

# Male Urethral Stricture Disease

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## INTRODUCTION

The true incidence of male urethral stricture disease is unknown, despite the fact that urethral strictures may have great negative impact on patients. The majority of stricture patients suffer from moderate complications such as irritative voiding symptoms, recurrent urinary tract infections, or the need for repeated urethral procedures (e.g., dilation or urethrotomy) (1, 2). A minority suffer severe sequelae such as acute urinary retention, renal failure, urethral carcinoma, Fournier's gangrene (3), or bladder failure resulting from long-standing obstruction (2). Table 1 lists ICD-9 and CPT-4 codes used to identify urethral stricture disease and related procedures.

## DEFINITION AND DIAGNOSIS

Male urethral stricture disease encompasses a spectrum of divergent ailments that cause obliteration of the urethral lumen and slowing or cessation of urinary flow. Strictures are usually described according to their location (e.g., fossa navicularis, penile urethra, bulbar urethra, membranous urethra, prostatic urethra, or bladder neck). Bulbar urethral strictures represent the overwhelming majority of cases, while prostatic urethral strictures are vanishingly rare.

The etiology of strictures is also varied. Fossa navicularis and distal penile urethral strictures can occur as a result of lichen sclerosis (a.k.a., balanitis xerotica obliterans), an idiopathic inflammatory disease of the glans penis. Penile urethral strictures may be post-surgical after repair of hypospadias.

Bulbar strictures are most often idiopathic, but may also be due to gonococcal infection, direct trauma (straddle injury), or as complication of prostatic irradiation for cancer.

Most strictures are treated by general-practice urologists with dilation or direct-vision internal urethrotomy (DVIU), although these have less than a 50% durable cure rate as initial therapy and an even lower cure rate once an initial procedure has failed. Selected general urologists and specialty referral centers treat strictures with open urethroplasty techniques, which generally have a lifetime success rate in the range of 75% to 100%, depending on the length and location of stricture.

In addition to the burden of the disease itself, therapy for strictures can sometimes be associated with further complications. For example, urethrotomy can be associated with complications such as bleeding (in 4% to 6% of cases), infection (8% to 9%), incontinence (1%), impotence (1%), and a failure rate of up to 100% after repeated use (4, 5). Until definitively treated with urethroplasty, strictures tend to recur after urethrotomy or dilation (6-8), further adding to their impact on patients. Even after definitive urethroplasty, urethral strictures can cause problems for the patient. Rates of surgical complications range from 7% (anastomotic urethroplasty) to 33% (fasciocutaneous urethroplasty) after open urethral surgery (9). One study showed that the rate of erectile dysfunction after anastomotic urethroplasty could be as high as 27% (10).

Despite an emerging understanding of the burden of urethral stricture on individual patients, little is

**Table 1. Codes used in the diagnosis and management of male urethral stricture****Males with one or more of the following:****ICD-9 diagnosis codes**

598	Urethral stricture
598.0	Urethral stricture due to infection
598.01	Urethral stricture due to infective diseases classified elsewhere
598.1	Traumatic urethral stricture
598.2	Postoperative urethral stricture
598.8	Other specified causes of urethral stricture
598.9	Urethral stricture, unspecified

**CPT procedure codes**

52283	Cystourethroscopy, with steroid injection into stricture
52275	Cystourethroscopy, with internal urethrotomy; male
52276	Cystourethroscopy with direct vision internal urethrotomy
52281 <sup>a</sup>	Cystourethroscopy, with calibration and/or dilation of urethral stricture or stenosis, with or without meatotomy, with or without injection procedure for cystography, male or female
52282	Cystourethroscopy, with insertion of urethral stent
53000	Urethrotomy or urethrostomy, external (separate procedure); pendulous urethra
53010	Urethrotomy or urethrostomy, external (separate procedure); perineal urethra, external
53020 <sup>a</sup>	Meatotomy, cutting of meatus (separate procedure); except infant
53025 <sup>a</sup>	Meatotomy, cutting of meatus (separate procedure); infant
53400	Urethroplasty; first stage, for fistula, diverticulum, or stricture (eg, Johanssen type)
53405	Urethroplasty; second stage (formation of urethra), including urinary diversion
53410	Urethroplasty, one-stage reconstruction of male anterior urethra
53415	Urethroplasty, transpubic or perineal, one stage, for reconstruction or repair of prostatic or membranous urethra
53420	Urethroplasty, two-stage reconstruction or repair of prostatic or membranous urethra; first stage
53425	Urethroplasty, two-stage reconstruction or repair of prostatic or membranous urethra; second stage
53431	Urethroplasty with tubularization of posterior urethra and/or lower bladder for incontinence (eg, Tenago, Leadbetter procedure)
53450	Urethromeatoplasty, with mucosal advancement
53600 <sup>a</sup>	Dilation of urethral stricture by passage of sound or urethral dilator, male; initial
53601 <sup>a</sup>	Dilation of urethral stricture by passage of sound or urethral dilator, male; subsequent
53605 <sup>a</sup>	Dilation of urethral stricture or vesical neck by passage of sound or urethral dilator, male, general or conduction (spinal) anesthesia
53620 <sup>a</sup>	Dilation of urethral stricture by passage of filiform and follower, male; initial
53621 <sup>a</sup>	Dilation of urethral stricture by passage of filiform and follower, male; subsequent
53640 <sup>a</sup>	Passage of filiform and follower for acute vesical retention, male

<sup>a</sup>Included only in definition of hospital outpatient and physician office visits.

known about the burden of the disease on society as a whole. This chapter presents results from an analysis of public and private healthcare data on disease rates, treatments, and costs of male urethral stricture disease in America.

**RISK FACTORS**

*Sexually Transmitted Disease (STD)*

Urethral stricture is a common sequela of sexually transmitted diseases in men, resulting from a chronic inflammatory process (11). The risk of urethral stricture is increased in men who have a history of chlamydia or gonorrhea (12-14).

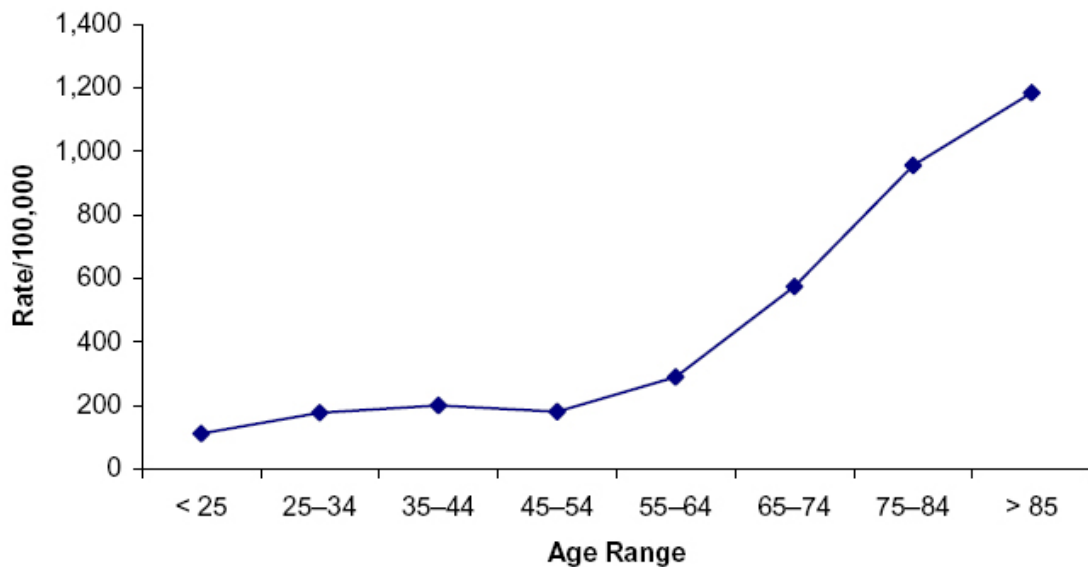
*Race*

Some, but not all, of the datasets analyzed in this project indicate that African Americans may have higher stricture rates than Caucasians have. (In general, sample numbers for Asian, Hispanic, and Native

American patients are too small to permit accurate conclusions.) Inpatient samples from Healthcare Cost and Utilization Project (HCUP) data (Table 2) show substantial racial variations, as do inpatient and outpatient samples from Medicare (Tables 3 and 4). Caution must always be used when interpreting Medicare data, as most Medicare patients are over 65 years of age, so the rate of strictures in younger patients may be non-representative. This racial variation in incidence has implications for both the etiology of strictures and funding for programs to investigate stricture disease in susceptible populations.

