8,575–11,941)

[a]Rate per
those five years.
categories of US civilian non-institutionalized population under age 18.
SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 7. National hospital outpatient visits by children with urinary tract infections, count (95% CI), number of visits, percentage of visits, rate[a] (95% CI)

	4-Year Count (95% CI)	Total No. Visits by Males/Females <18, 1994–2000	% of Visits	4-Year Rate (95% CI)
Primary diagnosis	374,907 (298,369–451,445)	72,578,652	0.5	529 (421–637)
Any diagnosis	527,424 (430,174–624,674)	72,578,652	0.7	744 (607–882)

[a]Rate per 100
years. Population
of US civilian non-institutionalized population under age 18.
SOURCE: National Hospital Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

with fever, pain, testicular swelling, and scrotal erythema. The primary differential diagnosis is torsion of the testis or appendix testis. Often, there is a simultaneous UTI. Frequently, an associated predisposing factor, such as urethral obstruction, ectopic ureter, neurogenic bladder dysfunction, or recent catheterization, is present. On rare occasions, orchitis may be caused by hematogenous spread of bacteria. Nonbacterial epididymitis can also result from vasal reflux of urine causing an inflammatory response. Rare, nonbacterial cases include viral, tuberculous, and mumps orchitis.

HCUP data indicate that inpatient hospitalization for orchitis is rare, 1.6 per 100,000 in 2000 (Table 8). MarketScan data from 1999 indicate that despite the general recommendation for antimicrobial treatment for orchitis, only 22% of children treated in physicians' offices or hospital outpatient clinics received an antimicrobial within a week of the visit, and only 43% received an antimicrobial within a year of the visit (Table 9). Of those treated in ERs, 56% received an antimicrobial. In the ER, adolescents were twice as likely to receive an antimicrobial as were boys 3 to 10 years of age. The unexpectedly low utilization of antimicrobials may be due in part to incorrect coding, as many children with torsion of the appendix testis are misclassified as having epididymitis despite the absence of infection. The higher rate of antimicrobial usage in adolescents may represent an appropriate understanding that the true infectious form of this disease is more common in this age group. Greater rigor in diagnosis and terminology is necessary to utilize antimicrobials appropriately in the treatment of patients with orchitis.

Table 8. National inpatient hospital stays for children with orchitis[a], count, rate[b]

Year	Count	Rate
1994	1,036	3.0
1996	777	2.1
1998	576	1.6
2000	612	1.6

[a]Orchitis defined as ICD-9 code 604.xx.
[b]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population under age 18.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 9. Use of antibiotics in the treatment of pediatric orchitis, 1999

	# of boys who had a physician office visit or hospital outpatient visit for orchitis	% of boys w/ office visit who received an antibiotic within a year of the visit	% of boys w/ office visit who received an antibiotic within a week of the visit	# of boys who had an ER visit for orchitis	% of boys w/ ER visit who received an antibiotic within a year of the visit	% of boys w/ ER visit who received an antibiotic within a week of the visit
Total	60	43%	22%	9	56%	56%
Age						
0–2	5	40%	0%	0		
3–10	12	58%	33%	3	33%	33%
11–17	43	40%	21%	6	67%	67%
Region						
Midwest	23	48%	26%	3	33%	33%
Northeast	13	23%	15%	3	33%	33%
South	17	47%	18%	0		
West	4	50%	25%	3	100%	100%
Unknown	3	67%	33%	0		

SOURCE: MarketScan, 1999.

ECONOMIC IMPACT

Direct Cost

Pediatric UTIs are a significant source of health care expenditures. Data analyzed for this chapter are limited to the immediate costs of treatment of the acute infection; however, UTI is frequently a manifestation of a larger underlying condition. Hence, much of the economic burden of diagnosing and treating the related conditions is not included here. Costs are not included for follow-up imaging, long-term antimicrobials, or treatment of anatomic abnormalities, dysfunctional elimination, and neurological abnormalities. Also not included in these analyses are long-term costs related to the sequelae of repeated pyelonephritis and scarring, such as hypertension or renal insufficiency.

According to data from the National Association of Children's Hospitals and Related Institutions (NACHRI), the mean cost per child admitted for a UTI from 1999 to 2001 was $4,501 (Table 10). The cost was higher among adolescents ($6,796) than among infants ($4,069) or older children ($4,554). Costs were higher for boys ($5,165) than for girls ($4,094). Costs were highest in the Northeast ($5,518) and lowest in the Midwest ($3,948). No racial/ethnic differences in costs were apparent. Inpatient costs per admission rose from $3,869 in 1999 to $4,444 in 2000 and $5,145 in 2001, although the increase was not caused by significant changes in any particular gender, geographic, or racial/ethnic group (Table 11).

Despite shorter length of stay for all groups analyzed between 1999 and 2001 (Table 12), nominal costs increased in all regions of the country (Table 11) in children hospitalized for UTI. Although hospitalized less often than girls (Tables 4 and 5), boys had higher inpatient costs (Table 10), no doubt related to their longer hospital stays, a finding noted in data from both NACHRI (Table 12) and HCUP (Table 13). Stays were longer in urban teaching hospitals, a finding likely related to differences in case mix between teaching and nonteaching facilities. The general trend toward shorter length of stay for UTI may reflect changing practice patterns in the management of uncomplicated UTI, with a greater reliance on outpatient oral antimicrobials to complete the therapeutic course initiated in the hospital. Nonetheless, the data suggest that inpatient costs have risen, despite efforts to decrease them through shorter hospital stays. Caution should be used in interpreting this trend, because these costs are not adjusted for inflation.

Table 10. Inpatient cost per child admitted with urinary tract infection listed as primary diagnosis, 1999–2001, mean cost[a] (in $) (95% CI)

	Count	Mean Cost	
Total[b]	16,024	4,501	(4,324–4,678)
Age			
0–2	10,383	4,069	(3,963–4,175)
3–10	3,774	4,554	(4,177–4,930)
11–17	1,867	6,796	(5,630–7,963)
Race/ethnicity			
White	7,807	4,500	(4,263–4,737)
Black	2,862	4,730	(4,158–5,302)
Asian	300	4,569	(3,966–5,172)
Hispanic	3,050	4,778	(4,364–5,192)
American Indian	39	8,851	(475–17,227)
Gender			
Male	6,092	5,165	(4,776–5,554)
Female	9,932	4,094	(3,938–4,249)
Region			
Midwest	4,635	3,948	(3,812–4,084)
Northeast	850	5,518	(4,794–6,241)
South	7,900	4,864	(4,535–5,194)
West	2,363	4,531	(4,259–4,804)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.
[b]Children of other races and missing race/ethnicity or region are included in the total.
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Given an average of 40,000 hospitalizations per year for UTIs (Table 2) and an average cost of $4,500 per inpatient episode (Table 10), a rough estimate of the annual economic burden for inpatient treatment of UTI would be $180 million. However, it is important to remember that while inpatient is by far the most expensive treatment setting, it represents a small fraction of UTI care. Hence, comprehensive estimates of the financial burden of pediatric UTI also need to incorporate the costs of outpatient and ER care, as well as those associated with evaluating and treating associated conditions.

Table 11. Inpatient cost per child admitted with urinary tract infection listed as primary diagnosis, count, mean cost[a] (in $) (95% CI)

	1999			2000			2001		
	Count	Mean Cost		Count	Mean Cost		Count	Mean Cost	
Total[b]	5,039	3,869	(3,706–4,033)	5,551	4,444	(4,182–4,706)	5,434	5,145	(4,726–5,564)
Age									
0–2	3,248	3,702	(3,498–3,906)	3,617	3,954	(3,827–4,081)	3,518	4,526	(4,315–4,738)
3–10	1,223	3,611	(3,417–3,805)	1,287	5,357	(4,314–6,399)	1,264	4,648	(4,331–4,964)
11–17	568	5,381	(4,630–6,132)	647	5,365	(4,867–5,863)	652	9,450	(6,216–12,684)
Race/ethnicity									
White	2,525	3,951	(3,769–4,132)	2,600	4,286	(4,058–4,513)	2,682	5,226	(4,595–5,857)
Black	867	4,227	(3,511–4,943)	1,011	4,386	(3,968–4,804)	984	5,526	(4,047–7,005)
Asian	87	4,041	(3,256–4,827)	100	4,571	(3,416–5,727)	113	4,973	(3,881–6066)
Hispanic	749	3,562	(3,376–3,748)	1,087	5,327	(4,236–6,418)	1,214	5,036	(4,704–5,369)
American Indian	5	2,737	(705–4768)	17	15,163	(0–35,084)	17	4,337	(2,879–5,795)
Gender									
Male	1,877	4,327	(3,946–4,709)	2,114	4,697	(4,427–4,966)	2,101	6,384	(5,346–7,423)
Female	3,162	3,598	(3,468–3,727)	3,437	4,288	(3,898–4,678)	3,333	4,364	(4,171–4,557)
Region									
Midwest	1,505	3,481	(3,277–3,686)	1,596	3,934	(3,762–4,106)	1,534	4,420	(4,111–4,730)
Northeast	180	4,929	(4,062–5,796)	325	5,034	(3,922–6,145)	345	6,281	(4,907–7,655)
South	2,399	4,261	(3,973–4,549)	2,744	4,799	(4,328–5,270)	2,757	5,454	(4,673–6,235)
West	800	3,937	(3,593–4,281)	765	4,684	(4,050–5,319)	798	4,981	(4,579–5,382)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.
[b]Children of other races and missing race/ethnicity or region are included in the totals.
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Indirect Cost

Because children do not contribute direct economic support in most families, the impact of lost productivity or time off from school cannot be determined. However, an ill child usually means work loss for parents and, as such, may generate substantial indirect costs. Better tools are needed to assess the parental economic impact of pediatric UTI.

PREVENTION

Strategies to prevent UTI primarily revolve around enhancing host defenses. Such practices as proper hygiene, good voiding habits, and relief of constipation are the primary methods for preventing uncomplicated infections. In some patients, prophylactic antimicrobials may be beneficial. For those with complicated UTIs, the correction of underlying anatomic abnormalities or the institution of adaptive approaches, such as intermittent catheterization, can be important. Efforts to reduce nosocomial infections though proper catheter management and to prevent resistance through more selective use of antimicrobials are increasing.

From a public health standpoint, there is continuing debate over the roles of both routine newborn circumcision and sibling screening for reflux once an index case is identified. Prenatal ultrasound screening may decrease the burden of illness by identifying anatomic abnormalities prior to the first infection.

Table 12. Trends in mean inpatient length of stay (days) for children hospitalized with urinary tract infection listed as primary diagnosis (95% CI)

	1999		2000		2001	
	Count	Length of Stay	Count	Length of Stay	Count	Length of Stay
All	5039	3.7 (3.6–3.8)	5551	3.6 (3.5–3.8)	5434	3.6 (3.6–3.7)
Age						
0–2	3,248	3.8 (3.6–4.0)	3,617	3.5 (3.4–3.6)	3,518	3.7 (3.6–3.8)
3–10	1,223	3.4 (3.2–3.5)	1,287	3.8 (3.3–4.3)	1,264	3.3 (3.1–3.4)
11–17	568	3.9 (3.5–4.2)	647	3.8 (3.5–4.1)	652	4.3 (3.8–4.7)
Race/ethnicity						
White	2,525	3.4 (3.3–3.5)	2,600	3.3 (3.2–3.4)	2,682	3.5 (3.3–3.6)
Black	867	4.2 (3.5–5.0)	1,011	3.8 (3.3–4.4)	984	3.7 (3.5–4.0)
Asian	87	3.3 (2.8–3.8)	100	3.4 (2.8–4.1)	113	3.7 (3.1–4.4)
Hispanic	749	3.7 (3.5–3.8)	1,087	4.0 (3.8–4.3)	1,214	4.0 (3.8–4.2)
American Indian	5	2.2 (0.8–3.6)	17	6.2 (2.9–9.4)	17	3.5 (2.4–5.5)
Other	325	3.9 (3.4–4.3)	345	3.4 (3.1–3.7)	242	3.4 (3.0–3.7)
Missing	481	4.3 (4.0–4.6)	391	3.9 (3.5–4.3)	182	3.3 (3.0–3.6)
Gender						
Male	1,877	4.2 (3.8–4.5)	2,114	3.9 (3.8–4.1)	2,101	4.1 (3.9–4.3)
Female	3,162	3.4 (3.3–3.5)	3,437	3.4 (3.2–3.6)	3,333	3.3 (3.2–3.4)
Region						
Midwest	1,505	3.2 (3.1–3.4)	1,596	3.1 (3.0–3.2)	1,534	3.2 (3.1–3.4)
Northeast	180	3.8 (3.2–4.4)	325	3.4 (3.1–3.8)	345	3.4 (3.0–3.7)
South	2,399	4.1 (3.8–4.4)	2,744	3.9 (3.7–4.2)	2,757	3.9 (3.8–4.1)
West	800	3.2 (3.0–3.4)	765	3.5 (3.2–3.8)	798	3.5 (3.3–3.7)
Missing	155	4.2 (3.6–4.8)	120	5.1 (4.3–5.9)	0	

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

RECOMMENDATIONS

The management of patients with acute uncomplicated UTI is well established, but ongoing efforts are likely to streamline diagnosis and treatment. Further research is needed to optimize the evaluation phase following the diagnosis of UTI in order to improve quality of care and decrease cost. To ensure proper access to care for all children, investigation is needed into who is and who is not receiving appropriate evaluation. In addition, there is a need for greater education among parents and health care providers regarding the role of dysfunctional voiding and constipation in UTI risk.

For hospitalized patients, urethral catheterization remains the primary risk factor for nosocomial UTI. Enhanced awareness of the morbidity and cost of this complication should lead to more judicious use of catheters and improved protocols for their management.

Table 13. National trends in mean length of stay (days) for children hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	4.2	3.6	3.4	3.1
Age				
0–2	4.7	3.9	3.6	3.4
3–10	3.7	3.2	3.1	2.8
11–17	3.5	3.0	3.1	2.7
Gender				
Male	4.9	4.2	4.0	3.7
Female	3.8	3.3	3.1	2.9
Race/ethnicity				
White	3.7	3.3	3.1	2.9
Black	5.1	4.2	4.0	3.6
Asian/Pacific Islander	4.8	4.1	3.6	4.2
Hispanic	4.4	4.2	4.2	3.6
Other	6.8	4.4	3.3	3.6
Region				
Midwest	3.5	3.2	2.9	2.8
Northeast	5.0	4.0	3.5	3.6
South	4.2	3.7	3.5	3.2
West	3.8	3.5	3.6	3.0
MSA				
Rural	3.5	3.0	2.8	2.6
Urban	4.3	3.7	3.5	3.2
Hospital Type				
Rural	3.5	3.0	2.8	2.6
Urban nonteaching	3.7	3.4	3.1	3.1
Urban teaching	4.9	4.1	3.7	3.4

MSA, metropolitan statistical area.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

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CHAPTER 9

Sexually Transmitted Diseases

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INTRODUCTION

This chapter focuses on the epidemiology and cost of sexually transmitted diseases (STDs) commonly seen in urologic practice in the United States. STDs generally comprise acute and/or chronic conditions attributed to acquisition of infectious agents during penile, anal, vaginal, and/or oral sex, but the emphasis in this chapter is on the urologic burden of these diseases.

The immediate and long-term disease burden and costs of STDs in the United States are immense, with severe and costly consequences for adolescents, adults, and their offspring. Infection with a bacterial STD may cause painful acute symptoms of urethritis, vaginitis, cervicitis, dysuria, or skin manifestations that require health care. If undetected and untreated, some bacterial STD infections may lead to serious and costly long-term consequences. For example, untreated bacterial STD in men may ascend to the upper genital tract, causing epididymitis, orchitis, or prostatitis. In women, untreated lower genital tract infection may lead to salpingitis or pelvic inflammatory disease (PID) that may result in infertility, life-threatening ectopic pregnancy, or chronic pelvic pain. Infection with a viral STD may become chronic, with single or relapsing episodes of painful or problematic symptoms and signs, as seen with genital herpes caused by herpes simplex virus (HSV) and genital warts and anogenital neoplasia caused by human papillomavirus (HPV). HSV infection also complicates the course and management of human immunodeficiency virus (HIV) infection. Infection by STDs during gestation or birth can result in eye infections (due to *Chlamydia trachomatis* or *Neisseriae gonorrhoeae*); pneumonia (from *C. trachomatis*); recurrent respiratory papillomatosis (from HPV); lifelong disability, including blindness, bone deformities, mental retardation (due to syphilis); or death (from syphilis or HSV).

The burden of disease and the trends for specific STDs vary considerably, but together these infections constitute a significant public health problem. The number of cases in the United States has been estimated to be in the tens of millions (Table 2), and as many as 15 million new (incident) STDs occur each year, of which 3 million are among teenagers (1).

