

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

TOMAS L. GRIEBLING*·†

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

ABSTRACT

Purpose: Various types of urinary tract infection (UTI) occur in men. In this study we examined health care use trends, including epidemiological and economic factors, for UTI in men in the United States.

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

Results: Approximately 20% of all UTIs occur in men. Between 1988 and 1994 the overall lifetime prevalence of UTI was estimated to be 13,689/100,000 men. Orchitis rates, particularly in older men, are generally higher than those of cystitis or pyelonephritis. Approximately 10% of all inpatient care of men with UTI is for orchitis (12 to 14/100,000 population). Rates of outpatient hospital and physician office care for male UTI have increased in the last decade. Rates for emergency room care for UTI in elderly men (85 to 94 years old) were almost twice those in men younger than 85 years. The adjusted mean health care expenditure for privately insured men with UTI was \$5,544 in 1999 compared to \$2,715 for men without UTI. Total annual health care expenditures for men and women with UTI were \$5,544 and \$5,407, respectively. Mean time lost from work was slightly higher for men. Based on composite data overall medical expenditures for men with UTI in the United States were estimated to be approximately \$1.028 billion in 2000.

Conclusions: Health care use and economic data on UTIs in men revealed a number of intriguing trends. These results raise various important questions for future research.

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

Urinary tract infections (UTIs) are less prevalent in men than in women. However, the overall rate of UTI in men is still significant, which leads to sizable health care expenditures. The epidemiology of UTI in men differs from that in women, in that rates are lower in young men and increase dramatically with increasing age. Although cystitis and pyelonephritis are common diagnoses in the 2 sexes, several forms of UTI and their associated risk factors are unique to men.

Bladder outlet obstruction due to benign prostatic hyperplasia may be associated with urinary stasis. Although it is difficult to prove causality, chronic obstruction may increase the risk of UTI in men with benign prostatic hyperplasia. Instrumentation such as cystoscopy or catheterization, commonly used in the evaluation of men with obstructive voiding symptoms, can lead to iatrogenic UTI. Transrectal ultrasonography and needle biopsies of the prostate are commonly used in the diagnostic evaluation for prostate cancer. UTI is a well recognized potential risk of transrectal prostate biopsy.¹ Complications may range from acute prostatitis and cystitis to complex infections, including pyelonephritis, prostatic abscess, osteomyelitis and urosepsis.

Several forms of prostatitis are recognized in the National Institutes of Health classification system.² Bacterial prostatitis may be acute or chronic. Acute bacterial prostatitis is a painful condition associated with a significant risk of uro-

sepsis. Chronic bacterial prostatitis is usually less severe and it may be associated with recurrent cystitis. Nonbacterial prostatitis or chronic pelvic pain syndrome is a condition characterized by pain attributed to the prostate despite an absent documentable bacterial infection. It may be associated with increased concentrations of inflammatory cells in prostatic secretions. The pathogenesis of prostatitis is probably multifactorial. Risk factors include reflux of infected urine into prostatic ducts, ascending urethral infection and hematogenous or lymphatic spread of organisms. Prostatic abscess is uncommon but it occurs more often in men with diabetes and immunosuppression.

Urethritis and epididymitis are painful conditions caused by bacterial infection of the urethra and epididymis, respectively. The 2 disorders may be acute or chronic and they are often associated with sexually transmitted diseases. Orchitis is often associated with bacterial epididymitis. Mumps orchitis occurs in about 30% of postpubertal boys with mumps. Scrotal infections may involve only the scrotal skin or they may progress to include deeper structures with a potential risk of necrotizing fasciitis and Fournier's gangrene.

The diagnosis and treatment of the wide variety of UTIs that occur in men are associated with a sizable component of overall urological care in this population. In this study we analyzed health care use patterns, and the direct and indirect economic burdens associated with the care of UTIs in men in the United States.

MATERIALS AND METHODS

The analytical methods used to generate these results have been described previously.^{3,4}

Submitted for publication September 8, 2004.

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

† Financial interest and/or other relationship with Medtronic, Pfizer and ICOS.

See Editorial on page 1065.

RESULTS

Prevalence and incidence. Approximately 20% of UTIs occur in men. Between 1988 and 1994 the overall lifetime prevalence of UTI in men was estimated to be 13,689/100,000 based on the National Health and Nutrition Examination Survey III (NHANES-III) (table 1). The estimated annual incidence of UTI in men was 2,318/100,000 (table 2). Data from United States Veterans Health Administration (VA) facilities support the higher prevalence of UTI in women compared to men (fig. 1, table 3). 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 in men. Orchitis rates were generally higher than those of cystitis or pyelonephritis. UTI rates increased with age in this cohort and they were higher in black men than in other racial/ethnic groups.