*Age*

A clear trend of increasing incidence of treatment for urethral stricture with age is seen across multiple datasets, likely indicating a true increase in urethral stricture disease with age, with a marked increase in persons over the age of 55 (Figure 1).



**Figure 1. Male dual VA-Medicare users with a diagnosis of urethral stricture in 2002, age-adjusted to 2000.**

SOURCE: Inpatient and Outpatient Files, VA Information Resource Center (VIREC) and Carrier and Outpatient and MedPar Files, CMS.

Table 2. Inpatient hospital stays for males with urethral stricture listed as primary diagnosis, count, rate<sup>a</sup> (95% CI), age-adjusted rate<sup>b</sup> (95% CI)

	1994			1996			1998			2000		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>c</sup>	7,004	5.7 (5.4-6.3)	5.7	5,235	4.1 (3.7-4.5)	4.1	4,932	3.8 (3.4-4.1)	3.8	5,035	3.8 (3.1-4.4)	3.8
Age												
<18	408	1.2 (0.7-1.7)		227	0.6 (0.3-0.9)		239	0.6 (0.4-0.9)		145	0.4 (0.2-0.6)	
18-24	241	2.0 (1.4-2.5)		171	1.4 (0.8-2.0)		*	*		218	1.7 (0.8-2.5)	
25-34	552	2.8 (2.1-3.4)		376	1.9 (1.4-2.4)		355	1.8 (1.4-2.3)		468	2.6 (1.6-3.5)	
35-44	618	3.1 (2.4-3.8)		474	2.2 (1.7-2.8)		560	2.6 (2.0-3.2)		650	3.0 (2.1-3.9)	
45-54	599	4.3 (3.3-5.2)		540	3.5 (2.7-4.3)		539	3.2 (2.6-4.0)		667	3.7 (2.8-4.7)	
55-64	725	7.6 (6.0-9.1)		543	5.5 (4.2-6.7)		500	4.7 (3.6-5.8)		649	5.8 (4.3-7.3)	
65-74	1,685	21 (18-25)		1,293	16 (13-18)		895	11 (9.2-13)		877	11 (8.7-13)	
75-84	1,545	41 (34-48)		1,159	27 (23-32)		1,202	26 (22-31)		905	19 (15-22)	
85+	630	70 (56-84)		452	52 (40-64)		493	50 (39-61)		457	45 (35-55)	
Race/ethnicity												
White	3,945	4.3 (3.7-4.9)	3.9	3,042	3.3 (2.9-3.6)	2.9	2,617	2.8 (2.4-3.1)	2.5	2,679	2.8 (2.2-3.5)	2.6
Black	1,078	7.3 (5.9-8.7)	10	770	5.0 (4.1-5.9)	6.9	833	5.3 (4.2-6.8)	6.9	761	4.8 (3.8-5.8)	6.1
Hispanic	361	2.8 (2.0-3.6)	5.0	349	2.4 (1.6-3.3)	3.7	339	2.2 (1.3-3.0)	4.3	398	2.4 (1.7-3.2)	3.8
Region												
Midwest	1,560	5.3 (3.9-6.7)	5.4	1,199	4.0 (3.1-4.9)	4.0	1,144	3.7 (3.0-4.4)	3.7	1,063	3.4 (2.5-4.3)	3.5
Northeast	2,427	9.8 (7.7-12)	9.3	1,546	6.2 (4.9-7.6)	5.9	1,209	4.9 (3.9-5.9)	4.7	1,178	4.8 (3.7-5.8)	4.4
South	2,115	5.1 (4.3-5.9)	5.1	1,783	4.0 (3.4-4.6)	4.0	1,716	3.8 (3.1-4.5)	3.8	1,892	4.0 (2.7-5.4)	4.0
West	903	3.2 (2.4-4.1)	3.4	707	2.4 (2.0-2.9)	2.6	862	2.9 (2.2-3.5)	3.0	902	3.0 (1.5-4.4)	3.1
MSA												
Rural	876	2.8 (2.1-3.5)	2.5	776	2.7 (2.1-3.3)	2.5	578	2.0 (1.5-2.4)	1.8	540	1.8 (1.4-2.3)	1.7
Urban	6,112	6.6 (5.8-7.5)	6.9	4,430	4.5 (4.0-4.9)	4.6	4,335	4.3 (3.8-4.7)	4.4	4,495	4.3 (3.5-5.1)	4.4

\*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 is 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.

<sup>b</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>c</sup>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 3. Inpatient stays by male Medicare beneficiaries with urethral stricture listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI), age-adjusted rate<sup>c</sup>

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>d</sup>	3,760	25 (22-29)	...	2,340	15 (13-18)	...	2,020	14 (11-17)	...	1,260	8.2 (6.2-10)	...
Total < 65	320	10 (5.2-15)	...	240	7.0 (3.0-11)	...	320	9.3 (4.7-14)	...	220	5.8 (2.4-9.2)	...
Total 65+	3,440	29 (25-34)	33	2,100	18 (14-21)	20	1,700	15 (12-19)	16	1,040	9.0 (6.5-11)	9.4
Age												
65-69	660	16 (11-22)	...	380	9.9 (5.4-14)	...	280	8.3 (3.9-13)	...	160	4.5 (1.4-7.7)	...
70-74	640	20 (13-27)	...	320	9.6 (4.9-14)	...	340	11 (5.8-16)	...	160	5.2 (1.6-8.8)	...
75-79	800	35 (24-46)	...	620	27 (18-37)	...	420	18 (11-26)	...	360	15 (7.9-21)	...
80-84	680	52 (34-69)	...	380	27 (15-40)	...	380	28 (15-40)	...	180	12 (4.1-20)	...
85-89	420	70 (40-101)	...	220	35 (14-55)	...	220	34 (14-54)	...	100	14 (1.7-26)	...
90-94	240	118 (51-186)	...	160	76 (23-128)	...	20	9.3 (0-27)	...	80	35 (0.9-68)	...
95-97	0	0	...	20	53 (0-156)	...	40	101 (0-240)	...	0	0	...
98+	0	0	...	0	0	...	0	0	...	0	0	...
Race/ethnicity												
White	2,660	21 (18-25)	21	1,680	13 (10-16)	13	1,320	11 (8.2-13)	11	880	6.7 (4.7-8.7)	6.3
Black	920	72 (51-93)	77	480	35 (21-49)	35	520	39 (24-54)	42	260	18 (8.1-27)	22
Asian	...	...	...	0	0	0	0	0	0	20	9.8 (0-29)	9.8
Hispanic	...	...	...	80	40 (1.0-80)	30	80	24 (0.6-47)	24	40	11 (0-25)	11
N. American	...	...	...	20	99 (0-293)	99	0	0	0	20	60 (0-177)	60
Native	...	...	...	...	...	...	...	...	...	...	...	...
Region												
Midwest	760	20 (14-27)	23	520	13 (8.3-19)	12	320	8.7 (4.4-12.9)	8.1	200	5.3 (2.0-8.5)	4.7
Northeast	1,260	40 (30-50)	44	700	22 (15-29)	22	600	22 (14-29)	22	240	8.2 (3.6-13)	7.5
South	1,260	24 (18-30)	20	920	17 (12-22)	17	760	14 (9.7-19)	14	460	7.9 (4.7-11)	7.9
West	320	13 (6.7-20)	14	80	3.4 (0.1-6.8)	4.3	280	13 (5.9-19)	13	280	11 (5.4-17)	11

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 male Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>d</sup>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 Files, 1992, 1995, 1998, 2001.