GENERAL NOTES ON ANALYTIC APPROACH

In keeping with the goals and scope of this compendium, this assessment focused on the acute and chronic STD infections and clinical manifestations that are encountered commonly by urologists. Unlike patients with many other conditions associated with urinary tract pathology or dysfunction, those with STDs are not primarily referred to urologists for diagnosis and treatment. Accordingly, we quantified the burden of selected STDs that most commonly present with symptoms of the penis, urethra, bladder, and external genitalia. We focused on the numbers of cases of medical visits of inpatient and outpatient services for four pathogen-specific STDs (herpes, chlamydia, gonorrhea, and syphilis), genital warts (a presentation in which HPV is always implicated), and two syndromic presentations commonly due to

Table 1. ICD-9 codes used in the diagnosis of sexually transmitted diseases[a]

Genital Herpes	
054.1	Genital herpes
054.10	Genital herpes unspecified
054.13	Herpetic infection of penis
054.19	Other genital herpes
Genital Warts	
078.11	Condyloma acuminatum
Chlamydia	
078.88	Other specified diseases due to Chlamydiae
079.88	Other specified chlamydial infection
079.98	Unspecified chlamydial infection
099.41	Other nongonococcal urethritis *Chlamydia trachomatis*
099.53	Other venereal diseases due to *Chlamydia trachomatis* lower genitourinary sites
099.54	Other venereal diseases due to *Chlamydia trachomatis* other genitourinary sites
099.55	Other venereal diseases due to *Chlamydia trachomatis* unspecified genitourinary site
Gonorrhea	
098.0	Gonococcal infection (acute) of lower genitourinary tract
098.1	Gonococcal infection (acute) of upper genitourinary tract
098.10	Gonococcal infection (acute) of upper genitourinary tract site unspecified
098.11	Gonococcal cystitis (acute)
098.12	Gonococcal prostatitis (acute)
098.13	Gonococcal epididymo-orchitis (acute)
098.14	Gonococcal seminal vesiculitis (acute)
098.15	Gonococcal cervicitis (acute)
098.16	Gonococcal endometritis (acute)
098.17	Gonococcal salpingitis specified as acute
098.19	Other gonococcal infection (acute) of upper genitourinary tract
098.2	Gonococcal infection (chronic) of lower genitourinary tract
098.30	Chronic gonococcal infection of upper genitourinary tract site unspecified
098.31	Gonococcal cystitis chronic
098.32	Gonococcal prostatitis chronic
098.33	Gonococcal epididymo-orchitis chronic
098.34	Gonococcal seminal vesiculitis chronic
Syphilis	
091.0	Genital syphilis (primary)
095.4	Syphilis of kidney
095.8	Other specified forms of late symptomatic syphilis
Epididymitis/orchitis not designated as due to Chlamydia or Gonococcus	
604	Orchitis and epididymitis
604.0	Orchitis, epididymitis, and epididymo-orchitis, with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess [excludes gonococcal (098.13 and 098.33), mumps (072.0), tuberculous (016.4 and 016.50)]

Continued on next page.

Table 1 (continued). ICD-9 codes used in the diagnosis of sexually transmitted diseases[a]

Epididymitis/orchitis (all codes)	
604	Orchitis and epididymitis
604.0	Orchitis, epididymitis, and epididymo-orchitis, with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess [excludes gonococcal (098.13 and 098.33) (which is included below), mumps (072.0), tuberculous (016.4 and 016.50)]
098.13	Gonococcal epididymo-orchitis (acute)
098.33	Gonococcal epididymo-orchitis (chronic)
Urethritis not designated as due to Chlamydia trachomatis or gonococcus	
099.4	Other non-gonococcal urethritis (including 099.40 Unspecified, and 099.49 Other specified organism) but excluding 099.41 Urethritis due to *Chlamydia trachomatis*
Urethritis (all codes)	
098.0	Gonococcal infection (acute) of lower genitourinary tract
098.2	Gonococcal infection (chronic) of lower genitourinary tract
099.4	Other nongonococcal urethritis (including 099.40 Unspecified, and 099.49 Other specified organism) but excluding 099.41 Urethritis due to *Chlamydia trachomatis* (which is included below)
099.41	Other nongonococcal urethritis *Chlamydia trachomatis*

[a]Codes limi
upper genitourinary tract.

STD infection (epididymitis/orchitis and urethritis). Epididymitis/orchitis and urethritis were included because of the likelihood of presentation to a urologist and the fact that STD pathogens are common etiologies. Sexually transmitted organisms are the most common cause of epididymitis in heterosexual men under 35 years of age (2); approximately two-thirds of the patients in this age group with acute epididymitis have epididymitis secondary to *N. gonorrhoeae* or *C. trachomatis* (3). Most urethritis is also the result of infection with a sexually transmitted organism (4). However, we excluded cases and visits for urethritis for Reiter Syndrome, urethritis designated as "not sexually transmitted," and urethral syndrome because their association with STDs is only partial. We also excluded acute or chronic prostatitis (unless there was a diagnosis code specifically linked to gonococcus in the data we examined) because the vast majority of prostatitis cases are not associated with an STD (5). We did not include proctocolitis, which may be due to sexual transmission of enteric pathogens, because this condition is rarely managed by urologists. Finally, we excluded common urinary tract infections (UTIs) of men or women that may be associated with sexual transmission, as these are addressed in another chapter.

Because of the limitations of the datasets used to quantify much of the burden of other diseases in this compendium, we relied heavily on the peer-reviewed literature for most of the summary statements about incidence and prevalence of the STDs and syndromic presentations. Several of these datasets are valuable for quantifying the overall health care burden for STDs, changes in demographic characteristics of persons with STDs, and the impact of STDs on minority populations. However, they do not readily allow for analyses restricted to cases seen exclusively by urologists.

We briefly discuss available data on the burden of other STDs that are rarely managed by urologists or are rare in general; these include HIV infection or its clinical manifestations, infection with HPV types associated with anogenital dysplasia and cancer, and hepatitis B. We also briefly discuss trichomoniasis, which was not included in the list of STDs fully investigated for burden of illness because of resource limitations. Although *Trichomonas vaginalis* infection commonly presents as a vaginitis, it is a frequent cause of lower urogenital tract infection that urologists may see and should think of when evaluating the etiology of urethritis in men or women. We briefly discuss chancroid, but because they occur

Table 2. Estimated incidence and prevalence of sexually transmitted diseases in the United States, 1996, by strength of evidence[a]

STD	Incidence[b]	Prevalence[c]
Chlamydia	3 million -II	2 million - II
Gonorrhea	650,000 - II	
Syphilis	70,000 - II	
Herpes	1 million - II	45 million - I
Human papilloma virus	5.5 million - III	20 million - III
Hepatitis B	77,000 - II	750,000 -I
Trichomoniasis	5 million - III	
Bacterial vaginosis	No estimates	
HIV	20,000 - II	560,000 - II
Total	15.3 million	

[a]Level I (good) surveillance data come from either representative national surveys or from national reporting systems with nearly complete counts. Level II (fair) surveillance data are derived from composite prevalence figures obtained from multiple populations over time or from less complete national reporting systems. Level III (poor) surveillance data are based on even weaker evidence and rough extrapolations.

[b]Incidence is the number of new cases in a given time period.

[c]Prevalence is the total number of cases in the population.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence, and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

rarely, we excluded lymphogranuloma venereum and granuloma inguinale. We excluded pediculosis pubis, scabies, hepatitis A virus (HAV) infection, bacterial vaginosis, and vulvovaginal candidiasis because these conditions are not necessarily the result of sexual exposure and are not usually associated with long-term sequelae managed by urologists. Finally, we excluded infection with hepatitis C virus (HCV) because it is rarely acquired through sexual exposure.

We used many claims databases to estimate aspects of the burden of STDs. Surveillance systems that capture national STD incidence data rely on cases, not medical visits; however, an episode of infection may result in more than one visit or claim. In interpreting analyses with various datasets, one must keep in mind that counts of medical visits are not the same as case counts, and that counts of both cases and office visits can reflect incident cases, prevalent cases, or a combination of the two. Given the nature of the datasets on which we performed primary analyses and given the reliance on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) coding in these datasets, the summary statements they permit concern relative burden of disease referent to office visits rather than to case counts or numbers of infected persons. Using claims data, we counted medical visit claims as a measure of burden, since they, in association with drug claims and procedure claims, constitute a large part of the economic burden of STDs.

Databases we used include hospital claims data for all inpatient care in many states, analysis and review data for Medicare patients, VA data, and inpatient and outpatient claims data for privately insured patients. Because most of those databases included only ICD-9 diagnostic codes, not procedure codes or drug codes, we used ICD-9 codes to capture the burden of STDs for three pathogen-specific STDs (herpes, chlamydia, and gonorrhea), genital warts, and two syndromic presentations of STD infection (epididymitis/orchitis and urethritis) measured by patient visits. There were too few visits for syphilis in these datasets to allow for reliable estimates. The following are brief descriptions of the databases used in the analyses discussed here.

DEFINITION AND DIAGNOSIS

To capture aspects of the burden of various STDs, we applied selected ICD-9 codes to datasets reflecting inpatient and outpatient visits to health care providers; these datasets and the methods of analysis are described in the methods chapter of this compendium. Our analyses of all datasets included visits associated with diagnostic codes for acute manifestations of the lower genitourinary tract or external genitalia and for selected sequelae due to ascension to the male upper genitourinary tract. Table 1 lists the codes used in the diagnosis of STDs. Except in the case of syphilis, we excluded visits associated with non-genitorurinary tract diagnostic codes or procedures, herpetic infections of the oropharynx, herpetic vulvovaginitis, herpetic ulceration of the vulva, herpetic infection without specification of anatomic site, gonoccoccal arthritis, neurosyphilis, salpingitis, oophoritis, endometritis, and pelvic inflammatory disease (PID) (unless specifically associated with gonococcal or chlamydial infection). We included ICD-9 codes for chlamydial infection of other and unspecified genitourinary sites and for gonococcal infection of the *upper genital tract* in order to include infections of the male genitourinary tract that urologists would be likely to manage. There are specific ICD-9 codes for cervicitis, endometritis, and salpingitis associated with gonorrheal infection but none for chlamydial infections specific to the cervix, endometrium, or Fallopian tubes. Because we wanted to address gonorrhea and chlamydial infections of the upper genital tract as consistently as possible, and because we did not restrict our analysis to male patients, the ICD-9 codes we included may have represented cases of cervicitis, endometritis, salpingitis, and oophoritis that urologists are unlikely to manage. However, a review of data from MarketScan show that patient visits associated with ICD-9 codes for chlamydial infection of *other* and *unspecified* anatomic sites and gonorrheal cervicitis, endometritis, and salpingitis are quite rare (Table 3). Therefore, our estimates of chlamydial and gonorrheal infection should largely represent lower urogenital tract infections that urologists may encounter.

In addition, the following three points should be noted:

1. We used the National Electronic Telecommunications Surveillance System (NETSS) as the sole data source for primary and secondary cases of syphilis in adolescents and adults in this project. None of the other available datasets contained sufficient numbers of syphilis cases to describe with any confidence the demographic and geographic distribution of the disease in the population. Because many cases of primary and secondary syphilis are diagnosed only with a serologic test and because the anatomic site of signs or symptoms is not reported, we were unable to exclude from NETSS data the cases of primary and secondary syphilis that lacked genitourinary symptoms and signs (e.g., palmar rash) and that urologists would, therefore, be unlikely to encounter.

2. Some patients have multiple diagnoses and could potentially have diagnoses of both the syndromic presentation of epididymitis/orchitis and an STD (e.g., a chlamydial or gonococcal infection). Therefore, we chose to analyze the available data in a way that enabled us to evaluate both aggregate data restricted to ICD-9 codes for epididymitis/orchitis not designated as due to chlamydia or gonococcus and aggregate data for all ICD-9 codes for epididymitis/orchitis. (If one were doing a straight addition, codes not designated as due to chlamydia or gonococcus would not be included in the numbers of visits for infection with chlamydia or gonococcus in which one of these organisms was likely the etiology of the patient's disease.) Accordingly, we used two different schemes for including visits for epididymitis/orchitis, according to ICD-9 codes, as indicated in Table 1.

3. Because urethritis is often observed in association with cystitis and pyelonephritis in acute, community-acquired urinary tract infections (UTIs), most clinicians commonly code urethritis as cystitis. Some patients with urethritis of probable STD etiology have multiple diagnoses and in the datasets examined could have both a diagnosis of the syndromic presentation of urethritis and a diagnosis of an STD (e.g., herpetic, chlamydial, or gonococcal infection). We chose to analyze the available data in such a way that one could evaluate both aggregate data restricted to both ICD-9 codes for urethritis not designated as due to chlamydia or gonococcus and aggregate data for all ICD-9 codes for urethritis. No specific ICD-9 code exists for urethritis secondary to herpetic infection. Accordingly, we used two different schemes for including visits for urethritis according to ICD-9 codes, as indicated in Table 1.

Unfortunately, the use of ICD-9 coding to assess the urologic burden of disease is limited because STD pathogens can cause pathology of multiple organ systems, and diagnoses linked with specific syndromes may or may not be related to infection with an STD pathogen. Linking ICD-9 codes with Current Procedural Terminology (CPT) codes for STD tests or surgical treatments, or with National Drug Codes (NDCs) for anti-infective treatment, can help identify diagnoses more likely to be related to an STD pathogen. However, CPT codes and NDCs were analyzed in only one of the datasets examined, MarketScan. Even in MarketScan, linking CPT codes or NDCs to establish a more specific definition of a visit is problematic because the dates associated with these codes may not always coincide with those of the ICD-9 codes, raising questions about the actual clinical association of the diagnostic and procedure codes. In analyzing MarketScan data, we made assumptions about time periods of infection and constructed dates around which overlap of ICD-9 codes, CPT codes, and/or NDCs could reasonably

Table 3. The numbers of inpatient and outpatient visits identified by ICD-9 codes for genital herpes, genital warts, chlamydial infection, gonorrhea, epididymitis/orchitis, and urethritis[a]

ICD-9 codes	Number of Inpatient Visits	Number of Outpatient Visits
Genital herpes		
054.1Genital herpes (total)	33	1,505
054.10 Genital herpes, unspecified	33	1,369
054.13 Herpetic infection of penis	0	93
054.19 Other	0	43
Genital warts		
078.11 Condyloma acuminatum	18	3,813
Chlamydia		
079.98 Chlamydia	11	373
099.53 Chlamydial cystitis, lower genitourinary sites	0	91
099.54 Other genitourinary sites	0	9
099.55 Unspecified genitourinary site	0	5
099.41 *Chlamydia trachomatis*	0	45
078.88 Other specified disease due to chlamydia	9	148
079.88 Other specified chlamydia infection	1	75
Gonorrhea		
098.0 Gonococcal infection (acute) of lower genitourinary tract	7	420
098.1 Gonococcal infection (acute) of upper genitourinary tract		
098.10 Gonococcal infection (acute) of upper genitourinary tract site unspecified	0	7
098.11 Gonococcal cystitis (acute)	0	6
098.12 Gonococcal prostatitis (acute)	0	10
098.13 Gonococcal epididymo-orchitis (acute)	0	2
098.14 Gonococcal seminal vesiculitis (acute)	0	0
098.15 Gonococcal cervicitis (acute)	1	42
098.16 Gonococcal endometritis (acute)	0	1
098.17 Gonococcal salpingitis specified as acute	0	8
098.19 Other gonococcal infection (acute) of upper genitourinary tract	2	5
098.2 Gonococcal infection (chronic) of lower genitourinary tract	0	85
098.33 Gonococcal epididymo-orchitis chronic	0	3
098.31 Gonococcal cystitis chronic	0	0
098.30 Chronic gonococcal infection of upper genitourinary tract site unspecified	0	0
098.32 Gonococcal prostatitis chronic	0	3
098.34 Gonococcal seminal vesiculitis chronic	0	0
Epididymitis/orchitis not designated as due to Chlamydia or gonococcus		
604 Orchitis and epididymitis		
604.0 Orchitis, epididymitis, and epididymo-orchitis, with abscess of epididymis or testis		
604.9 Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess	0	28

Continued on next page

Table 3 (continued). The numbers of inpatient and outpatient visits identified by ICD-9 codes for genital herpes, genital warts, chlamydial infection, gonorrhea, epididymitis/orchitis, and urethritis[a]

ICD-9 Codes	Number of Inpatient Visits	Number of Outpatient Visits
Epididymitis/orchitis regardless of whether or not due to Chlamydia or gonococcus		
604 Orchitis and epididymitis		
604.0 Orchitis, epididymitis, and epididymo-orchitis, with abscess of epididymis or testis		
604.9 Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess	0	28
098.13 Gonococcal orchitis	14	1,552
098.33 Chronic gonococcal orchitis	0	1
Urethritis not designated as due to Chlamydia or gonococcus:		
099.40 Unspecified	0	355
099.49 Other specified organism	0	7
Urethritis regardless of whether or not due to Chlamydia or gonococcus:		
099.40 Unspecified	0	354
099.49 Other specified organism	0	7
099.41 Urethritis due to *Chlamydia trachomatis*	0	45
098.0 Acute gonococcal infection of the lower genitourinary tract	7	419
098.2 Chronic gonococcal infection of the lower genitourinary tract	0	85

[a]Numbers limited to enrollees who were continuously enrolled in a health plan throughout 1999.
[b]Males ages 16-35 years only.
SOURCE: MarketScan, 1999.

reflect a clinical association.