Trends in health care resource use. Inpatient Care: Intravenous antibiotics may be required to treat men with complicated 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 revealed that across all years of study the rates of inpatient care in men 65 years or older were approximately 1.7 times those in men younger than 65 years (table 4). The younger group comprised primarily those who qualified for Medicare because of disability or end stage renal disease. The risk appeared to increase significantly with age since rates more than doubled in men 85 years and older. For example, the rate of inpatient care in 1992 for men 85 to 94 years old was 1,678/100,000 (95% CI 1,649 to 1,706) compared with 777/100,000 (95% CI 768 to 786) in men 75 to 84 years old and 308/100,000 (95% CI 304 to 312) in men 65 to 74 years old. This trend was similar in 1995 and 1998. Increased use of inpatient care may be associated with complicated infections in older men due to increased comorbidity and changes in the immune response associated with advanced age. In the period covered by Medicare data the rates of inpatient hospitalization for male UTI were about 1.5 times higher in black than in white or Hispanic men. The rate of inpatient use was somewhat higher in the South than in other regions.

Data on 1994 to 2000 from the Healthcare Cost and Utilization Project (HCUP) revealed that approximately 10% of all inpatient care for UTI in men was for the treatment of orchitis

TABLE 2. Male incidence of UTI in last 12 months by sociodemographic group (NHANES III, 1988 to 1994)

	Count	Rate
Totals	2,013,448	2,318
No. bladder infections/last 12 mos:		
1 or More	2,013,448	2,318
Mean	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 or Older	59,842	7,754
Race/ethnicity:		
White nonHispanic	1,505,602	2,207
Black nonHispanic	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
NonMSA	1,175,769	5,204

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

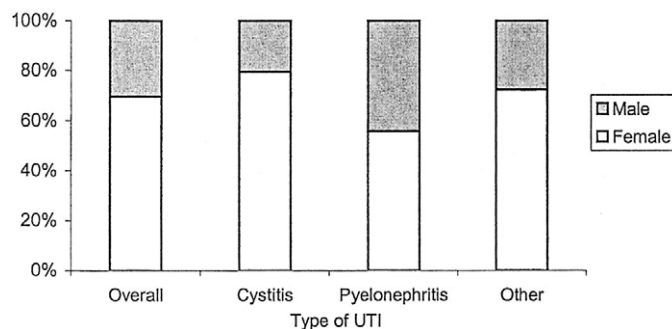


FIG. 1. Percent contribution of males and females to UTI types, 1999 to 2001, according to Outpatient Clinic File, VA Austin Automation Center, FY 1999 to 2001.

TABLE 1. Male lifetime prevalence of UTI by sociodemographic group (NHANES III, 1988 to 1994)

	Count	Rate
Totals	11,892,613	13,689
No. bladder infections:		
1-2 Ever	8,983,769	10,341
3 or Greater ever	2,908,845	3,348
Mean/last 12 mos in pts ever having UTI	0.26	
Race/ethnicity:		
White nonHispanic	9,864,439	14,458
Black nonHispanic	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:		
Metropolitan statistical area (MSA)	5,585,151	8,688
NonMSA	6,307,463	27,919

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

(table 5). Between 1994 and 2000 the overall rate of inpatient care for orchitis treatment was relatively stable at 12 to 14/100,000 population. Rates appeared to increase gradually with age and the most significant increases occurred between ages 65 and 85 years. In older men orchitis is commonly related to bacterial UTI, although in younger men it usually represents a complication of sexually transmitted urethritis. This may explain the observed differences in hospitalization rates related to patient age. Mean length of stay for inpatient hospitalizations in men with a primary diagnosis of UTI decreased from 6.5 days in 1994 to 5.1 days in 2000 (data not shown). This observation was noted across all age groups and geographic regions, and at rural and urban hospitals.