Table 4. Hospital outpatient visits by male Medicare beneficiaries with urethral stricture listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI), age-adjusted rate<sup>c</sup>

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>d</sup>	5,540	37 (33-42)		3,120	20 (17-24)		2,800	19 (16-23)		3,260	21 (18-24)	
Total < 65	560	18 (11-25)		620	18 (12-24)		900	26 (19-34)		760	20 (14-26)	
Total 65+	4,980	42 (37-48)	47	2,500	21 (18-25)	23	1,900	17 (14-21)	17	2,500	22 (18-25)	22
Age												
65-69	800	20 (14-26)		440	11 (6.6-16)		520	15 (9.5-21)		600	17 (11-23)	
70-74	1,300	40 (30-50)		380	11 (6.3-16)		580	19 (12-26)		720	23 (16-31)	
75-79	1,380	61 (47-75)		900	40 (28-51)		300	13 (6.5-20)		660	27 (18-36)	
80-84	660	50 (33-68)		520	37 (23-52)		320	23 (12-35)		220	15 (6.0-23)	
85-89	300	50 (25-76)		220	35 (14-55)		160	25 (7.5-42)		280	39 (18-59)	
90-94	540	267 (166-367)		40	19 (0-45)		20	9.3 (0-27)		20	8.6 (0-26)	
95-97	0	0		0	0		0	0		0	0	
98+	0	0		0	0		0	0		0	0	
Race/ethnicity												
White	2,960	24 (20-27)	22	1,620	12 (9.7-15)	12	1,700	14 (11-17)	13	2,180	17 (14-20)	16
Black	2,440	191 (157-225)	208	1,180	85 (63-107)	90	840	63 (44-82)	66	600	41 (26-56)	44
Asian	...	...	...	0	0	0	20	15 (0-43)	15	0	0	0
Hispanic	...	...	...	180	91 (31-150)	101	160	48 (15-81)	48	200	53 (20-86)	59
N. American	...	...	...	0	0	0	20	72 (0-211)	72	120	360 (72-649)	300
Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	1,560	42 (33-51)	40	1,180	31 (23-38)	24	960	26 (19-33)	25	880	23 (16-30)	22
Northeast	780	25 (17-32)	23	400	13 (7.1-18)	15	560	20 (13-28)	22	560	19 (12-26)	20
South	2,600	50 (41-58)	52	1,020	19 (13-24)	20	700	13 (8.7-17)	13	980	17 (12-22)	17
West	580	24 (15-33)	23	400	12 (9.7-25)	19	480	21 (13-30)	21	820	33 (23-43)	35

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 male Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>d</sup>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, 2001.



### *Geographic Location*

Few datasets include sample sizes large enough to permit inferences about the effect of geographic location on the incidence of strictures, but analysis of HCUP inpatient data indicates that the incidence was 2.6 times higher in urban hospitals than in rural hospitals (Table 2). This could reflect either a true increase in incidence in the urban setting or a tendency to refer patients with urethral stricture to urban medical centers for definitive treatment. No clear trends in diagnosis rates were seen across the regions of the United States.

## TREATMENT

### **Retrograde Urethrogram**

The rate of retrograde urethrograms performed for patients over 65 years of age with a diagnosis of urethral stricture disease was 6,557 per 100,000 in 2001 (Table 5). This means that 6.5% of patients with a diagnosis of urethral stricture disease who were over the age of 65 had a retrograde urethrogram in that year.

### **Dilation**

Analyzed by CPT procedure code, the rate of urethral dilations in the office setting in 2001 ranged from 0 to 35,304 per 100,000 Medicare beneficiaries 65 and older with a diagnosis of urethral stricture (Table 6). For comparison purposes, the rate of ureteroscopies performed in the same population in 1998 in all medical settings was 8,372 per 100,000 (15). Office dilation became much less common after 1992, decreasing in most cases by 2001.

### **Associated Illness**

Although causation cannot be determined from the datasets, the percentage of men with urethral stricture disease who also had a diagnosis of urinary tract infection in 2001 was notably high at 42% (Table 7). Approximately 11% of men with a urethral stricture diagnosis also had a diagnosis of urinary incontinence in the same year (Table 8).

## PREVALENCE AND INCIDENCE

Data from the Veterans Affairs (VA) show that the unadjusted rate of urethral stricture for all diagnoses was 274 per 100,000 male VA users in 1998 (Table 9). This rate declined to 193 per 100,000 by 2003. The rate of stricture diseases climbs sharply after the age of 55 (Figure 1).

Even with complex analysis of large datasets, the true prevalence of urethral stricture is only estimable. In a population of older veterans, prevalence was found to be as high as 0.6%. However, even this is likely to undercount the true prevalence of urethral stricture disease, because most of the patients in the VA datasets are older than the general population. In 2000, urethral stricture resulted nationally in thousands of inpatient, outpatient, and emergency room visits, tens of thousands of ambulatory surgery visits, and hundreds of thousands of office visits. Urethral strictures resulted in a 6.5% rate of affected patients undergoing radiographic studies (retrograde urethrogram) and a rate of urethral dilation that exceeds even that of commonly performed procedures such as ureteroscopy for stones (Table 5). Patients affected by stricture had a high rate of untoward associated sequelae, including urinary tract infection (42%) and incontinence (11%) (Tables 7 and 8). Urethral strictures are also associated with urethral carcinoma, and while not reported in the datasets analyzed here, urethral carcinoma must be listed as one of the many possible negative sequelae of the disease.

Multiple datasets indicate that the prevalence of stricture disease is decreasing over time. The reasons for this are unknown, but two hypotheses are (1) decreased incidence of *de novo* stricture disease and (2) decreased incidence of recurrent stricture disease due to more effective primary treatment. Better treatment of infectious urethritis may be decreasing its incidence, although separate specific study would be needed to determine the etiology accurately. It is also probable that increasingly successful surgical treatments of urethral stricture such as buccal mucosal urethroplasty are decreasing the persistence of the disease, thereby resulting in a lower incidence of strictures over time.