Finally, in interpreting the various claims and office visit datasets, it is important to keep in mind that ICD-9 codes for bacterial STDs tend to reflect incident cases that are treatable, whereas ICD-9 codes for viral STDs such as HPV and HSV tend to reflect prevalent cases with chronic manifestations that may involve extended therapy.

INCIDENCE, PREVALENCE, RISK FACTORS, AND HIGH-RISK GROUPS

Herpes Simplex

Background

An estimated 1 million people in the United States are newly infected each year with herpes simplex virus type two (HSV-2), the most common genital type. Since the late 1970s, the prevalence of HSV-2 infection has increased by 30%, and HSV-2 is now detectable in roughly one of every five persons over 11 years of age nationwide (6). The National Health and Nutrition Examination Surveys (1988–1994) (NHANES-III) reported that more than 25% of adults between 30 and 39 years of age were positive on serology for HSV-2 in those years (6). NHANES-III indicates that HSV-2 infection is more common in women than in men, affecting approximately one out of every four women, in contrast to fewer than one out of every five men (6). This may reflect differences in sexual behavior or more efficient transmission from male to females than from females to males (6).

HSV-2 infection increased fivefold among Caucasian teens (aged 12 to 19 years) between the 1970s and the 1990s, faster than among any other age or racial/ethnic group (6). Among Caucasians 20 to 29 years of age, the prevalence of HSV-2 infection increased twofold over that period. The percentage of people infected with either HSV-1 or HSV-2 increases with age, because people remain infected throughout their lives (7). Among persons 15 to 39 years of age, annual incidence of HSV-2 infection has been projected to increase steadily between 2000 and 2025, from 9 to 26 infections per 1,000 men and from 12 to 32 infections per 1,000 women; prevalence is projected to increase to 39% among men and 49% among women (8).

HSV-2 infection continues to spread across all social, economic, racial, and ethnic groups and is common in both urban and rural areas. There are no significant differences in prevalence among geographic regions of the United States. Although HSV-2 infection is increasing among young Caucasians, who have a seroprevalence of approximately 17%, infection is more common among African-Americans, who have a seroprevalence of 45% (6).

The principal symptoms of herpes—recurrent painful ulcers of the genitalia, perineum, and perianal area—can be treated, but the infection cannot be eliminated. However, most people with positive HSV serology do not have symptomatic infection that results in medical visits or in costs to the health care system (9). In NHANES-III, fewer than 10% who tested positive for HSV-2 had been symptomatic with genital herpes and knew they were infected (6); these numbers do not take into account the sizable percentage of genital herpes cases caused by HSV-1. With or without recognizable symptoms, HSV infection can be transmitted between sex partners and from mothers to newborns, and it is potentially fatal in infants born to infected women (6). Genital herpes can be particularly severe in people with HIV infection; it may cause genital ulcers and may increase HIV viral load, which increases the risk of HIV transmission (10).

_The cost of incident herpes infections in the United States in 2000 was estimated to be $1.8 billion, but because of the increasing incidence, this cost has been predicted to rise to $2.5 billion by 2015 and $2.7 billion by 2025 (8).

In the National Disease and Therapeutic Index (NDTI), the number of initial visits to clinicians' offices per year for genital herpes rose from fewer than 10,000 in 1966–1970 to more than 150,000 in 1995–2001. In the NDTI and in the other datasets we analyzed, the unit of analysis is health care system contacts, not the actual numbers of genital herpes cases; the exception to this is the Veterans Health Administration (VA) claims data in which the unit of analysis is the individual patient. Patients with genital herpes may seek care in public health care facilities or from private ambulatory care providers and, as a consequence, may not be captured in certain datasets. However, the datasets we analyzed are useful for describing trends in care-seeking behavior for genital herpes. For any population in a given dataset, the total numbers of patient visits for genital herpes are minimum estimates of contacts with health care providers; thus, patient visits for initial episodes do not necessarily reflect incident cases._

The Data

Healthcare Cost and Utilization Project (HCUP) data indicate that hospitalization for genital herpes is a rare event that has decreased in frequency over time, possibly due to the increased availability of outpatient medication that reduces the severity and duration of symptoms (Table 4). In 1994, 930 patients were hospitalized with a primary diagnosis of genital herpes, of whom 716 (77%) were 18 to 44 years of age. Hospitalizations decreased progressively after 1994, declining to 388 in 2000, of which 295 (76%) were women, 161 (42%) resided in the South, and 339 (87%) resided in urban areas.

Hospital outpatient and inpatient data generated by the Centers for Medicare and Medicaid Services (CMS) from 1992 through 1998 contained too few claims for genital herpes to permit detailed interpretation. According to the Medicare outpatient files, physician office visit rates increased from 12 visits per 100,000 beneficiaries in 1992 to 17 per 100,000 in 1998 (Table 5). It is likely that this increase reflects the greater use of outpatient management of genital herpes with drugs that reduce the severity and duration of symptoms. In 1998, the rates seen among male and female Medicare beneficiaries were identical (17 per 100,000); the highest rates were seen among persons under 65 years of age (42 per 100,000), those residing in the West (23 per 100,000), and Hispanics (40 per 100,000). Note that Medicare beneficiaries under age 65 include the disabled and persons with end-stage renal disease and are distinct from Medicare beneficiaries 65 and older.

Genital herpes was the most common pathogen-specific STD presentation in 2001 VA data, with a total of 118 cases per 100,000 unique outpatients (Table 6). The highest rates were seen among women (426 per 100,000), persons 25 to 34 years of age (543 per 100,000), African Americans (214 per 100,000), and those residing in the West (176 per 100,000) (Table 7). Progressive increases were noted in the counts and rates of patients diagnosed with genital herpes from

Table 4. Inpatient hospital stays by individuals with genital herpes listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	930	0.4 (0.3–0.4)	441	0.2 (0.1–0.2)	517	0.2 (0.1–0.2)	388	0.1 (0.1–0.2)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	188	0.8 (0.5–1.0)	*	*	*	*	*	*
25–34	314	0.8 (0.5–1.0)	*	*	*	*	*	*
35–44	214	0.5 (0.3–0.7)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	359	0.2 (0.1–0.2)	220	0.1 (0.1–0.2)	151	0.1 (0.0–0.1)	*	*
Black	318	1.0 (0.6–1.4)	*	*	156	0.5 (0.3–0.7)	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	401	0.3 (0.2–0.4)	164	0.1 (0.1–0.2)	*	*	*	*
Female	529	0.4 (0.3–0.5)	277	0.2 (0.2–0.3)	400	0.3 (0.2–0.4)	295	0.2 (0.2–0.3)
Region								
Midwest	173	0.3 (0.2–0.4)	*	*	*	*	*	*
Northeast	196	0.4 (0.2–0.5)	*	*	*	*	*	*
South	494	0.6 (0.4–0.8)	*	*	234	0.2 (0.1–0.4)	161	0.2 (0.1–0.2)
West	*	*	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	807	0.4 (0.3–0.5)	411	0.2 (0.2–0.2)	449	0.2 (0.2–0.3)	339	0.2 (0.1–0.2)

*Figure does not meet standard for reliability or precision; MSA, metropolitan statistical area.

[a]Rate per 10
Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

1999 through 2001 in most strata (age, gender, race/ethnicity, insurance status, and region).

The 1999 MarketScan data reported 1,505 outpatient visits and 33 inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 3. A much higher rate of visits was observed among women enrollees (88 per 100,000) than among men (50 per 100,000) (Table 8). The highest rates were seen among persons aged 25 to 29 years of age (182 per 100,000). This is consistent with the serologic findings discussed below and may reflect additional diagnoses made through screening of pregnant women by medical history or HSV serologic testing. It should be noted that initial episodes of genital herpes, which tend to be most symptomatic, are more likely to prompt medical care and to represent incident infections. Later episodes are less likely to have severe symptoms, and patients with recurrent episodes who are aware of genital herpes symptoms may be less likely to seek care.

Table 5. Physician office visits by Medicare beneficiaries with genital herpes listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	4,200	12 (12–13)	5,980	17 (16–17)	5,720	17 (17–17)
Total < 65	1,280	23 (22–25)	2,220	36 (35–38)	2,580	42 (40–43)
Total 65+	2,920	10 (9.7–10)	3,760	13 (12–13)	3,140	11 (11–12)
Age						
65–74	1,980	12 (12–13)	2,440	15 (14–16)	1,820	13 (12–13)
75–84	880	9.3 (8.7–9.9)	1,180	12 (12–13)	1,180	12 (12–13)
85–94	60	2.1 (1.6–2.6)	140	4.6 (3.8–5.3)	140	4.5 (3.8–5.3)
95+	0	0.0	0	0.0	0	0.0
Race/ethnicity						
White	3,320	11 (11–12)	4,540	15 (15–15)	4,000	14 (14–15)
Black	520	18 (16–19)	1,000	31 (29–33)	1,100	35 (33–38)
Asian	…	…	40	24 (17–31)	100	32 (25–38)
Hispanic	…	…	160	40 (34–46)	280	40 (35–45)
N. American Native	…	…	…	…	…	…
Gender						
Male	2,220	15 (14–16)	2,440	16 (15–17)	2,460	17 (16–18)
Female	1,980	10.0 (9.6–10)	3,540	18 (17–18)	3,260	17 (17–18)
Region						
Midwest	620	7.1 (6.5–7.7)	980	11 (10–12)	820	9.5 (8.9–10)
Northeast	580	7.5 (6.9–8.1)	1,160	15 (14–16)	1,120	17 (16–18)
South	1,860	15 (15–16)	2,240	18 (17–18)	2,500	20 (19–21)
West	1,100	22 (20–23)	1,400	27 (26–28)	1,160	23 (22–25)

…data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 6. Frequency of sexually transmitted diseases as a diagnosis in VA patients seeking outpatient care, 2001, count[a], rate[b]

	Primary Diagnosis		*Any Diagnosis*	
Sexually Transmitted Disease	**Count**	**Rate**	**Count**	**Rate**
Genital herpes	2,324	63	4,357	118
Genital warts	2,224	60	2,846	77
Chlamydia	380	10	515	14
Gonorrhea	473	13	634	17
Syphilis	71	2	100	3
Epididymitis (organism unspecified)[c]	1,519	41	1,833	50
Epididymitis (all cases)[c]	1,557	42	1,889	51
Urethritis (organism unspecified)	185	5	233	6
Urethritis (all cases)	590	16	771	21

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

[c]Includes males only.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY2001.

Table 7. Frequency of genital herpes[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	**Rate**	**Count**	**Rate**	**Count**	**Rate**
Total	**2,918**	**96**	**3,433**	**105**	**4,357**	**118**
Age						
18–24	89	351	103	438	116	504
25–34	576	382	621	437	738	543
35–44	724	219	823	264	943	315
45–54	865	126	956	133	1,262	168
55–64	340	68	491	89	693	107
65–74	245	32	309	37	445	47
75–84	73	14	124	19	148	18
85+	6	12	6	10	12	15
Race/ethnicity						
White	1,122	82	1,321	90	1,587	99
Black	598	179	649	189	758	214
Hispanic	128	112	150	122	212	164
Other	11	57	16	79	23	105
Unknown	1,059	88	1,297	98	1,777	113
Gender						
Male	2,439	84	2,844	91	3,655	104
Female	479	339	589	390	702	426
Region						
Midwest	587	85	629	84	708	85
Northeast	550	75	576	74	701	81
South	1037	102	1,326	119	1,717	133
West	744	124	902	142	1,231	176
Insurance status						
No insurance/self-pay	2,241	123	2,521	139	3,114	164
Medicare/Medicare supplemental	256	37	350	38	478	40
Medicaid	6	121	8	101	18	200
Private insurance/HMO/PPO	377	78	495	97	675	122
Other insurance	38	150	57	198	66	198
Unknown	0	0	2	81	6	66

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for genital herpes.

[b]The term cou
weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 8. Medical visits[a] for genital herpes in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	8	3 (1–6)
10–14	8	5 (1-8)
15–19	106	57 (46–67)
20–24	162	141 (119–163)
25–29	179	182 (156–209)
30–34	244	171 (150–192)
35–39	238	125 (110–141)
40–44	198	92 (79–104)
45–54	287	61 (54–68)
55–64	105	29 (24–35)
65+	3	32 (0–69)
Gender		
Male	529	50 (46–54)
Female	1,009	88 (82–93)
Region		
Midwest	352	68 (61–75)
Northeast	271	72 (64–81)
South	644	69 (63–74)
West	111	100 (82–119)
Unknown	160	61 (51–70)
Urban/rural		
MSA	1,152	79 (74–83)
Non-MSA	226	47 (41–54)
Unknown	160	61 (51–70)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Recurrent episodes of genital herpes also tend to become less frequent over time. This may explain why claims and visits for symptomatic genital herpes tend to peak in the younger age groups, as visits are generated for incident cases soon after infection, while HSV infection is more prevalent in older ages, as noted above. In MarketScan data, rates of inpatient and outpatient visits for genital herpes varied by geographical region, ranging from 100 per 100,000 enrollees in the West to 61 to 72 per 100,000 in the other regions. A marked difference in rates was also seen between urban areas (79 per 100,000) and rural areas (47 per 100,000).

For the 1,505 outpatient visits for genital herpes reported in the 1999 MarketScan data, 537 drug claims were filed for acyclovir, famcyclovir, or valacyclovir on the same date as an outpatient medical claim for genital herpes, and a total of 1,025 drug claims were filed for one of these drugs within 30 days after the outpatient visit. Drug claims were not analyzed for the small number of inpatient visits ICD-9 coded for genital herpes. In addition, 87,029 drug claims were filed for one of these three same drugs, regardless of ICD-9 codes for patient visits. Another recent study has underscored the difficulty of using drug claims for acyclovir as a way to estimate the burden of symptomatic genital herpes (11). Only 2% of the persons with acyclovir claims had ICD-9 codes for genital herpes, 9% had ICD-9 codes for herpes in nongenital sites (ICD-9 code 054 excluding 054.1), 6% had ICD-9 codes for herpes zoster (ICD-9 code 053), and 80% had ICD-9 codes for other medical care. Of those with ICD-9 codes for genital herpes, 27% did not have acyclovir claims.

Genital Warts

Background

Most genital warts are the result of infection with HPV type 6 or 11. Genital warts occur in sites on the external genitalia and can also occur in the vagina, urethra, and anus. Overall, the best estimates of the prevalence of genital warts are based on selected studies with extrapolations. Approximately 1% of sexually active adults in the United States are estimated to have genital warts. This estimate is based on levels of infection ranging from 1.5% among female college students treated in student health centers to 13% of patients in selected STD clinics (12, 13). A recent analysis of health care claims data from a private US health plan found that the prevalence of (and health plan costs associated with) genital warts billed through the health plan were highest among women 20 to 24 years of age (6.2 cases and $1,692 in costs per 1,000 person-years) and men 25 to 29 years of age (5.0 cases and $1,717 in costs per 1,000 person-years) (14). Risk factors for developing genital warts have been difficult to assess because of the lack of a marketed diagnostic test specific for HPV types 6 and 11 or other types associated with warts. However, urologists and other clinicians who engage in procedures directed at ameliorating genital

Table 9. Inpatient hospital stays by individuals with genital warts listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	562	0.2 (0.2–0.3)	337	0.1 (0.1–0.2)	296	0.1 (0.1–0.1)	315	0.1 (0.1–0.2)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	*	*	*	*	*	*	*	*
25–34	173	0.4 (0.2–0.6)	*	*	*	*	*	*
35–44	*	*	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	298	0.2 (0.1–0.2)	162	0.1 (0.0–0.1)	*	*	*	*
Black	*	*	*	*	*	*	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	325	0.3 (0.2–0.3)	167	0.1 (0.1–0.2)	171	0.1 (0.1–0.2)	207	0.2 (0.1–0.2)
Female	237	0.2 (0.1–0.2)	170	0.1 (0.1–0.2)	*	*	*	*
Region								
Midwest	*	*	*	*	*	*	*	*
Northeast	195	0.4 (0.2–0.6)	*	*	*	*	*	*
South	232	0.3 (0.2–0.4)	*	*	*	*	*	*
West	*	*	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	515	0.3 (0.2–0.4)	310	0.2 (0.1–0.2)	268	0.1 (0.1–0.2)	280	0.1 (0.1–0.2)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 10
Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

warts lesions should note that the possibility exists for nosocomial disease transmission through exposure to an aerosolized plume from HPV-infected tissue when using a carbon-dioxide laser (15, 16).