Outpatient Care (Hospital Outpatient Care): Data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) from 1994 to 2000 revealed that hospital outpatient visits by men with UTI listed as any of the reasons for the visit varied (91 to 175/100,000). When UTI was listed as the primary reason for the hospital patient visit, the rates increased from 80/100,000 (95% CI 33 to 127) in 1996 to 136/100,000 (95% CI 80 to 193) in 1998. The rate in 2000

TABLE 3. Frequency of UTI as a diagnosis in male VA patients seeking outpatient care (Outpatient Clinic File, VA Austin Automation Center, FY 1999 to 2001)

	No. 1999 Diagnosis		No. 2000 Diagnosis		No. 2001 Diagnosis	
	Primary	Any	Primary	Any	Primary	Any
Totals	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 or Older	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 health 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

UTI represents diagnosis codes for male UTIs, including cystitis, pyelonephritis, orchitis, and other UTIs, with rate is defined as number of unique patients with each condition divided by base population in the same fiscal year (FY) \times 100,000 to calculate rate per 100,000 unique outpatients and race/ethnicity data from clinical observation only, not self-report (note large number of unknown values).

TABLE 4. Inpatient stays by male Medicare beneficiaries with UTI listed as primary diagnosis (CMS, MedPAR and 5% Carrier File, 1992, 1995 and 1998)

	1992		1995		1998	
	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)
Age:						
Totals	74,320	505 (501–508)	72,820	478 (475–482)	70,480	487 (483–490)
Younger than 65	9,960	322 (316–329)	10,940	318 (312–323)	10,840	315 (310–321)
65 or Older	64,360	553 (549–557)	61,880	526 (521–530)	59,640	540 (536–544)
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 or Older	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	Not available	Not available	180	247 (211–283)	380	277 (249–305)
Hispanic	Not available	Not available	1,000	504 (472–535)	1,560	465 (442–488)
Native	Not available	Not available	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)

Unweighted counts multiplied by 20 to arrive at values and rate per 100,000 Medicare beneficiaries in same demographic stratum with persons of other races, unknown race and ethnicity, and other region included in totals (counts less than 600 should be interpreted with caution).

decreased slightly to 124/100,000 (95% CI 62 to 186). These data suggest that there has been a general trend toward increased outpatient care in men with UTI. This complements the observed decreases in inpatient care, as described.

Hospital outpatient visit data from CMS revealed a similar increase in use during the last decade. In Medicare beneficiaries at least 65 years old rates of hospital outpatient visits increased from 191/100,000 (95% CI 189 to 194) in 1992 to 301/100,000 (95% CI 298 to 304) in 1995 and 362/100,000 (95% CI 358 to 365) in 1998. The most dramatic increases were observed in the oldest cohort. In those 95 years or older rates of hospital outpatient visits more than doubled between 1992 and 1995, and they doubled again between 1995 and

1998. In the years for which complete data on racial/ethnic differences in outpatient hospital use were available (1995 and 1998) Hispanic men had the highest rates of use, followed by black men. For example, in 1998 the rates for Hispanic men (596/100,000, 95% CI 570 to 622) were 1.23 and 1.80 times higher than those for black and white men, respectively. The reason for this observed difference is unclear.

Outpatient Care (Physician Office Care): The majority of UTIs in men and women are treated at physician 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

TABLE 5. Inpatient hospital stays by adult males with orchitis listed as primary diagnosis (HCUP Nationwide Inpatient Sample, 1994, 1996, 1998 and 2000)

	1994		1996		1998		2000	
	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)
Totals	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 or Older	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)
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)

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

men in the United States (table 6). More than 1,290,000 of these visits were for a primary UTI diagnosis. Fluctuations in use rates have been observed with time with peaks occurring in 1992 and 1996. In these years the observed rates of physician office visits for UTI in men 55 years or older were significantly higher than those in 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 they may have been related to coding anomalies.

Medicare data on outpatient physician office visits in men with UTI indicate that use rates remained relatively stable throughout the 1990s. Rates were consistently highest in men in the 85 to 94-year-old age group, followed by those 75 to 84 years old (fig. 2). Rates in the most elderly cohort (95 years or older) were similar to the overall mean. Regional variations in Medicare physician outpatient visits appear to have decreased with time and they were least pronounced in 1998. As in NHAMCS data, Hispanic men had the highest rates of physician office use among the racial/ethnic groups analyzed.

Outpatient Care (Ambulatory Surgery Care): Visits to ambulatory surgery centers represent a small percent of Medicare visits for men with UTI. In Medicare beneficiaries at least 65 years old rates were 83/100,000 in 1992 (95% CI 82 to 85), 93/100,000 in 1995 (95% CI 92 to 95) and 95/100,000 in 1998 (95% CI 93 to 97). Rates were lower and more stable in younger Medicare beneficiaries who qualified because of disability or end stage renal disease. The highest rates were observed in 75 to 94-year-old men. The low use rates indicate that ambulatory surgery centers are not a primary site of service for men with UTI. The cases identified likely represent perioperative UTIs in men scheduled for outpatient surgery.