Table 5. Use of retrograde urethrocytography<sup>a</sup> or injection procedure for urethrogram<sup>b</sup> among males 65 years and older with urethral stricture, in any setting, count<sup>c</sup>, rate<sup>d</sup> (95% CI), age-adjusted rate<sup>e</sup>

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>f</sup>	13,840	7,322 (6,797-7,847)	12,060	7,157 (6,607-7,708)	10,580	7,774 (7,137-8,410)	8,200	6,557 (5,944-7,170)				
Age												
65-69	4,040	10,504 (9,134-11,875)	2,980	9,324 (7,897-10,751)	2,520	10,535 (8,796-12,274)	1,980	9,340 (7,590-11,090)				
70-74	4,000	8,368 (7,257-9,479)	3,720	8,832 (7,621-10,043)	2,760	8,550 (7,187-9,913)	2,360	8,049 (6,658-9,441)				
75-79	2,880	6,135 (5,164-7,107)	2,540	6,144 (5,109-7,179)	2,720	7,902 (6,627-9,178)	1,960	6,347 (5,130-7,565)				
80-84	1,780	5,414 (4,319-6,509)	1,680	5,280 (4,180-6,380)	1,480	5,777 (4,500-7,053)	1,100	4,622 (3,429-5,815)				
85-89	800	4,884 (3,407-6,361)	760	5,080 (3,509-6,651)	760	5,094 (3,519-6,669)	560	3,911 (2,493-5,328)				
90-94	280	5,109 (2,500-7,719)	220	4,198 (1,775-6,622)	320	8,290 (4,404-12,176)	180	3,766 (1,360-6,172)				
95-97	0	0	80	10,256 (769-19,744)	20	2,222 (0-6,556)	40	7,143 (0-16,607)				
98+	0	0	0	0	0	0	0	0				
Race/ethnicity												
White	11,380	7,204 (6,634-7,775)	10,280	7,117 (6,524-7,710)	8,840	7,619 (6,937-8,302)	7,060	6,717 (6,041-7,394)				6,736
Black	1,600	8,073 (6,377-9,768)	1,360	8,047 (6,213-9,882)	1,160	8,555 (6,453-10,656)	580	4,715 (3,041-6,390)				4,553
Asian	...	...	20	2,381 (0-7,024)	40	4,878 (0-11,463)	60	4,054 (0-8,581)				4,054
Hispanic	...	...	120	6,122 (1,378-10,867)	400	11,696 (6,871-16,520)	220	6,707 (2,866-10,549)				6,098
N. American	...	...	0	0	0	0	0	0				0
Native	...	...	0	0	0	0	0	0				0
Region												
Midwest	3,720	7,626 (6,572-8,680)	3,120	7,166 (6,082-8,250)	2,880	7,912 (6,673-9,151)	1,680	5,125 (4,057-6,193)				5,003
Northeast	2,760	7,697 (6,464-8,929)	2,400	7,528 (6,233-8,824)	1,920	7,339 (5,925-8,754)	1,440	6,338 (4,921-7,755)				6,514
South	5,780	7,585 (6,744-8,427)	4,700	6,924 (6,070-7,778)	3,800	7,244 (6,252-8,235)	3,460	7,257 (6,214-8,299)				7,173
West	1,520	6,022 (4,711-7,334)	1,740	7,831 (6,251-9,410)	1,860	10,043 (8,105-11,982)	1,560	8,117 (6,389-9,844)				8,429

... data not available.

<sup>a</sup>CPT 74450 or ICD-9 87.76.

<sup>b</sup>CPT 51610.

<sup>c</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>d</sup>Rate per 100,000 male Medicare beneficiaries 65 years and older with urethral stricture.

<sup>e</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>f</sup>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, 1992, 1995, 1998, 2001.

**Table 6. Use of procedures during physician office visits by male Medicare beneficiaries with urethral stricture listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup>**

CPT Code	Procedure	1992		1995		1998		2001	
		Count	Rate	Count	Rate	Count	Rate	Count	Rate
52281	Cystourethroscopy and urethral dilation	48,460	25,616	50,360	29,870	45,560	33,456	44,180	35,304
53600	Urethral dilation with sound, initial	38,560	20,383	25,220	14,958	16,640	12,219	12,360	9,877
53601	Urethral dilation with sound, subsequent	49,960	26,409	38,720	22,966	27,040	19,856	24,600	19,658
53620	Urethral dilation with filiform and followers, initial	15,860	8,384	11,800	6,999	9,000	6,609	8,100	6,473
53621	Urethral dilation with filiform and followers, subsequent	13,300	7,030	11,080	6,572	7,520	5,522	7,140	5,706
53640	Urethral dilation with filiform and followers for acute vesical retention	1,200	634	1,620	961	0	0	0	0

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 male Medicare beneficiaries 65 years and older with urethral stricture.

NOTE: Counts less than 600 should be interpreted with caution

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998, 2001.

**Table 7. Male Medicare beneficiaries with a diagnosis of urethral stricture and urinary tract infection (UTI) in the same year, count<sup>a</sup>, percent<sup>b</sup>**

	1992		1995		1998		2001	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Total <sup>c</sup>	58,040	35%	54,020	37%	49,560	42%	46,400	42%
Age								
65–69	10,440	31%	9,560	34%	7,840	38%	7,320	40%
70–74	13,400	32%	12,680	35%	11,000	39%	10,780	42%
75–79	14,660	36%	13,180	36%	12,640	42%	11,480	42%
80–84	10,660	37%	10,640	38%	9,740	44%	8,620	41%
85–89	6,280	43%	5,420	42%	6,120	47%	5,780	45%
90–94	2,060	45%	2,080	44%	1,780	51%	2,100	49%
95–97	320	48%	360	58%	320	43%	220	44%
98+	220	58%	100	56%	120	75%	100	71%
Race/ethnicity								
White	47,140	34%	45,740	36%	41,400	41%	38,520	42%
Black	7,680	44%	5,920	40%	5,460	46%	4,760	44%
Asian	...	...	200	26%	280	37%	600	46%
Hispanic	...	...	900	52%	1,640	56%	1,520	52%
N. American Native	...	...	80	67%	20	20%	20	20%
Region								
Midwest	14,400	34%	13,900	36%	12,380	39%	10,780	37%
Northeast	10,520	33%	9,300	34%	9,860	44%	8,380	43%
South	24,960	38%	22,120	37%	19,120	42%	18,260	43%
West	7,280	33%	7,480	38%	6,720	41%	7,520	44%

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Percent of males with urethral stricture who also have diagnosis of urinary tract infection.

<sup>c</sup>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, 1992, 1995, 1998, 2001.

**Table 8. Male Medicare beneficiaries with a diagnosis of urethral stricture and urinary incontinence in the same year, count<sup>a</sup>, percent<sup>b</sup>**

	1992		1995		1998		2001	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Total <sup>c</sup>	13,220	8%	11,940	8%	11,200	9%	11,760	11%
Age								
65–69	1,680	5%	1,880	7%	1,660	8%	1,440	8%
70–74	3,160	8%	2,860	8%	2,320	8%	2,600	10%
75–79	3,020	7%	2,700	7%	3,000	10%	2,620	10%
80–84	2,960	10%	2,660	10%	2,160	10%	2,700	13%
85–89	1,600	11%	1,180	9%	1,640	13%	1,580	12%
90–94	660	14%	540	11%	340	10%	740	17%
95–97	100	15%	100	16%	80	11%	60	12%
98+	40	11%	20	11%	0	0%	20	14%
Race/ethnicity								
White	10,900	8%	10,560	8%	9,560	9%	9,560	10%
Black	1,580	9%	1,060	7%	1,120	10%	1,440	13%
Asian	...	...	40	5%	100	13%	240	18%
Hispanic	...	...	60	3%	280	10%	260	9%
N. American Native	...	...	0	0%	0	0%	20	20%
Region								
Midwest	3,860	9%	3,120	8%	2,940	9%	2,680	9%
Northeast	1,880	6%	2,180	8%	2,240	10%	2,340	12%
South	5,360	8%	4,980	8%	4,400	10%	4,720	11%
West	2,060	9%	1,520	8%	1,500	9%	1,840	11%

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Percent of males with urethral stricture who also have diagnosis of urinary incontinence.

<sup>c</sup>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, 1992, 1995, 1998, 2001.