The primary goal in the treatment of visible genital warts is the removal of those that obstruct the urethra, vagina, anus, or oral cavity; cause discomfort, pain, or bleeding in the anogenital areas; or cause cosmetic problems. In the National Disease and Therapeutic Index (NDTI)I, the number of initial visits to physicians' offices for genital warts has risen from about 80,000 per year in 1966–1969 to more than 150,000 in every year since 1972. As with genital herpes, data from the NDTI and the other datasets used in this analysis (with the exception of the VA claims data) reflect health care system contacts, not the actual numbers of cases. However, year-to-year NDTI data are useful for describing trends in care-seeking in private physician's offices, although not in public health care facilities or from other private ambulatory care providers. Therefore, for any population in a given dataset, the total numbers of patient visits for genital warts are minimum estimates of health care contacts.

The Data

According to HCUP data, hospitalization for genital warts (ICD-9 code 078.11 only) is a very rare event that has remained stable over time (Table 9). In 2000, there was a weighted frequency of 315 hospitalizations with a primary diagnosis of genital warts, of which 207 (66%) were men and 280 (89%) resided in urban areas.

In all CMS databases examined, the diagnosis of genital warts was too rare to permit statistically meaningful interpretation (Table 10). Hospital outpatient visit rates for genital warts increased from 1.5 per 100,000 beneficiaries in 1995 to 4.0 per 100,000 in 1998; of an estimated 1,340 visits in 1998, the highest rates were seen among men (5.7 per 100,000) and persons under 65 years of age (16 per 100,000). ICD-9 codes for genital warts were revised substantially after 1992, resulting in increased specificity.

Table 10. Outpatient hospital visits by Medicare beneficiaries with genital warts listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992[c]		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[d]	7,440	22 (21–22)	520	1.5 (1.3–1.6)	1,340	4.0 (3.8–4.2)
Total < 65	3,320	61 (59–63)	420	6.8 (6.2–7.5)	980	16 (15–17)
Total 65+	4,120	14 (14–15)	100	0.3 (0.3–0.4)	360	1.3 (1.2–1.5)
Age						
65–74	2,380	14 (14–15)	40	0.2 (0.2–0.3)	300	2.1 (1.9–2.3)
75–84	1,320	14 (13–15)	60	0.6 (0.5–0.8)	60	0.6 (0.5–0.8)
85–94	360	13 (11–14)	0	0.0	0	0.0
95+	60	18 (13–22)	0	0.0	0	0.0
Race/ethnicity						
White	5,460	19 (18–19)	400	1.3 (1.2–1.4)	900	3.2 (3.0–3.4)
Black	920	31 (29–33)	100	3.1 (2.5–3.7)	260	8.4 (7.4–9.4)
Asian	…	…	…	…	…	…
Hispanic	…	…	…	…	60	8.5 (6.4–11)
N. American Native	…	…	…	…	…	…
Gender						
Male	3,740	25 (25–26)	380	2.5 (2.2–2.7)	820	5.7 (5.3–6.1)
Female	3,700	19 (18–19)	140	0.7 (0.6–0.8)	520	2.7 (2.5–3.0)
Region						
Midwest	2,260	26 (25–27)	240	2.7 (2.3–3.0)	420	4.9 (4.4–5.3)
Northeast	2,000	26 (25–27)	140	1.8 (1.5–2.1)	280	4.2 (3.7–4.7)
South	1,080	8.8 (8.3–9.4)	60	0.5 (0.4–0.6)	420	3.4 (3.1–3.7)
West	2,080	41 (39–43)	80	1.5 (1.2–1.9)	220	4.4 (3.9–5.0)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]ICD-9 codes for genital warts were revised substantially after 1992, resulting in increased specificity. Counts for 1992 re ect the relative lack of specificity in coding for that year as compared to subsequent years.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 11. Frequency of genital warts[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	2,673	88	2,809	86	2,846	77
Age						
18–24	71	280	64	272	62	269
25–34	434	288	421	296	409	301
35–44	647	196	657	210	622	207
45–54	829	120	939	131	938	125
55–64	369	74	402	73	465	72
65–74	231	30	223	27	253	27
75–84	87	16	96	15	86	11
85+	5	10	7	12	11	14
Race/ethnicity						
White	1,356	99	1,378	94	1,373	85
Black	480	144	502	147	500	141
Hispanic	59	52	76	62	81	63
Other	11	57	13	64	6	27
Unknown	767	64	840	64	886	56
Gender						
Male	2,522	87	2,635	84	2,697	76
Female	151	107	174	115	149	90
Region						
Midwest	647	94	701	94	673	81
Northeast	488	67	483	62	461	53
South	983	97	1,032	92	1,098	85
West	555	92	593	93	614	88
Insurance status						
No insurance/self-pay	2,037	112	2,139	118	2,142	113
Medicare/Medicare supplemental	315	45	324	35	359	30
Medicaid	12	242	12	152	13	145
Private insurance/HMO/PPO	278	57	302	59	304	55
Other insurance	29	115	31	108	28	84
Unknown	2	105	1	41	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for genital warts.

[b]The term cou
weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 12. Medical visits[a] for genital warts in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	61	25 (19–31)
10–14	92	53 (42–64)
15–19	390	209 (188–229)
20–24	597	520 (478–562)
25–29	458	466 (424–509)
30–34	498	349 (318–380)
35–39	445	235 (213–256)
40–44	374	173 (156–191)
45–54	601	127 (117–137)
55–64	309	87 (77–96)
65+	6	64 (13–116)
Gender		
Male	1,722	163 (156–171)
Female	2,109	183 (176–191)
Region		
Midwest	1,030	199 (187–211)
Northeast	756	201 (187–216)
South	1,475	158 (149–166)
West	141	127 (106–148)
Unknown	429	163 (147–178)
Urban/rural		
MSA	2,717	186 (179–192)
Non-MSA	685	144 (133–154)
Unknown	429	163 (147–178)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

In 2001 VA data, genital warts were the second most common pathogen-specific STD presentation, with a total of 77 cases per 100,000 unique outpatients (Table 6). As with genital herpes, the highest rates of genital warts in 2001 were seen among women (90 cases per 100,000 unique outpatients), persons 25 to 34 years of age (301 per 100,000), and African Americans (141 per 100,000) (Table 11). However, unlike genital herpes, no consistent trend was seen when comparing case counts and rates from 1999 through 2001 across age groups, gender, race/ethnicity, insurance status, and region (Table 11).

The 1999 data from MarketScan had 3,813 outpatient visits and 18 inpatient visits for genital warts accompanied by a claim for services associated with ICD-9 code 078.11 (Table 3). There were 2,109 medical visits for genital warts by women and 1,722 by men, the rates per 100,000 enrollees being 183 and 163, respectively (Table 12). The highest rates were seen among those 20 to 24 years of age (520 per 100,000). Rates varied by geographical region, from 127 per 100,000 in the West to 201 per 100,000 in the Northeast. A difference was also seen between urban (186 per 100,000) and rural (144 per 100,000) residents.

By defining an episode of genital warts with ICD-9 code 078.10 (wart – common, digitate, filiform, infectious, viral) or 078.19 (other specified viral warts – genital warts, verruca plana, verruca plantaris) linked with CPT procedure codes for the destruction or excision of a lesion of the anus, penis, vulva, perineum, vagina, or introitus, one might identify more patients with genital warts. Claims for drugs used principally to treat genital warts could also identify many patients with the condition: in the 1999 Marketscan data, there were 5,056 drug claims for imiquimod (where the prescription was obtained from a urologist or gynecologist), podofilox, or podophyllin, and 1,356 claims in which the visits included ICD-9 code 078.10 or 78.19 accompanied by CPT codes for procedures to destroy or excise a lesion of the anus, penis, vulva, perineum, vagina, or introitus.

Using National Ambulatory Medical Care Survey (NAMCS) data, we estimated that of the 4.5 million medical visits per year for genital warts, many more were for possible cases (4 million) than for definite cases (0.25 million) or probable cases (0.25 million). Please see the methods chapter for a detailed discussion of definite, probable, and possible cases. Further exploration of this dataset as a source of information on genital warts will require an in-depth understanding of the coding practices of office-based clinicians with respect to diagnoses and procedures.

In both the MarketScan and NAMCS datasets, women made the majority of outpatient visits for genital warts. Further exploration of the datasets will be necessary to determine if this preponderance represents a greater incidence or prevalence among women, or whether it merely reflects differences in care-seeking behavior. For example, genital warts in women are more likely to come to medical attention than genital warts in men, if only because women periodically seek Pap smears. In contrast, in the HCUP data, men made the majority of inpatient visits. One possible explanation for the difference in the sex distribution of inpatients and outpatients receiving wart care may be that ablative procedures for anogenital warts in men are more commonly performed by hospital-based surgeons, while anogenital warts in women are more commonly managed with ablative and nonablative procedures by office-based gynecologists.

Chlamydia

Background

Chlamydia trachomatis infection causes inflammation of the lower and upper genital tract and presents commonly as cervicitis, salpingitis, endometritis, and urethritis in women, and urethritis, epididymitis, orchitis, prostatitis, and proctitis in men. *C. trachomatis* also causes asymptomatic infection that can result in serious and costly sequelae if acute infection is not treated promptly and properly. Congenitally exposed infants may develop neonatal inclusion conjunctivitis and pneumonitis syndromes. Over the past two decades, there has been a dramatic increase in the use of various measures for diagnostic testing of symptomatic patients and screening of asymptomatic patients. Tests include rapid, nonculture monoclonal antibody-based tests, enzyme immunoassays (EIAs), nucleic acid probe tests, and nucleic acid amplification tests (NAATs). These tests may detect *C. trachomatis* in endocervical or urethral specimens or in urine (17).

Primarily because of increased efforts to screen and treat women for chlamydial infection, the incidence of chlamydia is estimated to have decreased from well over 4 million annual infections in the early 1980s to the current level of 3 million new cases annually, of which up to 75% are asymptomatic (1). The annual economic burden of sexually transmitted chlamydial infections and related sequelae, including PID, ectopic pregnancies, and tubal infertility, was estimated to exceed $2 billion in 1994 (18).

Of the reportable STDs in the United States, chlamydia is the most widespread. In 2001, a total of 783,242 cases (278 per 100,000 population) were reported to the Centers for Disease Control and Prevention (CDC). These included cases with and without symptoms or signs detected during medical examinations or routine screening. Forty percent of the cases of chlamydia were reported among persons 15 to 19 years of age. Reported prevalence among routinely screened, sexually active women is

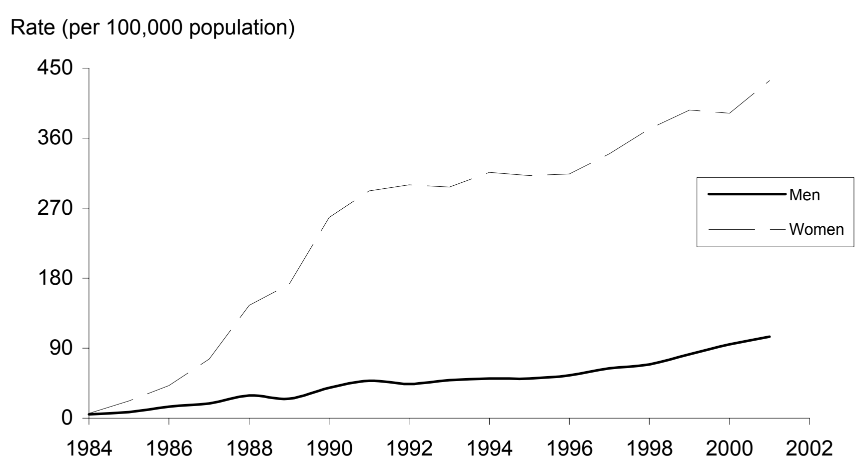

Figure 1. ***Chlamydia* – Rates by gender: United States, 1984–2001.**

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Chlamydia Prevalence Monitoring Project - Annual Report 2001. Available at: http://www.cdc.gov/std/chlamydia2001/CT2001text.pdf.

consistently greater than 5%, and prevalence among teenage girls often exceeds 10%. In 1996–1999, 9.5% of the women 17 to 37 years of age routinely screened for STDs during their induction into the US Army tested positive for chlamydial infection (19). In addition, 15.6% of adolescent girls entering juvenile detention facilities where chlamydia screening was routine tested positive (20). Prevalence rates tend to be high in STD clinics or other settings where clients present with symptoms. Chlamydial infection is common among all races and ethnic groups, but prevalence is generally higher among women than among men (Figure 1). Using the LCx assay (Abbott Laboratories, Abbott Park, IL) for *C. trachomatis*, urine samples have been tested on a representative sample of participants 14 to 39 years of age in the 1999-2000 NHANES data (21). The prevalence of *C. trachomatis* infection was 2.6% with no significant difference between male and females. Routine screening in family planning clinics reveals that chlamydial infection is more prevalent in areas without long-standing screening and treatment programs; in 1999, 7 of the 10 states with the highest rates were in the South (13).

The advent of routine screening programs for female adolescents and young women has greatly influenced estimates of the distribution of infection. For example, there are more cases or visits based on positive laboratory tests in women than in men because of the large number of infections detected through female screening programs. Also, high rates of chlamydial infection in certain jurisdictions or among certain populations may indicate more effective screening programs and use of more sensitive tests, rather than a higher underlying incidence of disease. However, screening is not comprehensive. A Health Plan Employer Data and Information Set (HEDIS) report recently indicated that of women eligible for chlamydia screening under national screening guidelines (22), 19% of those 16 to 20 years of age and 16% of those 21 to 26 years of age received screening in managed care organizations that reported screening rates to the National Committee of Quality Assurance (NCQA) in 2000 (23). Selected public sector programs (STD clinics, prenatal clinics, and family planning clinics) screen higher percentages of women. Inclusion of screening costs for patients with positive test results must be considered in analyses of the overall economic burden of STDs.

The Data

HCUP data indicate that hospitalization for chlamydial infection is a rare event that has decreased over time (Table 13). In 1994, a total of 2,278 patients were hospitalized with a primary diagnosis of chlamydial infection; the number decreased to 183 in 2000.

Medicare data on hospital outpatient and inpatient visits for chlamydial infection from 1995 through 1998 were too sparse to permit meaningful interpretation (Table 14). For example, Medicare hospital outpatient visit rates decreased from 2.8 per 100,000 beneficiaries in 1995 to 1.4 per 100,000 in 1998.

In 2001 VA data, chlamydial infection was the fourth most common pathogen-specific STD presentation, with a total of 14 cases per 100,000 unique outpatients (Table 6). The highest rates were seen among women (76 per 100,000), persons under 25 years of age (226 per 100,000), African Americans (52 per 100,000), and persons residing in the West (16 per 100,000) (Table 15). The higher rates observed among women and persons under 25 years of age may be due in part to higher rates of screening of younger women who are asymptomatic, especially in family planning, prenatal, and STD clinics. No consistent trend was seen when comparing case counts and rates from 1999 through 2001 across age groups, gender, race/ethnicity, insurance status, and region.