Emergency Room (ER) Care: Patients with UTI may present to an ER for initial evaluation and treatment. NHAMCS data indicate that approximately 424,700 ER visits were made by men with a primary diagnosis of UTI in 2000 (table 7). The overall use rate in 2000 was 442/100,000, which is similar to the rate of 420/100,000 observed in 1994. Lower rates of ER use in this population were observed in 1996 and 1998. ER use rates by male Medicare beneficiaries were somewhat higher at 506/100,000 (95% CI 502 to 510) in

1992 and 527/100,000 (95% CI 523 to 531) in 1998. In this analysis use rates were consistently highest in the next to oldest cohort (85 to 94 years), followed closely by the oldest men (95 years or older). Rates of ER use by older men were almost twice those of men 85 years or younger. This may represent increased severity of infection in elderly men, prompting evaluation in the ER.

Nursing Home Care: Information regarding UTI in men living in nursing home facilities was obtained from the National Nursing Home Survey of 1995, 1997 and 1999 (table 8). Overall rates in men with an admitting or current diagnosis of UTI appeared stable with time at 5,642/100,000 in 1997 (95% CI 4,641 to 6,642) and 5,803/100,000 in 1995 (95% CI 4,794 to 6,812). It is interesting to note that UTI rates in men living in nursing homes are closer to those in women than rates in community dwelling cohorts. No clear trends were observed with time in regard to age in male nursing home residents.

Men with UTI had higher incontinence rates than the general cohort of male nursing home residents. It is not clear whether UTI or urinary incontinence was the causal factor. The rates of indwelling catheter and ostomy use in male nursing home residents remained stable at 11.9% in 1995 and 11.3% in 1999. However, this is concerning because of the well established association between indwelling catheters, and urinary tract colonization and infection. These rates of catheter and ostomy use are higher than the 7.9% to 9.1% range observed in female nursing home residents.

Economic impact. UTIs in men are associated with significant direct and indirect economic costs. The adjusted mean health care expenditure in privately insured men diagnosed with UTI was \$5,544 in 1999, while the expenditure was \$2,715 in men who did not experience a UTI (table 9). In adults without UTI annual health care expenditures were lower in men than in women (\$2,715 vs \$3,833). However, there was little difference in total annual health care expenditures in men and women with UTI (\$5,544 vs \$5,407).

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 vs 4.8 hours) (table 10). Men with pyelonephritis also missed more total time from work than women (11.0 vs 7.7 hours),

TABLE 6. National physician office visits by adult males with UTI (NAMCS-Outpatient, 1992, 1994, 1996, 1998 and 2000)

	1992		1994		1996		1998		2000	
	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)
Totals	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:					<i>Primary reason for visit</i>					
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 or Older	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)
					<i>Any reason for visit</i>					
Totals	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 or Older	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)

Rate per 100,000 based on 1992, 1994, 1996, 1998 and 2000 CPS population estimates for relevant demographic categories of American male adult civilian noninstitutionalized population (counts may not sum to totals due to rounding).
 * Value does not meet standard for reliability or precision.

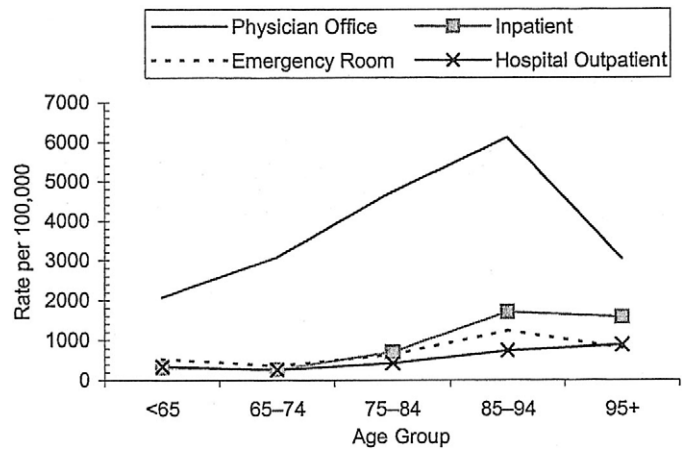


FIG. 2. Trends in visits by males with UTI listed as primary diagnosis by patient age and site of service, 1998, according to Centers for Medicare and Medicaid Services, 1998.