Table 9. Male VA users with a diagnosis of urethral stricture, 1998–2003, count, rate<sup>a</sup> (95% CI)

	1998		1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	8,992	274 (268–279)	9,229	263 (258–268)	9,397	253 (248–258)	9,003	220 (216–225)	9,156	205 (200–209)	9,201	193 (189–197)
Age												
< 25	15	41 (20–62)	21	64 (37–91)	16	55 (28–81)	14	51 (24–77)	7	25 (7–44)	7	25 (7–44)
25–34	133	70 (58–82)	147	82 (69–95)	131	79 (66–93)	132	86 (71–100)	118	80 (65–94)	123	85 (70–100)
35–44	444	111 (101–121)	415	107 (96–117)	380	104 (93–114)	383	112 (101–123)	310	95 (84–106)	305	97 (86–108)
45–54	1,290	172 (163–181)	1,278	160 (152–169)	1,298	158 (150–167)	1,311	153 (145–162)	1,292	146 (138–154)	1,202	141 (133–148)
55–64	1,424	261 (247–274)	1,521	261 (248–274)	1,601	256 (244–269)	1,506	213 (202–220)	1,736	210 (200–220)	1,876	188 (179–196)
65–74	3,242	389 (375–402)	3,207	355 (343–368)	3,071	319 (308–331)	2,794	258 (249–268)	2,729	233 (224–242)	2,625	218 (210–227)
75–84	2,186	452 (433–471)	2,361	410 (393–427)	2,598	381 (367–396)	2,565	306 (294–318)	2,633	266 (256–277)	2,657	245 (236–254)
85+	258	577 (506–647)	279	537 (474–599)	302	488 (433–543)	298	378 (335–421)	331	328 (292–363)	406	317 (286–348)
Gender												
Male	8,992	274 (268–279)	9,229	263 (275–287)	9,397	253 (248–258)	9,003	220 (216–225)	9,156	205 (200–209)	9,201	193 (189–197)
Female	0	0	0	0	0	0	0	0	0	0	0	0
Race/ethnicity												
White	6,400	305 (297–312)	6,587	287 (281–294)	6,683	268 (262–275)	6,477	232 (227–238)	6,463	213 (208–218)	6,283	203 (198–208)
Black	1,987	420 (402–439)	2,041	423 (405–442)	2,035	419 (401–437)	1,800	369 (352–386)	1,805	369 (352–387)	1,716	360 (343–377)
Hispanic	235	259 (226–292)	228	243 (211–274)	245	255 (223–286)	210	209 (181–237)	246	238 (237–305)	229	227 (197–256)
Other	99	233 (187–279)	95	213 (170–255)	93	200 (159–241)	100	205 (165–245)	84	168 (131–204)	82	167 (131–204)
Unknown	271	47 (41–52)	278	47 (41–52)	341	57 (51–64)	416	63 (57–69)	558	70 (64–76)	891	85 (80–91)
Insurance Status												
No insurance/self-pay	5,773	241 (235–247)	5,859	232 (227–238)	5,480	222 (217–228)	4,735	192 (186–197)	4,549	180 (174–185)	4,398	174 (169–180)
Medicare	1,052	412 (387–437)	1,462	374 (355–393)	2,306	354 (340–369)	2,938	297 (287–308)	3,250	260 (251–269)	3,573	239 (232–247)
Medicaid	4	182 (4–361)	12	440 (191–689)	13	339 (155–524)	23	370 (219–521)	26	300 (184–415)	30	315 (202–427)
Private												
Insurance/HMO	2,139	344 (329–359)	1,858	321 (307–336)	1,558	274 (260–288)	1,243	209 (197–221)	1,270	195 (185–206)	1,131	162 (153–172)
Other												
Insurance	24	214 (128–300)	38	219 (149–288)	39	166 (114–218)	64	237 (179–295)	59	193 (144–243)	67	187 (142–232)
Unknown	0	0	0	0	1	115	0	0	2	71	2	116
Region												
Eastern	1,118	234 (220–247)	1,080	210 (197–222)	1,235	221 (209–234)	1,168	172 (162–181)	1,310	169 (160–178)	1,448	181 (172–191)
Central	1,443	250 (237–263)	1,513	242 (229–254)	1,445	223 (212–235)	1,559	214 (204–225)	1,763	197 (188–206)	2,039	194 (185–202)
Southern	3,987	319 (309–329)	4,192	313 (304–323)	4,218	292 (283–301)	4,007	247 (239–255)	4,078	226 (219–233)	3,890	200 (194–207)
Western	2,444	249 (239–259)	2,444	237 (228–246)	2,499	235 (226–245)	2,269	215 (206–224)	2,005	201 (192–210)	1,824	189 (181–198)

<sup>a</sup>Rate per 100,000 veterans using the VA system, age-adjusted to 2000.

SOURCE: Inpatient and Outpatient Files, VA Information Resource Center (VIREC), Veterans Affairs Health Services Research and Development Service Resource Center.

## TRENDS IN HEALTHCARE RESOURCE UTILIZATION

### Inpatient Care

The HCUP dataset shows that the rate of hospitalizations for urethral stricture was 3.8 per 100,000 population in 2000 (Table 2). This represents a nearly 50% decrease since 1994, when the rate was 5.7 per 100,000. This rate is considerably lower than that of other urologic diseases such as urolithiasis (71 per 100,000 in 2000) (15). The rate of hospitalizations peaks at age 55 and appears to be higher in both urban and African American populations.

Medicare data show a higher rate of hospitalization for stricture disease in beneficiaries 65 and older, 9.0 per 100,000 in 2001 (Table 3). As in the HCUP data, a higher rate of hospitalizations in older patients is confirmed. The rate in patients under 65 years of age (comprising primarily disabled and dialysis-dependent individuals) was 5.8 per 100,000. The downward trend in incidence over time seen in HCUP

is confirmed, with a threefold decrease between 1992 and 2001.

### Outpatient Care

The rate of hospital outpatient visits for Medicare beneficiaries (most of whom, as noted, are over age 65) was 21 per 100,000 in 2001 (Table 4). This rate is only half the rate of visits for urolithiasis in this population (15).

### Physician Office Visits

Physician office visits by males with urethral stricture disease were determined using pooled data from the National Ambulatory Medical Care Survey, 1992–2000. The annualized rate was 229 per 100,000 (Table 10), far lower than the rate for urolithiasis (15). The rate of physician office visits by male Medicare beneficiaries was 312 per 100,000 in 2001 (Table 11).

**Table 10. Physician office visits for males with urethral stricture listed as any diagnosis, 1992–2000 (merged), count, rate<sup>a</sup> (95% CI), annualized rate<sup>b</sup>, age-adjusted rate<sup>c</sup>**

	1992–2000			
	Count	5-Year Rate	Annualized Rate	5-Year Age-Adjusted Rate
Total <sup>d</sup>	1,460,899	1,146 (858–1,434)	229	1,138
Age				
< 65	870,812	762 (476–1,048)	152	
65+	590,087	4,465 (3,198–5,731)	893	
Race/ethnicity				
White	1,026,894	1,106 (794–1,417)	221	1,049
Black	*	*	*	*
Other	*	*	*	*
MSA				
MSA	1,114,540	1,144 (849–1,440)	229	1,145
Non-MSA	*	*	*	*

\*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

<sup>a</sup>Rate per 100,000 is based on 1992, 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.

<sup>b</sup>Average annualized rate per year.

<sup>c</sup>Age-adjusted to the US Census-derived age distribution of the midpoint of years.

<sup>d</sup>Persons of missing or unavailable race and ethnicity, and missing MSA are included in the total.