The 1999 MarketScan data had 746 outpatient visits and 21 inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes for chlamydial infection listed in Table 3. Of these 767 visits, 558 were by women and 209 were by men, the rates being 49 and 20 per 100,000 enrollees, respectively (Table 16). The highest rates of visits were by persons 20 to 24 years of age (105 per 100,000). The higher rates observed among women and persons under 25 years of age may be due in part to higher rates of screening of younger asymptomatic women during family planning and prenatal care. Rates did not vary greatly by geographical region, ranging from 31 per 100,000 in the Midwest to 39 per 100,000 in the Northeast. However, a marked difference was seen between urban (38 per 100,000) and rural (24 per 100,000) residents. The higher rates observed among urban residents may be due in part to higher rates of screening in urban areas, not greater

Table 13. Inpatient hospital stays by individuals with *Chlamydia* listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	2,278	0.9 (0.6–1.2)	684	0.3 (0.2–0.3)	272	0.1 (0.1–0.1)	183	0.1 (0.0–0.1)
Age								
< 14	1,548	2.9 (1.4–4.4)	268	0.5 (0.3–0.6)	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	172	0.7 (0.4–1.0)	*	*	*	*	*	*
25–34	*	*	*	*	*	*	*	*
35–44	*	*	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	411	0.2 (0.2–0.3)	337	0.2 (0.1–0.2)	*	*	*	*
Black	434	1.4 (0.9–1.9)	154	0.5 (0.3–0.6)	*	*	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Other	*	*	*	*	*	*	*	*
Gender								
Male	1,052	0.8 (0.4–1.3)	231	0.2 (0.1–0.2)	*	*	*	*
Female	1,226	1.0 (0.6–1.2)	453	0.3 (0.2–0.4)	224	0.2 (0.1–0.2)	164	0.1 (0.1–0.2)
Region								
Midwest	315	0.5 (0.3–0.7)	*	*	*	*	*	*
Northeast	1,364	2.7 (1.0–4.3)	317	0.6 (0.4–0.8)	*	*	*	*
South	430	0.5 (0.3–0.7)	*	*	*	*	*	*
West	169	0.3 (0.2–0.4)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	2,022	1.1 (0.6–0.5)	566	0.3 (0.2–0.3)	229	0.1 (0.1–0.2)	163	0.1 (0.0–0.1)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 10
Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 14. Outpatient hospital visits by Medicare beneficiaries with *Chlamydia* listed as primary diagnosis, count[a], rate[b] (95% CI)

	1995		1998	
	Count	Rate	Count	Rate
Total all ages[c]	980	2.8 (2.6–2.9)	460	1.4 (1.2–1.5)
Total < 65	440	7.2 (6.5–7.8)	240	3.9 (3.4–4.3)
Total 65+	540	1.8 (1.7–2.0)	220	0.8 (0.7–0.9)
Age				
65–74	380	2.3 (2.1–2.6)	120	0.8 (0.7–1.0)
75–84	160	1.7 (1.4–1.9)	100	1.1 (0.8–1.3)
85–94	0	0.0	0	0.0
95+	0	0.0	0	0.0
Race/ethnicity				
White	540	1.8 (1.6–1.9)	280	1.0 (0.9–1.1)
Black	260	8.1 (7.1–9.1)	100	3.2 (2.6–3.9)
Asian	…	…	…	…
Hispanic	100	25 (20–30)	20	2.8 (1.6–4.1)
N. American Native	…	…	20	37 (20–54)
Gender				
Male	400	2.6 (2.4–2.9)	220	1.5 (1.3–1.7)
Female	580	2.9 (2.6–3.1)	240	1.3 (1.1–1.4)
Region				
Midwest	80	0.9 (0.7–1.1)	60	0.7 (0.5–0.9)
Northeast	460	6.0 (5.4–6.5)	180	2.7 (2.3–3.1)
South	240	1.9 (1.7–2.1)	120	1.0 (0.8–1.1)
West	180	3.5 (3.0–4.0)	80	1.6 (1.3–2.0)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTES: Counts less than 600 should be interpreted with caution. Coding changes make comparison with data from 1992 impossible.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 15. Frequency of *Chlamydia*[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	636	21	572	17	515	14
Age						
18–24	55	217	44	187	52	226
25–34	202	134	150	106	152	112
35–44	179	54	182	58	120	40
45–54	139	20	140	20	119	16
55–64	29	6	24	4	40	6
65–74	25	3	23	3	22	2
75–84	6	1	9	1	10	1
85+	1	2	0	0	0	0
Race/ethnicity						
White	145	11	122	8	110	7
Black	214	64	226	66	183	52
Hispanic	12	10	18	15	16	12
Other	2	10	0	0	3	14
Unknown	263	22	206	16	203	13
Gender						
Male	519	18	445	14	389	11
Female	117	83	127	84	126	76
Region						
Midwest	131	19	137	18	75	9
Northeast	185	25	134	17	134	15
South	183	18	191	17	197	15
West	137	23	110	17	109	16
Insurance status						
No insurance/self-pay	557	31	488	27	422	22
Medicare/Medicare supplemental	20	3	29	3	27	2
Medicaid	1	20	0	0	4	45
Private insurance/HMO/PPO	49	10	53	10	51	9
Other insurance	9	36	2	7	11	33
Unknown	0	0	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for chlamydia.

[b]The term cou
weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 16. Medical visits[a] for chlamydial infection in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	64	26 (20–33)
10–14	24	14 (8–19)
15–19	165	88 (75–102)
20–24	120	105 (86–123)
25–29	68	69 (53–86)
30–34	80	56 (44–68)
35–39	69	36 (28–45)
40–44	45	21 (15–27)
45–54	80	17 (13–21)
55–64	52	15 (11–19)
65+	0	0
Gender		
Male	209	20 (17–22)
Female	558	49 (44–53)
Region		
Midwest	163	31 (27–36)
Northeast	145	39 (32–45)
South	322	34 (31–38)
West	41	37 (26–48)
Unknown	96	36 (29–44)
Urban/Rural		
MSA	557	38 (35–41)
Non-MSA	114	24 (20–28)
Unknown	96	36 (29–44)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

incidence of infection.

In the 767 medical visits coded as being for chlamydial infection in the 1999 MarketScan data, 178 drug claims were filed for a recommended or alternate medication regimen from the CDC STD treatment guidelines (36 for amoxicillin, 73 for azithromycin, 46 for doxycycline, 14 for erythromycin, and 9 for ofloxacin) within 7 days before or 20 days after the date of the medical visit. Thus, in only 23% of the cases in which chlamydia was diagnosed was a drug prescribed that was consistent with CDC STD treatment guidelines. In the same dataset, an additional 3,654 medical claims were associated with ICD-9 codes, CPT codes, or NDCs for chlamydial infections. All those claims had at least one of the ICD-9 or CPT codes listed in Table 17 and a drug claim for amoxicillin, azithromycin, doxycycline, erythromycin, or ofloxacin within the 7 days before and 20 days after the date of the medical visit. This analysis indicates that the use of ICD-9 codes alone in the absence of CPT codes for *Chlamydia* testing and NDC codes for *Chlamydia* treatment in claims-based datasets substantially underestimates the numbers of provider visits for chlamydial infections. Because CPT codes for STDs are not available in HCUP or VA data and are presumably uncommon in Medicare data, they were not included in analyses for this chapter.

Gonorrhea

Background

Neisseriae gonorrhoeae is the cause of gonorrhea and its related clinical syndromes. Uncomplicated *N. gonorrhoeae* infection is usually confined to the mucosa of the cervix, urethra, rectum, and throat. The infection is often asymptomatic among females; untreated, it can lead to PID, tubal infertility, ectopic pregnancy, and chronic pelvic pain (24). *N. gonorrhoeae* usually causes symptomatic urethritis among males and occasionally results in epididymitis. Rarely, local infection disseminates to cause an acute dermatitis tenosynovitis syndrome, which can be complicated by arthritis, meningitis, or endocarditis (24).

In symptomatic patients, *N. gonorrhoeae* infection can be diagnosed presumptively using a gram stain of urethral or endocervical exudates if the smear contains typical gram-negative diplococci within polymorphonuclear leukocytes. However, other Neisseria species, including those normally in the flora of the oro- and nasopharynx, have a similar appearance. Culture testing has been the standard against which all other tests for *N. gonorrhoeae* have been compared. However, there are problems in maintaining the viability of organisms during transport and storage in the diverse settings in which culture testing is indicated. Nonculture tests are now available, including EIAs that detect specific gonococcal antigens, nucleic acid hybridization tests (NAATs) that detect *N. gonorrhoeae*-specific deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) sequences, and NAATs that amplify and detect *N. gonorrhoeae*-specific DNA or RNA sequences.

Table 17. Codes used to identify additional medical visits for chlamydial infection[a] in MarketScan data

ICD-9 Codes	
V73.88	Screening for other specified chlamydial disease
V73.98	Screening, unspecified urethritis
099.40	Other nongonococcal urethritis, unspecified
099.49	Other nongonococcal urethritis, other specified organism
CPT codes	
86631	Chlamydia
86632	Chlamydia, IgM
87110	Chlamydia, culture
97270	*Chlamydia trachomatis*
87320	Infectious agent antigen detection by enzyme immunoassay technique, qualitiative or semiquantitative, multiple-step method; *Chlamydia trachomatis*
87490	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, direct probe technique
87491	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, amplified probe technique
87492	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, quantification
87810	Infectious agent detection by immunoassay with direct optical observation; *Chlamydia trachomatis*

[a]A medical visits was identified as an additional chlamydia visit if the date of a claim for amoxicillin, azithromycin, doxycyline, erythromycin, or o oxacin was within the interval o
codes.

These tests are substantially more sensitive than the first-generation nonculture tests were (17, 24-29).

Of the reportable STDs, gonorrhea is second only to chlamydial infections in the number of cases reported annually to CDC; 361,705 cases were reported in 2001, with an age distribution similar to that for *C. trachomatis* infections (30). The number of reported cases of gonorrhea in the United States increased steadily from 1964 to 1977, fluctuated through the early 1980s, increased until 1987, decreased starting in 1987, and has leveled off since 1998. Antimicrobial resistance in *N. gonorrhoeae* contributed to the increase in cases in the 1970s and 1980s. The decline in prevalence that began in 1987 may be attributable to recommendations by CDC (31) that only highly effective antimicrobial agents be used to treat gonorrhea. Using the LCx assay for *N. gonorrhoeae*, urine specimens were tested on a representative sample of participants 14- to 39- years of age in the 1999 to 2000 NHANES data (32); the prevalence of *N. gonorrhoeae* was 0.25%. The prevlance of gonorrhea among non-Hispanic black (1.3%) was over 25 times that among non-Hispanic white (0.05%). Among those infected with *N. gonorrhoeae*, 57% were also infected with *C. trachomatis*.

The incidence of gonorrhea is highest in high-density urban areas among persons under 24 years of age who have more than one sex partner in a 6-month period and who engage in unprotected sexual intercourse. Increases in gonorrhea prevalence have been noted recently among men who have sex with men (MSM) (33). Up to 50% of infected men and women lack symptoms, and routine screening for gonococcal infection is not common except in public STD clinics. Thus, reported cases of gonorrhea substantially underestimate the true burden of the disease and may not accurately represent the true underlying trends over time or differences in disease rates by demographic characteristics. Because gonorrhea screening is more commonly offered in public STD clinics that are frequented by low-income men, gonorrhea rates may appear higher in these demographic groups merely as a result of the enhanced screening.

Infected women are more likely to be asymptomatic than infected men, and screening for gonococcal infection in asymptomatic women is uncommon; therefore, cases in women are less likely to be identified and reported. Reported gonorrhea rates have leveled off overall. From 1998 through

Figure 2. Gonorrhea – Reported rates: United States, 1970–2001.

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Gonococcal Isolate Surveillance Project (GISP) - Annual Report 2001. Available at: http://www.cdc.gov/std/GISP2001/GISP2001Text&Fig.pdf.

2001, the gonorrhea rate in the United States persisted at around 129 cases per 100,000 population (Figure 2) (30). The South continues to have the highest rates of any region. Rates were highest among young women 15 to 19 years of age and men 20 to 24, regardless of race or ethnicity (13). Reported rates of gonorrhea among African Americans are more than 30 times higher than rates among Caucasians and more than 11 times higher than rates among Hispanics (13). As with chlamydia, high reported rates of gonorrhea in certain areas or among certain populations may indicate more effective screening programs and the use of more sensitive tests, rather than higher underlying rates of disease.

The annual economic burden of gonorrhea and related sequelae was estimated to exceed $1 billion in 1994 (18).

The Data

According to HCUP data, hospitalization for a primary diagnosis of gonorrhea is a rare event that decreased from 2,154 hospitalizations in 1994 to 969 in 2000 (Table 18). Although other data indicate that chlamydial infection is more common than gonorrhea (30), infection with *N. gonorrhoeae* is more likely to result in hospitalization because it tends to cause more severe symptoms and may require more sophisticated diagnostic assessment, intravenous antibiotics, or surgical intervention (e.g., abscess drainage).

Medicare data on hospital outpatient and inpatient visits for gonorrhea from 1992 through 1998 are too sparse to permit meaningful interpretation. Hospital outpatient visit rates of approximately 1 per 100,000 Medicare beneficiaries were observed in all three years of data.

In the 2001 VA data, gonorrhea was the third most common pathogen-specific STD clinical presentation, with a total of 17 cases per 100,000 unique outpatients (Table 6). As with chlamydia, the highest rates were seen among women (29 per 100,000), persons under 25 years of age (109 per 100,000), and African Americans (71 per 100,000); this may be due in part to higher rates of screening of younger asymptomatic women in family planning, prenatal, and STD clinics (Table 19). Geographic distribution throughout the country was relatively uniform (15 to 19 per 100,000). A generalized decreasing trend was noted when comparing case counts and rates from 1999 through 2001; this trend was most consistent among persons 25- to 54- years of age, among Caucasians and African Americans, and among persons living in the Northeastern, Southern, and Midwestern regions. In

Table 18. Inpatient hospital stays by individuals with gonorrhea listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	2,154	0.8 (0.7–1.0)	1,250	0.5 (0.4–0.6)	1,115	0.4 (0.3–0.5)	969	0.4 (0.3–0.4)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	542	3.8 (2.8–4.8)	272	1.8 (1.2–2.3)	221	1.4 (1.0–1.8)	221	1.4 (0.9–1.8)
18–24	739	3.0 (2.3–3.7)	448	1.8 (1.4–2.3)	457	1.8 (1.4–2.2)	403	1.5 (1.2–1.9)
25–34	519	1.3 (1.0–1.6)	321	0.8 (0.6–1.0)	280	0.7 (0.5–0.9)	229	0.6 (0.4–0.8)
35–44	215	0.5 (0.4–0.7)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	381	0.2 (0.2–0.3)	258	0.1 (0.1–0.2)	195	0.1 (0.1–0.1)	193	0.1 (0.1–0.1)
Black	1,294	4.1 (3.2–5.0)	794	2.4 (1.9–2.9)	555	1.6 (1.3–2.0)	494	1.4 (1.1–1.8)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	173	0.1 (0.1–0.2)	*	*	*	*	*	*
Female	1,975	1.5 (1.2–1.8)	1,120	0.8 (0.7–1.0)	995	0.7 (0.6–0.9)	920	0.7 (0.5–0.8)
Region								
Midwest	539	0.9 (0.5–1.3)	254	0.4 (0.2–0.6)	279	0.4 (0.3–0.6)	295	0.5 (0.3–0.6)
Northeast	363	0.7 (0.5–1.0)	226	0.4 (0.2–0.6)	172	0.3 (0.2–0.5)	184	0.4 (0.2–0.5)
South	1,082	1.3 (0.9–1.6)	688	0.8 (0.5–1.0)	601	0.6 (0.5–0.8)	408	0.4 (0.3–0.5)
West	170	0.3 (0.1–0.5)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	1,865	1.0 (0.8–1.2)	1,066	0.5 (0.4–0.6)	978	0.5 (0.4–0.6)	882	0.4 (0.3–0.5)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 10
Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 19. Frequency of gonorrhea[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	708	23	660	20	634	17
Age						
18–24	25	99	29	123	25	109
25–34	153	101	138	97	123	91
35–44	216	65	180	58	163	54
45–54	201	29	187	26	189	25
55–64	41	8	59	11	71	11
65–74	46	6	42	5	38	4
75–84	25	5	23	4	24	3
85+	1	2	2	3	1	1
Race/ethnicity						
White	144	11	130	9	127	8
Black	299	90	287	84	251	71
Hispanic	18	16	19	16	32	25
Other	1	5	2	10	2	9
Unknown	246	20	222	17	222	14
Gender						
Male	654	23	599	19	586	17
Female	54	38	61	40	48	29
Region						
Northeast	237	32	159	20	164	19
Midwest	125	18	139	19	128	15
South	250	25	234	21	232	18
West	96	16	128	20	110	16
Insurance status						
No insurance/self-pay	588	32	559	31	507	27
Medicare/Medicare supplemental	46	7	43	5	42	4
Medicaid	1	20	1	13	2	22
Private insurance/HMO/PPO	68	14	54	11	69	12
Other insurance	5	20	3	10	11	33
Unknown	0	0	0	0	3	33

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for gonorrhea.

[b]The term
not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 20. Medical visits[a] for gonorrhea in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	16	7 (3–10)
10–14	6	3 (1–6)
15–19	104	56 (45–66)
20–24	82	71 (56–87)
25–29	70	71 (55–88)
30–34	87	61 (48–74)
35–39	64	34 (25–42)
40–44	57	26 (20–33)
45–54	71	15 (12–18)
55–64	44	12 (9–16)
65+	1	11 (0–32)
Gender		
Male	203	19 (17–22)
Female	399	35 (31–38)
Region		
Midwest	159	31 (26–35)
Northeast	87	23 (18–28)
South	278	30 (26–33)
West	19	17 (9–25)
Unknown	59	22 (17–28)
Urban/rural		
MSA	430	29 (27–32)
Non-MSA	113	24 (19–28)
Unknown	59	22 (17–28)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.

[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.

SOURCE: MarketScan, 1999.

each year examined, the highest rates of gonorrhea occurred among those who had no insurance or were self-paying patients.