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

	Count	Rate (95% CI)
1994	370,637	420 (320-520)
1996	296,377	322 (232-412)
1998	322,937	342 (245-440)
2000	424,705	442 (325-559)

Rate per 100,000 based on 1994, 1996, 1998 and 2000 CPS population estimates for relevant demographic categories of American male adult civilian noninstitutionalized population.

although the percent of men missing work was slightly lower than the percent of women (21% vs 24%). Of men diagnosed with orchitis in this sample 14% reported missing work (mean total 7.6 hours, 95% CI 2.3 to 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 to 6.5).

Based on composite data overall medical expenditures for men with UTI in the United States were estimated to be approximately \$1.028 billion in 2000 (table 11). This is approximately 2.4 times lower than the overall amount spent to care for women with UTI during the same period. However, the costs of care for UTI in men appear to be increasing. 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 12). This was significantly higher than expenditures for younger male Medicare beneficiaries (total \$91.1 million) but comparable on a per person basis.

DISCUSSION

UTIs are among the most common urological disorders in men and women. Various 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 individuals and the health care system.

The data analyses presented reveal several 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 use of outpatient care in various settings for the treatment of UTI related disorders. Per capita financial expenditures in men with UTI are similar to those for UTI in women. However, the mean amount of time lost from work by men is somewhat greater.

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

	1995		1997		1999	
	Count	Rate (95% CI)	Count	Rate (95% CI)	Count	Rate (95% CI)
Totals	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 or Older	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)

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

TABLE 9. Estimated annual expenditures of privately insured workers with and without medical claim for UTI in 1999 (Ingenix, Salt Lake City, Utah 1999)

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

Primary beneficiaries 18 to 64 years old with employer provided insurance who were continuously enrolled in 1999 with estimated annual expenditures derived from multivariate models 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 and co-insurance/copayments), and 26 disease conditions.

TABLE 10. Average annual work loss of persons treated for UTI (MarketScan, Chichester, United Kingdom 1999)

Condition	No. Persons	% Missing Work	Av Hrs Work Absence (95% CI)		
			Inpt	Outpt	Totals
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)

Individuals with inpatient or outpatient claim for UTI and for whom absence data were collected with work loss based on reported absences contiguous to admission and discharge dates of each hospitalization or date of outpatient visit.

TABLE 11. Expenditures for male UTI and share of costs by service site (NAMCS, NHAMCS, HCUP and Medical Expenditure Panel Survey, 1994, 1996, 1998 and 2000)

	\$ Million/Yr (%)			
	1994	1996	1998	2000
Totals	811.5	903.8	969.3	1,027.9
Total share:				
Inpt	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 outpt	18.7 (2.3)	18.1 (2.0)	31.0 (3.2)	28.8 (2.8)
ER	85.2 (10.5)	75.9 (8.4)	90.1 (9.3)	129.5 (12.6)

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

CONCLUSIONS

Analysis of these data raises several important research questions related to UTI in men. What is the relationship between comorbid urological conditions such as benign pros-

tatic hyperplasia, urinary incontinence and UTI? What is the role of preventive care in men at risk for UTI? How can the diagnosis and treatment of men with UTI be improved to minimize time lost from work and decrease overall medical

TABLE 12. Expenditures for male Medicare beneficiaries for UTI treatment by service site in 1998 (CMS, 1998)

Service Site	Total Annual Expenditures (\$ million)	
	Age Younger Than 65	Age 65 or Older
Inpt	70.9	376.4
Outpt:		
Physician office	9.8	59.0
Hospital outpatient	1.3	4.7
Ambulatory surgery	2.8	17.7
ER	6.4	22.4
Overall	91.1	480.2

expenditures? What roles do demographic factors such as race/ethnicity and geography have in the risk of 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 men and women with

UTI. Additional research on health services, outcomes, economic impacts and epidemiological factors is needed to answer these challenging questions.

REFERENCES

1. Roberts, R. O., Bergstralh, E. J., Besse, J. A., Lieber, M. M. and Jacobsen, S. J.: Trends and risk factors for prostate biopsy complications in the pre-PSA and PSA eras, 1980 to 1997. *Urology*, **59**: 79, 2002
2. Krieger, J. N., Nyberg, L., Jr. and Nickel, J. C.: NIH consensus definition and classification of prostatitis. *JAMA*, **282**: 236, 1999
3. Litwin, M. S., Saigal, C. S., Yano, E. M., Avila, C., Geschwind, S. A., Hanley, J. M. et al: Urologic Diseases in America Project: analytic methods and principal findings. *J Urol*, **173**: 933, 2005
4. Litwin, M. S. and Saigal, C. S.: Urologic Diseases in America Interim Compendium. Washington, D. C.: United States Department of Health and Human Services, Public Health Service, National Institute of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2004