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

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

Table 11. Physician office visits by male Medicare beneficiaries with urethral stricture listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI), age-adjusted rate<sup>c</sup>

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>d</sup>	73,940	496 (480-512)	...	63,040	414 (400-429)	...	53,260	368 (354-382)	...	48,040	312 (299-324)	...
Total < 65	5,180	166 (146-186)	...	4,780	139 (121-156)	...	4,740	138 (120-155)	...	5,000	131 (115-148)	...
Total 65+	68,760	584 (565-604)	636	58,260	495 (477-513)	526	48,520	439 (422-457)	459	43,040	371 (355-386)	382
Age												
65-69	11,140	274 (251-296)	...	10,000	260 (237-282)	...	8,180	242 (219-266)	...	6,560	185 (165-205)	...
70-74	17,860	549 (513-585)	...	14,800	444 (412-476)	...	10,380	340 (311-370)	...	9,560	311 (283-338)	...
75-79	17,440	770 (720-821)	...	14,220	627 (581-673)	...	12,760	559 (516-602)	...	11,100	452 (415-490)	...
80-84	12,820	979 (903-1,054)	...	11,380	819 (752-886)	...	10,100	733 (669-797)	...	8,300	555 (501-608)	...
85-89	7,040	1,181 (1,058-1,303)	...	5,680	892 (788-995)	...	5,620	864 (763-964)	...	5,420	749 (660-838)	...
90-94	2,060	1,017 (822-1,213)	...	1,840	870 (694-1,047)	...	1,340	623 (474-772)	...	1,720	742 (586-899)	...
95-97	280	693 (332-1,054)	...	300	796 (395-1,196)	...	80	202 (5.1-399)	...	280	729 (349-1,109)	...
98+	120	316 (63-569)	...	40	90 (0-214)	...	60	125 (0-268)	...	100	184 (22-346)	...
Race/ethnicity												
White	57,920	461 (444-478)	456	50,480	388 (373-403)	390	42,520	348 (333-362)	344	39,860	305 (291-318)	303
Black	11,520	903 (829-976)	917	9,360	676 (615-737)	656	7,800	584 (527-642)	614	5,820	397 (351-442)	414
Asian	...	...	...	220	302 (123-480)	357	420	306 (176-437)	350	420	205 (118-292)	224
Hispanic	...	...	...	1,180	594 (443-745)	655	1,460	435 (335-534)	453	880	234 (165-303)	229
N. American Native	...	...	...	40	199 (0-472)	298	20	72 (0-211)	72	20	60 (0-177)	60
Region												
Midwest	18,260	492 (460-524)	494	15,520	403 (374-431)	410	13,600	368 (340-395)	376	11,480	302 (278-327)	297
Northeast	17,440	550 (514-586)	562	14,280	449 (416-482)	443	10,800	389 (356-421)	386	8,900	305 (276-333)	292
South	26,760	511 (484-538)	507	23,220	423 (399-448)	420	20,000	373 (350-396)	373	19,800	341 (320-362)	346
West	9,020	373 (339-408)	359	8,220	354 (320-389)	353	7,880	352 (318-387)	336	7,000	283 (253-312)	287

... data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 male Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>d</sup>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, 2001.

**Table 12. Ambulatory surgery visits for males with urethral stricture listed as any diagnosis, 1994–1996 (merged), count, rate<sup>a</sup> (95% CI), annualized rate<sup>b</sup>, age-adjusted rate<sup>c</sup>**

	1994–1996			
	Count	3-Year Rate	Annualized Rate	3-Year Age-Adjusted Rate
Total	227,322	180 (163–197)	60	179
Age				
0–2	8,035	131 (55–207)	44	
3–10	27,158	167 (130–204)	56	
11–17	6,666	50 (22–78)	17	
18–34	20,668	64 (45–82)	21	
35–44	22,198	108 (74–142)	36	
45–54	26,188	177 (124–229)	59	
55–64	34,910	357 (257–457)	119	
65–74	39,404	489 (383–595)	163	
75–84	32,799	812 (632–991)	271	
85+	9,296	1,079 (578–1,580)	360	
Region				
Midwest	76,431	256 (221–292)	85	257
Northeast	54,798	222 (167–277)	74	220
South	74,448	172 (145–199)	57	168
West	21,645	76 (57–95)	25	76

\*Figure does not meet standard for reliability or precision.

<sup>a</sup>Rate per 100,000 is based on 1994, 1995, 1996 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population

<sup>b</sup>Average annualized rate per year.

<sup>c</sup>Grouped years age-adjusted to the US Census-derived age distribution of the midpoint of years. Individual years age-adjusted to the US Census-derived age distribution of the year under analysis.

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

SOURCE: National Survey of Ambulatory Surgery, 1994, 1995, 1996.

### Ambulatory Surgery Visits

The annualized rate of ambulatory surgery center visits, based on pooled data for 1994–1996 from the National Survey of Ambulatory Surgery, was 60 per 100,000 (Table 12). There is a bimodal distribution in incidence, with the first peak in patients under the age of 10 and the second peak steadily increasing in patients after age 35.

### Emergency Room Care

The rate of emergency room visits by male Medicare beneficiaries with urethral strictures was relatively low, 6.9 per 100,000 in 2001 (Table 13).

### ECONOMIC IMPACT

Stricture disease is expensive—expenditures for the disease reached almost \$200 million in 2000 (which is not inflation-adjusted). Lifetime treatments with

(usually repeated) direct visual internal urethrotomy (DVIU) have been estimated to cost an average of \$17,747 per patient in the United States, and the lifetime costs of immediate urethral reconstruction have been estimated at \$16,444 (16). British reports put the cost of DVIU or dilation at \$3,375, compared with \$7,522 for one-stage urethroplasty and \$15,555 for two-stage urethroplasty (8).

The estimated total annual expenditure for male urethral stricture disease was \$191 million in 2000 (Table 14). These costs are much lower than those of more common urologic diseases such as nephrolithiasis, which cost \$2.1 billion in 2000 (15). Although total costs for the treatment of urethral stricture in males in the United States have generally increased since 1994, they have fluctuated, peaking at \$207 million in 1998 (Table 14). Spending on all service categories varied over the study period, with the exception of physician office visits, which



Table 13. Emergency room visits by male Medicare beneficiaries with urethral stricture listed as primary diagnosis, count<sup>a</sup>, rate<sup>b</sup> (95% CI), age-adjusted rate<sup>c</sup>

	1992			1995			1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total <sup>d</sup>	2,740	18 (15-21)	23	2,480	16 (13-19)	21	1,840	13 (10-15)	16	1,060	6.9 (5.0-8.7)	7.9
Total < 65	240	7.7 (3.3-12)		220	6.4 (2.6-10)		200	5.8 (2.2-9.4)		200	5.3 (2.0-8.5)	
Total 65+	2,500	21 (18-25)		2,260	19 (16-23)		1,640	15 (12-18)		860	7.4 (5.2-9.6)	
Age												
65-69	540	13 (8.3-18)		320	8.3 (4.2-12)		220	6.5 (2.7-10)		180	5.1 (1.8-8.4)	
70-74	440	14 (7.9-20)		420	13 (7.2-18)		200	6.6 (2.5-11)		120	3.9 (0.8-7.0)	
75-79	640	28 (18-38)		640	28 (18-38)		300	13 (6.5-20)		160	6.5 (2.0-11)	
80-84	300	23 (11-35)		440	32 (18-45)		480	35 (21-49)		140	9.4 (2.4-16)	
85-89	460	77 (46-109)		280	44 (21-67)		340	52 (27-77)		160	22 (6.8-38)	
90-94	80	39 (1.0-78)		120	57 (11-102)		80	37 (0.9-73)		100	43 (5.2-81)	
95-97	40	99 (0-235)		0	0		20	51 (0-149)		0	0	
98+	0	0		40	90 (0-214)		0	0		0	0	
Race/ethnicity												
White	2,060	16 (13-20)	17	1,980	15 (12-18)	15	1,420	12 (8.9-14)	12	780	6.0 (4.1-7.8)	6.0
Black	640	50 (33-68)	47	420	30 (17-43)	29	300	22 (11-34)	18	220	15 (6.1-24)	14
Asian	...	...	...	20	27 (0-81)	27	0	0	0	0	0	0
Hispanic	...	...	...	20	10 (0-30)	10	40	12 (0-28)	18	0	0	0
N. American	...	...	...	0	0	0	0	0	0	0	0	0
Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	880	24 (17-31)	24	860	22 (16-29)	19	500	14 (8.2-19)	16	180	4.7 (1.6-7.8)	4.2
Northeast	560	18 (11-24)	17	480	15 (9.1-21)	16	500	18 (11-25)	18	180	6.2 (2.1-10)	5.5
South	1,100	21 (15-27)	21	880	16 (11-21)	16	680	13 (8.4-17)	12	540	9.3 (5.8-13)	10
West	160	6.6 (2.0-11)	5.8	260	11 (5.1-17)	13	140	6.3 (1.6-11)	5.4	140	5.7 (1.5-9.9)	4.8

...data not available.