The 1999 MarketScan data had 592 outpatient visits and 10 inpatient visits which were accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for gonorrhea (Table 3). There were 399 medical visits for gonococcal infection by women and 203 by men, the rates being 35 and 19 per 100,000, respectively (Table 20). The highest rates were seen equally among those 20 to 24 years of age and those between 25 and 29 (71 per 100,000). Again, the higher rates of gonococcal infection observed among women and those under 25 may be due in part to higher rates of screening of younger asymptomatic women. Rates varied by geographical region, ranging from 17 per 100,000 enrollees in the West to 31 per 100,000 in the Midwest. A difference was also seen between urban (29 per 100,000) and rural (24 per 100,000) residents. The 602 medical visits that were ICD-coded as being for gonococcal infection resulted in 169 (28%) claims for one of the drugs recommended by CDC for treatment of uncomplicated, lower urinary tract gonococcal infection filed within 7 days before or 20 days after the date of the medical visit. However, in the same dataset, 2,530 visits resulted in drug claims for one of these same drugs filed within 7 days before or 20 days after the date of the medical visit and were *either* ICD-coded as being for gonorrhea *or* included a CPT code that referred to a test for gonorrhea. Thus, defining probable and possible visits for gonococcal infection based only on ICD-9 codes would substantially underestimate the number of visits for treatment of gonococcal infection. Clinicians tend not to use gonococcus-specific ICD-9 codes when simply ruling out gonococcal infection with a test; in the case of a test later found to be positive, the original ICD-9 code is not customarily altered to reflect gonococcal infection.

Syphilis

Background

Syphilis is a systemic disease caused by *Treponema pallidum*. Patients with syphilis may seek treatment for signs or symptoms of primary infection (i.e., ulcer or chancre at the infection site), secondary infection (e.g., skin rash, mucocutaneous lesions, or lymphadenopathy), or tertiary infection (e.g., cardiac, ophthalmic, or auditory abnormalities, or gummatous lesions) (31). Signs of primary and secondary syphilis that most commonly would be seen by a urologist include chancre and rash. Latent infections are detected by serologic testing. Latent syphilis acquired within the preceding year is referred to as early latent syphilis; all other cases of latent syphilis are classified as either late latent syphilis or latent syphilis of unknown duration. The latent stages of syphilis begin with disappearance of the secondary symptoms. Unless they have cause to screen patients, urologists rarely see latent syphilis or its manifestations that occur outside the genitourinary system.

The diagnosis of syphilis depends on clinical findings and directly visualizing *T. pallidum* organisms in secretions or tissue or on serology. Darkfield examinations and direct fluorescent antibody tests of lesion exudate or tissue are the definitive methods for diagnosing early syphilis, but such testing is rarely performed outside STD clinics. A presumptive diagnosis is possible with the use of two types of serologic tests for syphilis: nontreponemal tests (e.g., Venereal Disease Research Laboratory [VDRL] and Rapid Plasma Reagin [RPR]) and treponemal tests (e.g., fluorescent treponemal antibody absorbed [FTA-ABS] and *T. pallidum* particle agglutination [TP-PA]). The use of only one type of serologic test is insufficient for diagnosis because false-positive nontreponemal test results may occur secondary to various medical conditions. Routine serologic screening is done in only a few settings, including blood banks, prenatal care and STD clinics, and some HIV care clinics; it is also required in premarital testing in some states.

Staging of syphilis is based on serology results and relies on knowledge of past titers and treatment history. This can be challenging if no information on past titers or treatment is available, as is often the case when patients pursue care in more than one setting. Treatment with penicillin is often provided based on a single, isolated serologic result because such treatment is generally safe, effective, and inexpensive. If a patient is successfully treated, the titer of the nontreponemal serologic test will fall, usually within the 6 months following treatment. Primary, secondary, and early latent stages are all infectious stages; primary and secondary stages in adults and congenital syphilis are subject to national surveillance because their infectious nature or origin makes them important to public health. Other stages are not under national surveillance but add to the overall burden of disease.

In 1996, 11,400 new cases of primary and secondary syphilis and 53,000 new cases of all stages of syphilis were reported to CDC; if we assume 20% underreporting, approximately 70,000 total syphilis infections were diagnosed in that year (34). However, the rate of primary and secondary syphilis reported in the United States decreased 90% between 1990 and 2000, from 20.34 to 2.12 cases per 100,000 population (Figure 3). In 2001, the overall rate (2.17 per 100,000) represented a 2% increase over the 2000 rate, which was the lowest rate since reporting began in 1941 (35), and the first annual increase since 1990. In 1999,

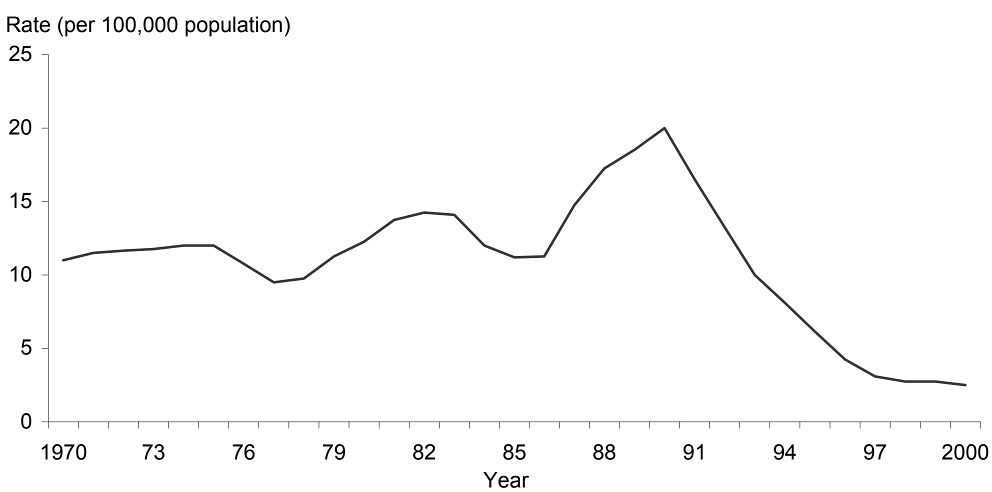

Figure 3. Primary and secondary syphilis – Reported rates: United States, 1970–2001.

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Syphilis Surveillance Report - February 2003. Available at: http://www.cdc.gov/std/Syphilis2001/2001SyphSuppText.pdf.

CDC estimated that the annual direct medical costs for adult and congenital syphilis were $213 million, with an additional cost of $752 million for syphilis-attributable HIV infection (36).

The Data

During 2001, 6,103 primary and secondary syphilis cases were reported to state and local health departments in the United States. The highest rate of primary and secondary syphilis among women was seen in those 20 to 24 years of age (3.8 per 100,000 population); the highest rate among men was seen in those 35 to 39 years of age (7.2 per 100,000). The 2001 rate for men was 15.4% higher than the rate in 2000, and the rate for women was 17.7% lower. The male-to-female case ratio of primary and secondary syphilis rose from 1.1:1 in 1996 to 2.1:1 in 2001. Current efforts to eliminate syphilis in the United States are focused on communities in which relatively elevated rates of STDs are being observed among men who have sex with men (MSM) and on heterosexual communities with high prevalence, many of which are in the South. The recent increase in cases in men, the growing disparity in case numbers between men and women observed across all racial and ethnic groups, and reported outbreaks of syphilis among MSM in large urban areas all suggest that increases in syphilis are occurring among MSM. Rates have also remained disproportionately high in the South (3.4 per 100,000) and among non-Hispanic blacks (11 per 100,000) (37, 38). Urologists who care for MSM or work in communities with a high incidence of syphilis may diagnose and treat patients with primary or secondary stages of syphilis, especially when they present with genital ulcers.

Epididymitis/Orchitis

Background

Epididymitis, or inflammation of the epididymis, commonly occurs as a complication of urethral infection with *N. gonorrhoeae*, *C. trachomatis*, or *Pseudomonas aeruginosa*. It may also occur as a complication of systemic infection with *Mycobacterium tuberculosis*, *Brucella spp*., *Streptococcus pneumoniae*, *Neisseria meningiditis*, *Treponema pallidum*, and various fungi (3). Epididymitis causes considerable morbidity in terms of pain, suffering, and loss of productivity. The condition is common in the United States; in 1977, an estimated 634,000 patients sought treatment for it (39). Changes in the incidence of epididymitis have not been consistently monitored over time because the condition is not subject to national surveillance.

Orchitis is an inflammation of the testicles, which may be caused by any of several bacteria or viruses. Orchitis tends to occur in conjunction with infections of the prostate or epididymis and, like those conditions, may occur as a manifestation of STDs such as gonorrhea or chlamydial infection. The most common viral cause of orchitis is mumps, a non-sexually-transmissible virus (2). The incidence of orchitis is not subject to national surveillance. Because orchitis tends to occur commonly in conjunction with epididymitis, most ICD-9 codes do not distinguish between the two conditions. There are only two unique orchitis codes—one for gonococcal orchitis and one for chronic gonococcal orchitis; there is no unique code for gonococcal epididymitis (Table 1). Summary analyses of cases and visits in national datasets suggest that only about 60% of the cases of epididymitis and orchitis are attributable to STDs (3).

The Data

HCUP data indicate that since 1996 there has been little change over time in hospitalizations for both epididymitis/orchitis using all ICD-9 codes (Table 21) and epididymitis/orchitis not specified as due to Chlamydia or gonococcus (organism unspecified) (Table 22). In 1996, 8,954 hospitalizations had epididymitis/orchitis (all cases) listed as the primary diagnosis; there was a steady increase in rates of stays across all 10-year age categories from 25 to 34 through 85+ (Table 21). In 2000, there were 8,448 hospitalizations for epididymitis/orchitis, with increasing rates of stays across 10-year age categories from <14 through 85+ (Table 21. Over 99% of the cases were for epididymitis/orchitis not designated as due to Chlamydia or gonococcus (Table 22); it appears that clinicians rarely code patients specifically as having acute or chronic gonococcal orchitis (ICD codes 098.13 or 098.33).

Medicare hospital outpatient data indicate that rates of epididymitis/orchitis (organism unspecified) increased from 14 per 100,000 beneficiaries in 1992 to 26 per 100,000 in 1998 (Table 23). An inverse relationship was seen in the Medicare inpatient data, where hospitalizations for epididymitis/orchitis

Table 21. Inpatient hospital stays by individuals for epididymitis/orchitis (all cases) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	10,235	8.3 (7.8–8.8)	8,954	7.0 (6.5–7.4)	8,954	6.8 (6.4–7.3)	8,448	6.3 (5.9–6.8)
Age								
< 14	657	2.4 (1.8–2.9)	526	1.8 (1.4–2.3)	396	1.4 (1.0–1.7)	435	1.5 (1.1–1.9)
14–17	423	5.8 (4.3–7.3)	277	3.5 (2.4–4.7)	208	2.6 (1.8–3.4)	182	2.2 (1.5–2.9)
18–24	586	4.8 (3.7–5.9)	385	3.1 (2.4–3.9)	428	3.4 (2.6–4.2)	420	3.2 (2.5–3.9)
25–34	1,660	8.3 (7.1–9.4)	1,161	5.8 (5.0–6.7)	1,072	5.6 (4.7–6.5)	872	4.8 (3.9–5.6)
35–44	1,586	8.0 (6.9–9.1)	1,565	7.4 (6.4–8.5)	1,668	7.6 (6.7–8.6)	1,490	6.8 (5.9–7.7)
45–54	1,223	8.7 (7.4–10)	1,251	8.1 (6.9–9.2)	1,336	8.1 (7.0–9.2)	1,354	7.6 (6.6–8.6)
55–64	1,205	12 (11–14)	1,029	10 (8.8–12)	1,159	11 (9.3–13)	1,042	9.3 (8.1–11)
65–74	1,507	19 (16–22)	1,427	18 (15–20)	1,171	15 (12–17)	1,324	16 (14–19)
75–84	1,098	29 (25–33)	1,059	25 (21–29)	1,205	27 (23–30)	1,079	22 (19–26)
85+	291	32 (21–44)	275	32 (22–41)	311	32 (23–40)	252	25 (17–32)
Race/ethnicity								
White	5,370	5.9 (5.4–6.4)	5,118	5.5 (5.1–5.9)	4,892	5.2 (4.8–5.7)	4,374	4.6 (4.2–5.0)
Black	1,568	11 (9.3–12)	1,102	7.2 (6.0–8.4)	1,070	6.8 (5.7–8.0)	1,054	6.6 (5.6–7.7)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	718	5.5 (4.2–6.8)	684	4.8 (3.8–5.7)	670	4.3 (3.2–5.3)	820	5.0 (4.1–6.0)
Region								
Midwest	2,310	7.9 (7.0–8.8)	2,280	7.6 (6.7–8.5)	2,133	7.0 (6.1–7.8)	2,010	6.4 (5.7–7.2)
Northeast	2,789	11 (10–13)	2,161	8.7 (7.5–9.9)	2,029	8.2 (6.9–9.5)	1,684	6.8 (5.8–7.8)
South	3,642	8.8 (7.8–9.8)	3,257	7.3 (6.6–8.1)	3,428	7.5 (6.8–8.3)	3,392	7.3 (6.4–8.1)
West	1,494	5.4 (4.5–6.3)	1,256	4.3 (3.7–4.9)	1,365	4.5 (3.7–5.4)	1,363	4.5 (3.7–5.3)
MSA								
Rural	2,351	7.5 (6.5–8.6)	2,035	7.0 (6.0–8.0)	2,052	7.0 (6.1–7.9)	1,763	6.0 (5.1–6.9)
Urban	7,812	8.5 (7.9–9.1)	6,919	7.0 (6.5–7.4)	6,865	6.8 (6.2–7.3)	6,676	6.4 (5.9–6.9)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 22. Inpatient hospital stays by individuals with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	10,082	8.2 (7.7–8.7)	8,894	6.9 (6.5–7.4)	8,882	6.8 (6.3–7.2)	8,387	6.3 (5.9–6.7)
Age								
< 14	650	2.3 (1.8–2.9)	521	1.8 (1.3–2.3)	396	1.4 (1.0–1.7)	435	1.5 (1.1–1.9)
14–17	377	5.2 (3.7–6.7)	256	3.3 (2.1–4.4)	176	2.2 (1.5–2.9)	177	2.1 (1.4–2.9)
18–24	512	4.2 (3.2–5.2)	363	3.0 (2.3–3.7)	422	3.4 (2.6–4.2)	388	3.0 (2.3–3.7)
25–34	1,649	8.2 (7.0–9.4)	1,156	5.8 (5.0–6.7)	1,047	5.4 (4.6–6.3)	852	4.7 (3.8–5.5)
35–44	1,577	8.0 (6.9–9.0)	1,558	7.4 (6.3–8.4)	1,664	7.6 (6.7–8.6)	1,490	6.8 (5.9–7.7)
45–54	1,223	8.7 (7.4–10)	1,251	8.1 (6.9–9.2)	1,336	8.1 (7.0–9.2)	1,354	7.6 (6.6–8.6)
55–64	1,199	12 (10–14)	1,029	10 (8.8–12)	1,154	11 (9.3–12)	1,042	9.3 (8.1–11)
65–74	1,507	19 (16–22)	1,427	18 (15–20)	1,171	15 (12–17)	1,319	16 (14–19)
75–84	1,098	29 (25–33)	1,059	25 (21–29)	1,205	27 (23–30)	1,079	22 (19–26)
85+	291	32 (21–44)	275	32 (22–41)	311	32 (23–40)	252	25 (17–32)
Race/ethnicity								
White	5,323	5.8 (5.3–6.4)	5,099	5.5 (5.0–5.9)	4,887	5.2 (4.8–5.6)	4,374	4.6 (4.2–5.0)
Black	1,471	10 (8.7–11)	1,071	7.0 (5.8–8.2)	1,043	6.7 (5.6–7.8)	1,004	6.3 (5.3–7.3)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	718	5.5 (4.2–6.8)	679	4.7 (3.8–5.7)	654	4.2 (3.1–5.2)	820	5.0 (4.1–6.0)
Region								
Midwest	2,284	7.8 (6.9–8.7)	2,270	7.5 (6.6–8.4)	2,118	6.9 (6.0–7.8)	1,984	6.4 (5.6–7.1)
Northeast	2,743	11 (9.8–12)	2,137	8.6 (7.4–9.8)	2,001	8.1 (6.8–9.4)	1,679	6.8 (5.8–7.8)
South	3,569	8.6 (7.7–9.6)	3,240	7.3 (6.5–8.1)	3,408	7.5 (6.7–8.2)	3,371	7.2 (6.4–8.1)
West	1,485	5.3 (4.4–6.2)	1,247	4.3 (3.7–4.9)	1,355	4.5 (3.7–5.4)	1,354	4.4 (3.6–5.3)
MSA								
Rural	2,300	7.4 (6.3–8.4)	2,028	7.0 (6.0–8.0)	2,046	7.0 (6.1–7.9)	1,752	6.0 (5.1–6.9)
Urban	7,710	8.4 (7.8–9.0)	6,866	6.9 (6.4–7.4)	6,798	6.7 (6.2–7.2)	6,626	6.4 (5.9–6.9)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 10

Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 23. Outpatient hospital visits by Medicare beneficiaries with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	2,100	14 (14–15)	3,320	22 (21–23)	3,740	26 (25–27)
Total < 65 yrs	320	10 (9.2–12)	1,060	31 (29–33)	1,060	31 (29–33)
Total 65+	1,780	15 (15–16)	2,260	19 (18–20)	2,680	24 (23–25)
Age						
65–74	940	13 (12–14)	1,380	19 (18–20)	1,740	27 (26–28)
75–84	660	19 (17–20)	600	16 (15–18)	820	22 (21–24)
85–94	180	23 (19–26)	240	28 (25–32)	100	12 (9.2–14)
95+	0	0.0	40	49 (34–63)	20	23 (13–33)
Race/ethnicity						
White	1,480	12 (11–13)	2,300	18 (17–18)	2,900	24 (23–25)
Black	440	35 (31–38)	740	53 (50–57)	460	34 (31–38)
Asian	…	…	…	…	80	58 (45–71)
Hispanic	…	…	140	71 (59–82)	80	24 (18–29)
N. American Native	…	…	…	…	80	286 (222–351)
Region						
Midwest	800	22 (20–23)	1,120	29 (27–31)	1,400	38 (36–40)
Northeast	240	7.6 (6.6–8.5)	640	20 (19–22)	480	17 (16–19)
South	680	13 (12–14)	1,140	21 (20–22)	1,200	22 (21–24)
West	320	14 (13–16)	420	18 (16–20)	660	30 (27–32)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

(organism unspecified) decreased from 26 per 100,000 beneficiaries in 1992, to 19 per 100,000 in 1995, to 14 per 100,000 in 1998 (Table 24).