<sup>a</sup>Unweighted counts multiplied by 20 to arrive at values in the table.

<sup>b</sup>Rate per 100,000 male Medicare beneficiaries in the same demographic stratum.

<sup>c</sup>Age-adjusted to the US Census-derived age distribution of the year under analysis.

<sup>d</sup>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, 2001.

**Table 14. Expenditures for male urethral stricture, by site of service (% of total)**

Service Type	1994		1996		1998		2000	
Hospital Outpatient	\$3,985,122	2.3%	\$4,339,936	2.3%	\$8,002,002	3.9%	\$5,081,869	2.7%
Physician Office	\$9,210,826	5.3%	\$14,957,752	8.0%	\$17,114,631	8.3%	\$22,683,608	11.9%
Ambulatory Surgery	\$130,472,080	74.5%	\$142,088,620	76.0%	\$152,419,401	73.7%	\$132,300,099	69.2%
Emergency Room	---	0.0%	---	0.0%	---	0.0%	---	0.0%
Inpatient	\$31,519,724	18.0%	\$25,656,338	13.7%	\$29,305,944	14.2%	\$31,008,773	16.2%
<b>TOTAL</b>	<b>\$175,187,753</b>		<b>\$187,042,646</b>		<b>\$206,841,978</b>		<b>\$191,074,350</b>	

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

increased by almost 150% between 1994 and 2000 and were responsible for the majority of the increase in total expenditures. Despite the increasingly large proportion of expenditures being for physician office visits, ambulatory surgery still accounted for nearly 70% of spending for the treatment of urethral stricture in males in 2000.

Individual-level expenditures for urethral stricture were estimated using risk-adjusted regression models controlling for age, work status, income, urban or rural residence, and health plan characteristics (Table 15). The annual healthcare expenditure of an insured male with urethral stricture diseases is almost three times that of an insured male without stricture disease (\$3,713 vs \$10,472). Thus, an incremental cost of \$6,759

is associated with treatment of urethral stricture. Although pharmaceutical costs were similar for men with and without stricture, medical costs were almost 3.5 times higher among men treated for the condition. This result is not unexpected, as treatment of urethral stricture does not rely heavily on pharmaceuticals and typically consists of widening the urethra through dilation, insertion of a urethral stent, urethrotomy, or open urethroplasty (in severe cases). Individual-level expenditures among men with urethral stricture appear to increase with age, although the relationship was not found to be monotonic: pharmaceutical expenditures peaked in the 55- to 64-year-old group, and medical expenditures peaked in the 45- to 54-year-

**Table 15. Estimated annual expenditures for privately insured male employees with and without a medical claim for urethral stricture, 2002<sup>a</sup>**

	Annual Expenditures (per person)					
	Males without Urethral Stricture (N=284,831)			Males with Urethral Stricture (N=500)		
	Medical	Rx Drugs	Total	Medical	Rx Drugs	Total
Total	\$2,677	\$1,036	\$3,713	\$9,227	\$1,245	\$10,472
Age						
18-34	\$1,287	\$658	\$1,945	\$4,262	\$870	\$5,132
35-44	\$2,137	\$879	\$3,016	\$9,088	\$898	\$9,986
45-54	\$3,047	\$1,217	\$4,264	\$11,848	\$859	\$12,707
55-64	\$3,239	\$1,129	\$4,368	\$9,187	\$1,921	\$11,108
Region						
Midwest	\$2,587	\$1,028	\$3,615	\$8,918	\$1,247	\$10,165
Northeast	\$2,610	\$1,119	\$3,729	\$8,997	\$1,349	\$10,346
South	\$2,730	\$968	\$3,698	\$9,411	\$1,151	\$10,562
West	\$2,940	\$1,064	\$4,004	\$10,134	\$1,309	\$11,443

Rx, Prescription.

<sup>a</sup>The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 2002. 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 binary indicators for 28 chronic disease conditions.

SOURCE: Ingenix, 2002.

**Table 16. Expenditures for male Medicare beneficiaries for treatment of urethral stricture, by site of service (% of total)**

Service Type	Age 65 and over							
	1992		1995		1998		2001	
Hospital Outpatient	\$846,600	2.4%	\$422,500	1.2%	\$613,700	1.6%	\$537,500	1.7%
Physician Office	\$2,269,080	6.4%	\$2,505,180	6.9%	\$2,474,520	6.5%	\$3,012,800	9.8%
Ambulatory Surgery	\$17,436,160	48.9%	\$22,431,600	62.1%	\$23,789,340	62.9%	\$19,983,600	64.9%
Emergency Room	\$592,500	1.7%	\$806,820	2.2%	\$836,400	2.2%	\$538,360	1.7%
Inpatient	\$14,547,760	40.8%	\$9,928,800	27.5%	\$10,101,400	26.7%	\$6,713,200	21.8%
TOTAL	\$35,692,100		\$36,094,900		\$37,815,360		\$30,785,460	

Service Type	Under 65							
	1992		1995		1998		2001	
Hospital Outpatient	\$0	0.0%	\$57,040	2.0%	\$236,700	5.6%	\$169,480	3.7%
Physician Office	\$155,400	7.2%	\$200,760	7.2%	\$255,960	6.1%	\$370,000	8.1%
Ambulatory Surgery	\$2,000,880	92.8%	\$2,527,560	90.7%	\$3,722,320	88.3%	\$4,028,680	88.2%
Emergency Room	---	0.0%	---	0.0%	---	0.0%	---	0.0%
Inpatient	---	0.0%	---	0.0%	---	0.0%	---	0.0%
TOTAL	\$2,156,280		\$2,785,360		\$4,214,980		\$4,568,160	

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998, 2001.

old group. Costs did not exhibit substantial regional variation.

Total expenditures for urethral stricture in male Medicare enrollees age 65 and older decreased from \$36 million in 1992 to \$31 million in 2001 (Table 16). The decrease was driven almost exclusively by a decline in inpatient spending. Similar to the proportion in the general population, ambulatory surgery costs made up about 65% of Medicare expenditures for urethral stricture in 2001 and have fluctuated over time. Among male Medicare enrollees under the age of 65, expenditures more than doubled between 1992 and 2001, although total costs in 2001 were only about \$4.6 million. Ambulatory surgery also dominated expenditures in this group, accounting for nearly 90% of the costs in 2001.

Twenty-four percent of men diagnosed with urethral stricture missed some work. On average, each male diagnosed with urethral stricture missed 2.3 hours for inpatient visits and 9.2 hours for outpatient stays—a total of nearly 12 hours of work missed per diagnosis (Table 17). Each outpatient visit for urethral stricture resulted in about 5 hours of missed work (Table 18). Men in the South and the West also appeared to miss more hours of work for each outpatient visit than did men in other regions.

## OVERALL BURDEN OF URETHRAL STRICTURE

Urethral stricture places a moderate burden on the US healthcare system, with total expenditures amounting to nearly \$200 million in 2000. Expenditures were modest for Medicare enrollees 65 years of age and older and were insignificant among Medicare enrollees under 65 years of age. At the individual level, diagnosis of urethral stricture was associated with increased costs almost entirely accounted for by medical services. About one-quarter of men with claims for urethral stricture missed some work.

## LIMITATIONS

By definition, all statistical analyses require assumptions and manipulations of data that may not be accurate. The limitations of the datasets analyzed in this project were discussed above (17). In general, however, we have attempted to remove sources of error in analyzing these datasets. For example, the numbers of patients with urethral stricture were generally lower than the numbers of patients with other urologic diseases, and in those cases where patient counts were too low to allow statistical significance, data analysis was not reported. Improved data collection methods will help to better analyze the impact of such relatively rare diseases in the future.

**Table 17. Average annual work loss of males treated for urethral stricture, 1999 (95%CI)**

	Number of Workers <sup>a</sup>	% Missing Work	Average Work Absence (hrs)		
			Inpatient <sup>b</sup>	Outpatient <sup>b</sup>	Total
Total	100	24%	2.3 (0–6.3)	9.2 (3.5–15)	11.6 (4.7–18)
Age					
18–29	7	0%	0	0	0
30–39	21	29%	0	11 (0–28)	11 (0–28)
40–49	29	21%	6.9 (0–21)	5.8 (0–13)	12.7 (0–28)
50–64	43	28%	0.7 (0–1.9)	12.2 (2.4–22)	13 (3.2–23)
Region					
Midwest	31	23%	0	2.4 (0.3–4.5)	2.4 (0.3–4.5)
Northeast	11	9%	0	1.5 (0–4.7)	1.5 (0–4.7)
South	37	30%	5.4 (0–16)	15.4 (2.1–29)	20.8 (4.1–37)
West	12	8%	0	10 (0–32)	10 (0–32)
Unknown	9	44%	3.6 (0–9.8)	16 (0–41)	19.6 (0–43)

<sup>a</sup>Individuals with an inpatient or outpatient claim for urethral stricture and for whom absence data were collected. Work loss is based on reported absences contiguous to admission and discharge dates of each hospitalization or the date of the outpatient visit.

<sup>b</sup>Inpatient and outpatient include absences that start or stop the day before or after a visit.

Source: Marketscan Health and Productivity Management, 1999.

**Table 18. Average work loss<sup>a</sup> associated with a hospital stay or an ambulatory care visit for male urethral stricture (95% CI)**

	Number of Inpatient Stays	Average Hours Missed for Inpatient Stays	Number of Outpatient Visits	Average Hours Missed for Outpatient Visits
Total	4	58 (0–210)	180	5.1 (2–8)
Age				
18–29	...	...	9	0
30–39	...	...	54	4.3 (0–9)
40–49	1	200 ...	51	3.3 (0–8)
50–64	3	11 (0–41)	66	8.0 (2–14)
Region				
Midwest	...	...	53	1.4 (0–3)
Northeast	1	0	28	0.6 (0–2)
South	1	200 ...	69	8.2 (2.9–14)
West	...	...	20	6.0 (0–18)
Unknown	2	16 (0–118)	10	14.4 (0–36)

...data not available.

<sup>a</sup>Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of outpatient visit.

SOURCE: Marketscan Health and Productivity Management, 1999.

In addition, some datasets, including those maintained by the VA and Medicare, underestimate the rate of urethral strictures because they tend not to capture younger patients, who are more typically affected by strictures after trauma, after hypospadias surgery, or as a result of balanitis xerotica obliterans.

## CONCLUSIONS

Male urethral stricture disease occurs at a rate as high as 0.6% in some susceptible populations and results in more than 5,000 inpatient visits yearly. Office visits for urethral stricture numbered almost 1.5 million per year between 1992 and 2000. The total cost of male urethral stricture diseases in 2000 was almost \$200 million, and the yearly individual cost of the disease averaged more than \$6,000. Urethral stricture disease appears to be more common in the elderly and in African American patients, and by most measures, the prevalence of urethral stricture disease has decreased over time. Patients with urethral stricture disease appear to have very high rates of urinary tract infection (41%) and incontinence (11%). Demographic data such as those analyzed here have not previously been available and should help in the understanding of this disease.

## REFERENCES

- Romero Perez P, Mira Llinares A. Complications of the lower urinary tract secondary to urethral stenosis. *Actas Urol Esp* 1996;20:786-93.
- Romero Perez P, Mira Llinares A. Male urethral stenosis: review of complications. *Arch Esp Urol* 2004;57:485-511.
- Hodonou R, Hounnasso PP, Gbessi DG, Akpo C. Penile-perineal-scrotal gangrene. Epidemiologic, diagnostic, and therapeutic features. Report of 32 cases. *Prog Urol* 2000;10:271-6.
- Chilton CP, Shah PJ, Fowler CG, Tiptaft RC, Blandy JP. The impact of optical urethrotomy on the management of urethral strictures. *Br J Urol* 1983;55:705-10.
- Kinder PW, Rous SN. The treatment of urethral stricture disease by internal urethrotomy: a clinical review. *J Urol* 1979;121:45-6.
- Heyns CF, Steenkamp JW, De Kock ML, Whitaker P. Treatment of male urethral strictures: is repeated dilation or internal urethrotomy useful? *J Urol* 1998;160:356-8.
- Pansadoro V, Emiliozzi P. Internal urethrotomy in the management of anterior urethral strictures: long-term followup. *J Urol* 1996;156:73-5.
- Greenwell TJ, Castle C, Andrich DE, MacDonald JT, Nicol DL, Mundy AR. Repeat urethrotomy and dilation for the treatment of urethral stricture are neither clinically effective nor cost-effective. *J Urol* 2004;172:275-7.
- Andrich DE, Dunglison N, Greenwell TJ, Mundy AR. The long-term results of urethroplasty. *J Urol* 2003;170:90-2.
- Coursey JW, Morey AF, McAninch JW, Summerton DJ, Secrest C, White P, Miller K, Pieczonka C, Hochberg D, Armenakas N. Erectile function after anterior urethroplasty. *J Urol* 2001;166:2273-6.
- De Schryver A, Meheus A. Epidemiology of sexually transmitted diseases: the global picture. *Bull World Health Organ* 1990;68:639-54.
- Greenberg SH. Male reproductive tract sequelae of gonococcal and nongonococcal urethritis. *Arch Androl* 1979;3:317-9.
- Osoba AO. Sexually transmitted diseases in tropical Africa. A review of the present situation. *Br J Vener Dis* 1981;57:89-94.
- Pandhi D, Reddy BS. Watering can perineum--a forgotten complication of gonorrhoea. *J Eur Acad Dermatol Venereol* 2002;16:486-7.
- Pearle MS, Calhoun EA, Curhan GC. Urologic diseases in America project: urolithiasis. *J Urol* 2005;173:848-57.
- Rourke KF, Jordan GH. Primary urethral reconstruction: the cost minimized approach to the bulbous urethral stricture. *J Urol* 2005;173:1206-10.
- Litwin MS, Saigal CS, Yano EM, Avila C, Geschwind SA, Hanley JM, Joyce GF, Madison R, Pace J, Polich SM, Wang M. Urologic diseases in America Project: analytical methods and principal findings. *J Urol* 2005;173:933-7.