VA data for 2001 report 50 cases of epididymitis/orchitis (organism unspecified) per 100,000 unique outpatients (Table 25). Comparably high rates were seen in all 10-year age categories from 25 to 34 through 55 to 64 (61 per 100,000 to 73 per 100,000). The highest rates were seen among African Americans (87 per 100,000) and persons residing in the West (57 per 100,000). When the definition of epididymitis/orchitis was expanded to include all cases (organism both specified and unspecified), there were 51 cases per 100,000 unique outpatients, similar to the incidence of epididymitis/orchitis (organism unspecified alone).

The 1999 MarketScan data report that 1,580 outpatient visits and 14 inpatient visits were accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for epididymitis and/or orchitis not designated as due to chlamydia or gonococcus (Table 3); among males 16- to 35- years of age, rates of epididymitis/orchitis varied by region, from 556 per 100,000 enrollees in the Midwest to 715 per 100,000 enrollees in the Northeast (Table 26). A small difference was also seen between urban (617 per 100,000) and rural (670 per 100,000) residents. While 1,594 visits were identified as epididymitis/orchitis not designated as due to chlamydia or gonococcus (organism unspecified), only one visit for gonococcal orchitis was identified; as in the HCUP data, it appears that clinicians rarely code patients specifically as having acute or chronic gonococcal orchitis (ICD-9 code 098.13 or 098.33). This may be due to a low underlying prevalence of gonococcal orchitis or to the use of other ICD-9

Table 24. Inpatient stays by Medicare beneficiaries with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	3,760	26 (25–26)	2,840	19 (18–19)	2,020	14 (13–15)
Total < 65 yrs	540	17 (16–19)	680	20 (18–21)	500	15 (13–16)
Total 65+	3,220	28 (27–29)	2,160	18 (18–19)	1,520	14 (13–14)
Age						
65–74	1,680	23 (22–24)	1,200	17 (16–18)	640	10 (9.2–11)
75–84	1,200	34 (32–36)	780	21 (20–23)	620	17 (16–18)
85–94	320	40 (36–45)	160	19 (16–22)	240	28 (24–31)
95+	20	26 (14–37)	20	24 (13–35)	20	23 (13–33)
Race/ethnicity						
White	3,220	26 (25–27)	2,360	18 (17–19)	1,500	12 (12–13)
Black	320	25 (22–28)	360	26 (23–29)	400	30 (27–33)
Asian	…	…	40	55 (38–71)	0	0.0
Hispanic	…	…	40	20 (14–26)	40	12 (8.3–16)
N. American Native	…	…	20	99 (55–144)	0	0.0
Region						
Midwest	1,000	27 (25–29)	800	21 (19–22)	460	12 (11–14)
Northeast	660	21 (19–22)	440	14 (13–15)	460	17 (15–18)
South	1,380	26 (25–28)	1,160	21 (20–22)	780	15 (14–16)
West	580	26 (24–28)	420	18 (16–20)	280	13 (11–14)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

codes to capture gonococcal orchitis (604, 604.0, 098.1, 098.10, or 098.30).

Urethritis

Background

Urethritis, or urethral inflammation of any etiology, causes urethral discharge, dysuria, or pruritis at the end of the urethra (40). In heterosexual men, the most common causes of urethritis are gonococcal and chlamydial infections, and infection is limited to the distal urethra (41). In women, urethritis is often observed in association with cystitis and pyelonephritis. *Escherichia coli* remains the predominant uropathogen (80%) isolated in acute community-acquired uncomplicated UTIs, followed by *Staphylococcus saprophyticus* (10% to 15%) (42), but clinicians more commonly code such UTIs as cystitis, rather than as urethritis. Sexually transmitted infections that may result in urethritis include *N. gonorrhoeae* and *C. trachomatis*, but the resulting inflammation creates nonspecific symptoms and signs that cannot be used to identify the etiologic pathogen (2, 40, 41). As with epididymitis and orchitis, there are no systematic national surveillance systems for urethritis, so its incidence cannot be tracked over time. However, because reported cases of gonorrhea in men tend to be cases of urethritis (24, 43), trends in urethritis resemble those in the reporting of gonorrhea.

Urethritis causes considerable morbidity in terms of pain, suffering, and loss of productivity. In the United States, men and women with symptoms of lower UTIs account for an estimated 7 million office visits per year to physicians in office practice (44). In the NDTI, the number of initial visits to physicians' offices per year for nonspecific urethritis in men and women averaged about 250,000 in 1996–1997 and decreased to about 200,000 in 2001.

Table 25. Frequency of epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	1,853	61	1,921	59	1,833	50
Age						
18–24	19	75	17	72	15	65
25–34	122	81	110	77	99	73
35–44	277	84	257	82	198	66
45–54	515	75	568	79	540	72
55–64	330	66	350	63	394	61
65–74	258	34	377	46	357	38
75–84	213	40	216	34	211	26
85+	19	39	26	45	19	24
Race/ethnicity						
White	957	70	1,019	69	956	59
Black	315	94	342	100	309	87
Hispanic	88	77	91	74	100	78
Other	7	36	9	44	8	37
Unknown	486	40	460	35	460	29
Region						
Midwest	370	54	412	55	377	46
Northeast	421	57	415	53	377	43
South	674	66	704	63	681	53
West	388	65	390	61	398	57
Insurance status						
No insurance/self-pay	1,246	68	1,254	69	1,186	62
Medicare/Medicare supplemental	338	49	389	43	414	35
Medicaid	1	20	5	63	3	33
Private insurance/HMO/PPO	247	51	251	49	211	38
Other insurance	20	79	22	76	19	57
Unknown	1	52	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for epididymitis (organism unspecified).

[b]The term cou
weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 26. Medical visits[a] for epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus, by males aged 16–35 years, 1999, count, rate[b] (95% CI)

	Count	Rate
Region		
Midwest	382	556 (500–611)
Northeast	291	715 (633–797)
South	691	654 (605–702)
West	84	567 (446–687)
Unknown	146	491 (412–571)
Urban/rural		
MSA	1,092	617 (581–654)
Non-MSA	356	670 (601–739)
Unknown	146	491 (412–571)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

The Data

The HCUP data report a small decrease in the number of hospitalizations for all urethritis (using all urethritis ICD-9 codes). In 1994, there were 1,313 hospitalizations with a urethritis diagnosis, and a progressive decrease in each year of data to 687 hospitalizations in 2000 (Table 27). Analysis of Medicare hospital outpatient data from 1992 to 1998 yielded counts for cases of urethritis that were too small to calculate meaningful rates.

VA data indicate that in 2001, urethritis (organism unspecified) was diagnosed in 6 cases per 100,000 unique outpatients (Table 30), with the highest rates seen among men (7 per 100,000), those under the age of 25 (39 per 100,000), and African Americans (20 per 100,000). There was a fairly even distribution of case rates across the country (6 to 7 per 100,000 in each region). Urethritis (using all urethritis ICD-9 codes) was diagnosed in 21 per 100,000 unique outpatients, with the highest rates seen among those under the age of 25 (135 per 100,000), women (35 per 100,000), and African Americans (85 per 100,000); there was a fairly even distribution across the country (19 to 24 per 100,000 in each region) (Table 31). Comparing the frequencies in Tables 30 and 31 indicates that in all three years of study approximately 70% of urethritis cases were classified as due to *Chlamydia* or gonococcus.

The 1999 MarketScan data reported 362 outpatient visits and no inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for nonchlamydial or nongonococcal urethritis (Table 3). Women made 74 medical visits for urethritis (organism unspecified), and men made 288, for rates of 6 and 27 per 100,000 enrollees, respectively (Table 32). The highest rate was seen among those 30 to 34 years of age (39 per 100,000). Rates varied greatly by geographical region, with the highest rate seen in the South (21 per 100,000). There was a minimal difference between the rates for urban (16 per 100,000) and rural (18 per 100,000) residents. In addition to the 362 visits for urethritis not due to chlamydia or gonococcus, 45 outpatient visits were reported for chlamydial urethritis, and 504 outpatient and 7 inpatient visits were reported for gonococcal urethritis. Combining these cases with cases of urethritis not specified as due to *Chlamydia* or gonococcus, a total of 425 women and 492 men made medical visits for all urethritis, yielding rates of 37 per 100,000 and 47 per 100,000, respectively (Table 33). The highest rate was seen among those 25 to 29 years of age (104 per 100,000). Rates varied greatly by geographical region, with the highest rate seen in the South (47 per 100,000). Again, there was a minimal difference between the rates for urban (43 per 100,000) and rural (41 per 100,000) populations.

THE BURDEN OF OTHER STDs NOT COMMONLY MANAGED BY UROLOGISTS

Several other presentations account for a large burden of STD (in terms of both morbidity and cost) that is not quantified in these analyses. These include the other manifestations of infection with HPV and infection with HIV/AIDS, hepatitis B virus (HBV), and *Haemophilus ducreyi*. Although we did not perform any new analyses of these diseases using the datasets described above, we provide here a brief overview of the overall burden of each of them from the published literature.

Table 27. Inpatient hospital stays by individuals with urethritis (all cases) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	1,313	0.5 (0.4–0.6)	778	0.3 (0.2–0.4)	752	0.3 (0.2–0.3)	687	0.2 (0.2–0.3)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	321	2.3 (1.5–3.0)	184	1.2 (0.8–1.6)	*	1 (1–1)	163	1.0 (0.6–1.4)
18–24	352	1.4 (1.0–1.8)	260	1.0 (0.7–1.4)	314	1.2 (0.9–1.6)	286	1.1 (0.8–1.4)
25–34	345	0.8 (0.6–1.1)	220	0.5 (0.4–0.7)	160	0.4 (0.3–0.6)	161	0.4 (0.3–0.6)
35–44	171	0.4 (0.3–0.6)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	212	0.1 (0.1–0.2)	*	*	*	*	*	*
Black	788	2.5 (1.9–3.1)	473	1.4 (1.1–1.8)	347	1.0 (0.8–1.3)	365	1.1 (0.8–1.4)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	185	0.2 (0.1–0.2)	*	*	*	*	*	*
Female	1,128	0.9 (0.7–1.1)	651	0.5 (0.4–0.6)	636	0.5 (0.4–0.6)	648	0.5 (0.4–0.6)
Region								
Midwest	341	0.6 (0.3–0.8)	165	0.3 (0.2–0.4)	190	0.3 (0.2–0.4)	189	0.3 (0.2–0.4)
Northeast	189	0.4 (0.2–0.5)	*	*	*	*	159	0.3 (0.1–0.5)
South	635	0.7 (0.5–1.1)	422	0.5 (0.3–0.6)	416	0.4 (0.3–0.6)	283	0.3 (0.2–0.4)
West	148	0.3 (0.1–0.4)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	1,156	0.6 (0.5–0.8)	664	0.3 (0.3–0.4)	656	0.3(0.2–0.4)	632	0.3 (0.2–0.4)

*Figure does not meet standard for reliability or precision; MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 28. Frequency of urethritis not designated as due to *Chlamydia* or gonococcus[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	**Rate**	**Count**	**Rate**	**Count**	**Rate**
Total	275	9	230	7	233	6
Age						
18–24	11	43	8	34	9	39
25–34	52	34	40	28	30	22
35–44	73	22	59	19	62	21
45–54	66	10	74	10	63	8
55–64	29	6	20	4	32	5
65–74	26	3	16	2	19	2
75–84	16	3	12	2	17	2
85+	2	4	1	2	1	1
Race/ethnicity						
White	82	6	74	5	73	5
Black	90	27	74	22	72	20
Hispanic	9	8	5	4	5	4
Other	0	0	1	5	1	5
Unknown	94	8	76	6	82	5
Gender						
Male	268	9	227	7	230	7
Female	7	5	3	2	3	2
Region						
Midwest	85	12	85	11	49	6
Northeast	40	5	39	5	52	6
South	98	10	63	6	84	6
West	52	9	43	7	48	7
Insurance status						
No insurance/self-pay	208	11	176	10	169	9
Medicare/Medicare supplemental	32	5	26	3	27	2
Medicaid	0	0	2	25	1	11
Private insurance/HMO/PPO	35	7	25	5	35	6
Other insurance	0	0	1	3	1	3
Unknown	0	0	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for urethritis (organism unspecified).

[b]The term cou

weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 29. Frequency of urethritis (all cases)[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	919	30	835	25	771	21
Age						
18–24	39	154	36	153	31	135
25–34	207	137	169	119	149	110
35–44	273	83	235	75	210	70
45–54	237	34	249	35	225	30
55–64	61	12	67	12	85	13
65–74	62	8	51	6	40	4
75–84	37	7	26	4	29	4
85+	3	6	2	3	2	3
Race/ethnicity						
White	205	15	179	12	167	10
Black	366	110	351	102	301	85
Hispanic	25	22	23	19	25	19
Other	1	5	2	10	3	14
Unknown	322	27	280	21	275	17
Gender						
Male	858	30	769	25	714	20
Female	61	43	66	44	57	35
Region						
Northeast	259	35	188	24	205	24
Midwest	188	27	214	29	159	19
South	323	32	271	24	268	21
West	149	25	162	25	139	20
Insurance status						
No insurance/self-pay	757	41	693	38	612	32
Medicare/Medicare supplemental	68	10	56	6	54	5
Medicaid	1	20	3	38	4	45
Private insurance/HMO/PPO	87	18	79	15	90	16
Other insurance	6	24	4	14	9	27
Unknown	0	0	0	0	2	22

[a]Represents diagnosis codes for urethritis (all urethritis codes).
[b]The term cou
weighted to represent national population estimates.
[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 30. Medical visits[a] for urethritis not designated as due to *Chlamydia* or gonococcus in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	11	5 (2–7)
10–14	6	3 (1–6)
15–19	23	12 (7–17)
20–24	30	26 (17–35)
25–29	35	36 (24–47)
30–34	55	39 (28–49)
35–39	66	35 (26–43)
40–44	34	16 (10–21)
45–54	66	14 (11–17)
55–64	36	10 (7–13)
65+	0	0
Gender		
Female	74	6 (5–8)
Male	288	27 (24–30)
Region		
Midwest	66	13 (10–16)
Northeast	44	12 (8–15)
South	193	21 (18–24)
West	21	19 (11–27)
Unknown	38	14 (10–19)
Urban/rural		
MSA	235	16 (14–18)
Non-MSA	88	18 (15–22)
Unknown	39	15 (10–19)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Table 31. Medical visits[a] for urethritis (all cases), 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	27	11 (7–15)
10–14	10	6 (2–9)
15–19	110	59 (48–70)
20–24	111	97 (79–115)
25–29	102	104 (84–124)
30–34	139	97 (81–114)
35–39	127	67 (55–79)
40–44	88	41 (32–49)
45–54	133	28 (23–33)
55–64	69	19 (15–24)
65+	1	11 (0–32)
Gender		
Female	425	37 (33–40)
Male	492	47 (43–51)
Region		
Midwest	226	44 (38–49)
Northeast	112	30 (24–35)
South	441	47 (43–51)
West	41	37 (26–48)
Unknown	97	37 (29–44)
Urban/rural		
MSA	623	43 (39–46)
Non-MSA	196	41 (35–47)
Unknown	98	37 (30–45)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Human Papillomavirus (HPV) Infections Other Than Genital Warts

We discussed HPV infection in conjunction with genital warts (for which HPV types 6 and 11 are the principal causes) above. In addition, multiple types of HPV are carcinogenic (high-risk). Using polymerase chain reaction (PCR), investigators report an overall prevalence of HPV-DNA of 42% in penile carcinomas and 50% in vulvar carcinomas (45). HPV is detectable in 80% to 100% of lesions in basaloid and warty penile cancers (of which Bowen's disease, erythroplasia of Queyrat, and bowenoid papulosis are precursor lesions), whereas it is detectable in only 33% of keratinizing and verrucous penile carcinomas (46).

Cervical cancer is the second most common female malignancy worldwide and the principal cause of cancer in women in most developing countries (47). Certain types of HPV have been identified as the principal causes of invasive cervical cancer and cervical intraepithelial neoplasia (48, 49). Despite the widespread implementation of cancer screening, 13,000 new cases of cervical cancer were diagnosed in the United States in 2002, and there were an estimated 4,100 associated deaths (50).

The major known risk factors for acquiring genital HPV infection include having multiple sex partners (51, 52) and having sex partners who have had multiple partners (51). The cumulative 3-year incidence of genital HPV infection of all types among college-age students has been found to be 43%, and the mean duration of new infections is 8 months (53). Extrapolating these data to the US population, we estimate that there are at least 5.5 million new genital HPV infections each year (34) and that approximately 20 million people have productive genital HPV (that is, active shedding of HPV DNA) (12). In 1994, the economic burden of genital HPV infection and related sequelae, including cervical cancer, in the United States was estimated to exceed $4.5 billion per year (18).

Human Immunodeficiency Virus (HIV)/AIDS

In all US states and territories, data on persons with AIDS are reported to state or local health departments, which forward the data, without personal identifiers, to CDC. Data concerning sex, race/ethnicity, behavioral risk, and state and county of residence are abstracted from medical records of persons who meet either the clinical (opportunistic illness) criteria or the immunologic AIDS-defining criteria that were added to the definition in 1993 (54).

As of the end of December 2001, more than 816,000 cases of AIDS had been reported to CDC. Adult and adolescent AIDS cases totaled 807,000, of which 666,000 were in men and 141,000 were in women. More than 9,000 of the reported AIDS cases were in children under 13 years of age. As of the same date, more than 467,000 persons reported to have AIDS had died—462,000 adults and adolescents and more than 5,000 children under 15 years of age. Current, detailed estimates of the numbers of persons in the United States living with AIDS, by region of residence and year, are available at http://www.cdc.gov/hiv/stats/htm.

The widespread use of highly active antiretroviral therapy (HAART) resulted in substantial decreases in AIDS deaths between 1995 and 1999 in all demographic and risk groups, as well as decreases in new AIDS diagnoses. Further decreases in AIDS diagnoses and deaths in the United States at this point will require better access to therapy, simpler drug regimens, and the continued development of effective drugs. Unfortunately, HIV continues to be transmitted among MSM, among intravenous drug users, and via heterosexual contact. Between 1990 and 1999, the number of living persons diagnosed with AIDS increased fourfold in the United States. The proportions of persons with AIDS are increasing among women, African Americans, Hispanics, intravenous drug users, heterosexuals, and residents of the South, reflecting earlier trends in HIV transmission, differences in testing behaviors, and differential effects of HAART. The poor are disproportionately affected, and HIV incidence rates remain especially high among African Americans with high-risk behaviors.

Hepatitis B

Hepatitis B is caused by infection with hepatitis B virus (HBV). In adults, only 50% of acute HBV infections are symptomatic, and about 1% of cases result in acute liver failure and death. Risk for chronic infection is associated with age at infection. About 90% of infected infants and 60% of infected children under the age of 5 become chronically infected, compared with 2% to 6% of adults. The risk of death from cirrhosis or hepatocellular carcinoma among persons with chronic HBV infection is 15% to 25%.

An estimated 181,000 persons in the United States were infected with HBV during 1998, and about 5,000 deaths occurred from HBV-related cirrhosis or hepatocellular carcinoma. According to NHANES-III data, an estimated 1.25 million people are chronically infected with HBV, serve as a reservoir for infection, and are at increased risk for death from chronic liver disease (31).

HBV is efficiently transmitted by percutaneous or mucous membrane exposure to infectious body fluids. Sexual transmission among adults accounts for about two-thirds of the incident HBV infections in the United States. In the 1990s, transmission among heterosexual partners accounted for about 40% of the infections, and transmission among MSM accounted for another 15%. The most common risk factors for heterosexual transmission include having more than one sex partner in a 6-month period and having a recent history of an STD.

Among MSM, risk factors for HBV infection include having more than one sex partner in a 6-month period, engaging in unprotected receptive anal intercourse, and having a history of other STDs. Changes in sexual practices among MSM to prevent HIV infection have resulted in a lower risk for HBV infection than was observed in the late 1970s, when studies found HBV markers among up to 70% of adult MSM. Recent surveys of young MSM (15 to 22 years of age) indicated that 11% had serologic evidence of past or current HBV infection (anti-HBc or HbsAg) and that 9% had evidence of having been immunized against HBV (anti-HBs alone among persons reporting having received one or more doses of hepatitis B vaccine) (55).

Up to 70% of persons with acute hepatitis B have previously received care in settings where they could have been vaccinated (e.g., STD clinics, drug treatment programs, and correctional facilities). A 1997 survey of STD clinics demonstrated that hepatitis B vaccine was routinely offered in only 5% of these settings (56).

Chancroid

Chancroid, caused by *Haemophilus ducreyi*, is one of the genital ulcerative STDs, along with syphilis and HSV. Chancroid is prevalent in Africa and Asia and has been shown to be a risk factor in the transmission of HIV. It is a reportable disease in some states and territories but tends to be underreported because laboratory diagnosis of chancroid is difficult, and most laboratories are incapable of culturing H. ducreyi (57). National surveillance data collated by CDC reveal that reported cases of chancroid in the United States rose from about 1,000 per year in 1981–1984 to 5,000 in 1987 but have decreased steadily since then to fewer than 100 cases in 2001 (30).

Trichomoniasis

Trichomonas vaginalis is another common cause of lower urogenital tract infection that urologists may see when evaluating the etiology of urethritis in men or women or urinary symptoms (with or without vaginitis and cervicitis) in women. *T. vaginalis* is a microscopic parasite found worldwide, and trichomoniasis is one of the most common STDs, affecting mainly 16- to 35-year-old women. Signs and symptoms of infection in women range from no symptoms to foul-smelling or frothy green discharge from the vagina, vaginal itching, and redness. Other symptoms can include painful sexual intercourse, lower abdominal discomfort, and the urge to urinate. Most men with this infection do not have symptoms, but those who are symptomatic most commonly have a discharge from the urethra, the urge to urinate, and a burning sensation with urination.

In the NDTI, the number of initial visits to physicians' offices per year for trichomonal vaginitis declined from more than 500,000 in 1966 to fewer than 100,000 in 2001. Vaginal infections caused by *T. vaginalis* are among the most common conditions found in women visiting reproductive health facilities. In 1996, between 3% and 48% of sexually active young women requesting routine care at prenatal, family planning, and college health clinics were diagnosed with trichomoniasis (58). Currently, there are no national surveillance data on this disease (13), but it has been estimated that 5 million persons in the United States become infected with *T. vaginalis* each year, with infection being more common in women who have had more than one sex partner in a 6-month period (1).

THE ADDITIONAL BURDEN OF STDs DUE TO SEQUELAE OF ACUTE INFECTIONS AND PERINATAL TRANSMISSION

Several bacterial and viral STDs can cause serious and costly complications if they are not detected and treated promptly. In women, sequelae of acute lower genital tract bacterial STDs that are not promptly treated include PID and its consequences of ectopic pregnancy, infertility, and chronic pelvic pain. Pregnant women can perinatally transmit several STDs, including syphilis resulting in congenital syphilis, gonorrhea resulting in ophthalmia neonatorum, chlamydial infection resulting in pneumonitis and conjunctivitis, HSV resulting in neonatal herpes, HIV resulting in neonatal infection, hepatitis B resulting in neonatal infection, and HPV resulting in respiratory papillomatosis. Bacterial vaginosis in women has been associated with preterm delivery. Infection with certain HPV types can result in dysplasia or cancer of the cervix, penis, vulva, vagina, and anus. Although these complications are far less common than acute cases of bacterial STD and cases of chronic viral STD, they tend to be more complicated and expensive to manage and therefore contribute substantially to the overall clinical and economic burden of STDs. (For details on the burden of these diverse sequelae, see references (59-66)).

MSM: A HIGH-RISK POPULATION FOR STD

Studies demonstrate that MSM with a large number of sexual partners are at higher risk of infection with STDs, including HIV, hepatitis A virus (HAV), and HBV, than are homosexual, bisexual, or heterosexual men who have fewer sexual partners. Although the frequency of unsafe sexual practices and reported rates of bacterial STDs and incident HIV infection have declined substantially in MSM during the past several decades, recent outbreaks of syphilis and gonorrhea have been observed among MSM in several US cities, contributing to increased rates among men (67). MSM, many of whom have been HIV-infected, accounted for most of the new syphilis cases in many urban areas in 2001. These trends threaten to reverse the marked declines in syphilis morbidity seen over the past decade.

Several factors may explain the recent increases in STD and HIV infection observed among MSM. Increases in unsafe sexual behavior by this population have been seen in several US cities, including those with recent outbreaks. Possible reasons for these relapses in safe behaviors include confidence in the effectiveness of antiretroviral therapy in reducing or eliminating transmission risk, "prevention fatigue," lack of awareness of how STDs increase HIV transmission, and increased use of the Internet to identify new sexual partners.

Inadequate provision of STD services to MSM may also play an important role in the recent increases in STD and HIV infection. Anecdotes suggest that many programs provide syphilis serology to MSM only at the initial patient visit because it can be performed readily using blood collected for HIV viral load tests. However, routine risk assessment of sexual risks, clinical assessment and screening for gonorrhea and chlamydial infection, and provision of hepatitis B vaccine at initial or follow-up visits appears to be less common. Thus, many clinicians are missing opportunities to assess risk, encourage risk reduction, educate patients about the risks of HIV transmission despite antiretroviral therapy, and treat STDs that could promote HIV transmission to others.

Urologists who care for MSM should be aware of common symptoms and signs of STDs, e.g., urethral discharge, dysuria, anorectal symptoms (such as pain, pruritis, discharge, and bleeding), genital or anorectal ulcers, other mucocutaneous lesions, lymphadenopathy, and skin rash. Urologists should consider the unique variations in signs that may be encountered in this population such as oral and perianal chancres in those who practice oral and anal sex. Urologists should also be aware of recent trends in STDs in MSM and recent guidelines for risk assessment, diagnosis, and treatment of HIV-uninfected and HIV-infected patients (31). Clinicians should assess sexual risk for all male patients, including routinely inquiring about the gender of patients' sex partners. MSM, including those with HIV infection, should routinely undergo straightforward, nonjudgmental STD/HIV risk assessment and client-centered prevention counseling to reduce the likelihood of acquisition or transmission of HIV and other STDs (31). In addition, screening for STDs and vaccination for HAV and HBV should be considered for MSM at risk for STDs (31, 68, 69).

ECONOMIC IMPACT

Patient visits, claims for testing, diagnostic procedures, drugs, and other treatment account for the majority of direct medical costs. Most published literature on the economic burden of STDs is based on cost per case, not cost per visit. To calculate the direct medical cost of STDs, one must consider unit costs of medical visits that may involve diagnoses, procedures, drugs, and other treatments. Such unit costs can be estimated from special cost studies or by using claims data (such as MarketScan data). Projections of the economic costs for selected populations could be made using some of the datasets that we examined, but with multiple caveats and assumptions. For example, assuming that Medicare and VA costs are lower than the commercial costs reflected in MarketScan data, one could apply a slightly lower average unit cost when estimating actual "costs" rather than "charges." All the visit/drug costs—weighted across the various datasets—could then be applied to the total number of visits to obtain a national estimate of direct medical costs.

The most recent aggregate estimates of the direct medical costs of STDs were published in 1998 (54). These estimates included the STDs examined in this report, as well as manifestations of STDs rarely managed by urologists (e.g., salpingitis) and other

STDs not addressed here. Direct medical costs for STD treatment in the United States were estimated (adjusted to 1997 dollars) to be in excess of $8 billion per year (Tables 34 and 35). This figure does not include lost wages and productivity, out-of-pocket costs, costs related to STD screening programs, or costs resulting from perinatal transmission. Of all STDs other than HIV, HPV has the highest incidence and accounts for the highest direct medical costs (more than $1.6 billion annually), most or which are associated with treating precancerous and cancerous cervical lesions (34). Estimates of direct medical costs will vary over time as screening, diagnostic, treatment, and prevention practices change.

Table 33. Estimated annual medical costs of the major viral STDs in the United States adjusted to 1997 dollars

STD	Total Cost[a] ($ millions)
Genital herpes	208.0
HPV	1,622.8
Hepatitis B	51.4
HIV	4,540.0
Total costs, viral STDs	6,422.2

[a]All cost figures are adjusted to 1997 dollars using the Consumer Price Index, from the US Department of Labor's Bureau of Labor Statistics.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

RECOMMENDATIONS

In the United States, estimates of incidence and prevalence of the more common STDs depend on convenience samples; incomplete national reporting (for chlamydial infection, HBV, syphilis, and gonorrhea); inconsistent, non-representative prevalence data; and rough extrapolations. None of the datasets we examined provides data for accurately estimating the incidence or prevalence of any STD. For example, if we use of only ICD-9 codes to define a case or visit, we substantially underestimate the costs of chronic STDs, such as genital herpes and genital warts, which commonly result in multiple claims for medical visits that may involve diagnoses, procedures, drugs, and surgical treatment. In addition, ICD-9 codes and CPT codes do not readily capture screening for the several STDs that may be asymptomatic and are commonly detected through screening. However, most of the available datasets do provide data that describe basic trends in incidence, populations at highest risk, types of clinicians who provide STD care, and care-seeking behavior for various STDs.

Truly reliable estimates of prevalence based on representative national surveys are limited to HSV-2, C. trachomatis infection, and gonorrhea; similarly reliable estimates of incidence based on fairly complete national surveillance are limited to HIV. Estimates of the burden of HPV have tended to underestimate the oncogenic types of the disease and will change as new guidelines are implemented for Pap smears, with primary testing of women under the age of 30. Population-based serologic surveys, such as NHANES, appear to have the greatest potential for estimating the prevalence of viral STDs in various segments of the population. For estimating the incidence of bacterial STDs, extrapolations from passive surveillance data provide the most reliable data at a population level. Based on our review of the literature and the analyses of numerous datasets, the overall estimate of the STD burden of the early 21st century should approximate that of the late 1990s, with 15 million new cases of STDs occurring annually. The magnitude of this figure underscores the importance

Table 32. Estimated annual medical costs of the major curable STDs in the United States adjusted to 1997 dollars

STD	Total Cost[a] ($ millions)
Chlamydia	374.6
Gonorrhea	56.0
Pelvic in ammatory disease	1,125.2
Trichomoniasis	375.0
Syphilis	43.8
Total costs, bacterial STDs	1,974.6

[a]All cost figures are adjusted to 1997 dollars using the Consumer Price Index, from the US Department of Labor's Bureau of Labor Statistics.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

of understanding the burden of STDs—by clinicians, public health agencies, persons at risk for STDs, the general public, and persons with STDs (31).

Urologists and other clinicians who see persons at risk for or infected with STDs stand to profit by understanding the incidence, prevalence, subclinical shedding, and transmission modes and risks of STDs. They should also be aware of prevention measures, risk assessment, screening, diagnostic testing, treatment, diagnosis and management of complications, counseling, patient education, sex partner services, and reporting of cases mandated by public health law. As more urologists pursue specialization in gynecological urology, issues of the detection, management, and impact of STDs on upper genitourinary sites may become more central to urologic practice. For all sexually active adolescent and adult patients, urologists and other clinicians should consider STDs as an etiology of genitourinary symptoms and signs and should screen or diagnose and treat according to national guidelines (17, 31). Urologists and other clinicians should also provide appropriate counseling, patient education, follow-up, and medical referral for sex partners and should report cases of notifiable diseases. Fortunately, resources for improving knowledge and skills are available for the clinician through commercial continuing medical education programs and through government-supported training networks (including CDC-sponsored Prevention Training Centers in all regions), on-line training courses, and various clinical decision support tools (such as the STD treatment guidelines that are available online) (31). In addition, continued commitment and advocacy for resources are needed to reduce the burden of STDs and to provide access to high-quality prevention and treatment services in the United States. For additional resources, including recommendations, guidelines, and statistical reports, the reader is referred to the website of the Division of STD Prevention at CDC: http://www.cdc.gov/nchstp/dstd/dstp.html.

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