

Erectile Dysfunction and Peyronie's Disease

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INTRODUCTION

Male sexual health has taken on increased importance as the United States population ages, develops coexisting medical conditions, and undergoes interventions that can affect sexual health. This chapter focuses on two major areas of male sexual health, erectile dysfunction (ED) and Peyronie's disease (PD). Related domains, including sexual desire, vitality, ejaculatory and orgasmic function, partner intimacy, and female sexual health, are also important, but they are beyond the scope of this chapter.

It is estimated that ED affects as many as 30 million men in the United States (1). In 1985, the estimated total direct costs for ED exceeded \$146 million (2). Patient interest in and treatment for ED surged with the introduction of oral phosphodiesterase-5 inhibitors (PDE-I) in 1998, and expenditures for office visits and other outpatient treatments increased during that time. The available data likely underestimate current treatment utilization given that in the 22 months after the first PDE-I, sildenafil (Viagra™), was launched, nearly 18 million prescriptions were filled at an approximate cost of \$90 per 10-tablet prescription (3). The emergence of effective, convenient, and generally well-tolerated new treatment options (along with educational campaigns initiated by the pharmaceutical industry) has contributed to increased public awareness and a greater acceptability of and attention to the health and socioeconomic impacts of male sexual health. This is an important issue for men considering or having received treatment for prostate cancer, a condition that is increasingly being identified

through widespread prostate specific antigen testing. In addition, the use of androgen replacement has increased in recent years, as testosterone is often equated with youth, vitality, strength, and sexual performance (4).

Neither ED nor PD is life-threatening. However, these conditions may result in withdrawal from sexual intimacy, reduced quality of life, decreased working productivity, and increased healthcare utilization (5). Dramatic changes in first-line treatment options for ED are likely to lead more men to seek treatment. Patterns of care may shift away from surgical and device therapies provided by urologists and toward pharmacologic treatments and/or multidisciplinary approaches coordinated by primary care providers. With men increasingly seeking to preserve sexual function and quality of life as they age, it is important to characterize the burden and severity of disease, treatment patterns, and economic consequences of male sexual health.

ERECTILE DYSFUNCTION

DEFINITION AND DIAGNOSIS

ED is defined as the persistent "inability to achieve or maintain an erection sufficient for satisfactory sexual performance" (1). This definition suggests that reports of ED prevalence, severity, treatment effectiveness, and healthcare utilization may vary based on patients' and partners' perceptions and expectations about erectile function and sexual performance. As newer oral and

Table 1. Codes used in the diagnosis and management of erectile dysfunction and Peyronie's disease**Erectile dysfunction****Males 18 years or older with one or more of the following:****ICD-9 diagnosis codes**

- 302.71 Psychosexual dysfunction with inhibited sexual desire
- 302.72 Psychosexual dysfunction with inhibited sexual excitement
- 302.74 Psychosexual dysfunction with inhibited male orgasm
- 607.82 Vascular disorders of penis
- 607.84 Impotence of organic origin
- 607.89 Other specified disorders of penis
- 607.9 Unspecified disorder of penis

ICD-9 procedure codes

- 64.94 Fitting of external prosthesis of penis
- 64.95 Insertion or replacement of non-inflatable penile prosthesis
- 64.96 Removal of internal prosthesis of penis
- 64.97 Insertion or replacement of inflatable penile prosthesis

CPT procedure codes

- 37788 Penile revascularization, artery, with or without vein graft
- 37790 Penile venous occlusive procedure
- 54115 Removal foreign body from deep penile tissue (eg, plastic implant)
- 54230 Injection procedure for corpora cavernosography
- 54231 Dynamic cavernosometry, including intracavernosal injection of vasoactive drugs (eg, papaverine, phentolamine)
- 54235 Injection of corpora cavernosa with pharmacologic agent(s) (eg, papaverine, phentolamine)
- 54240 Penile plethysmography
- 54250 Nocturnal penile tumescence and/or rigidity test
- 54400 Insertion of penile prosthesis; non-inflatable (semi-rigid)
- 54401 Insertion of penile prosthesis; inflatable (self-contained)
- 54402 Removal or replacement of non-inflatable or inflatable penile prosthesis
- 54405 Insertion of multi-component, inflatable penile prosthesis, including placement of pump, cylinders, and reservoir
- 54406 Removal of all components of a multi-component, inflatable penile prosthesis without replacement of prosthesis
- 54407 Removal, repair, or replacement of inflatable penile prosthesis, including pump and/or reservoir and/or reservoir and/or cylinders
- 54408 Repair of component(s) of a multi-component, inflatable penile prosthesis
- 54409 Surgical correction of hydraulic abnormality of inflatable prosthesis, including pump and/or reservoir and/or cylinders
- 54410 Removal and replacement of all component(s) of a multi-component, inflatable penile prosthesis at the same operative session
- 54411 Removal and replacement of all components of a multi-component inflatable penile prosthesis through an infected field at the same operative session, including irrigation and debridement of infected tissue
- 54415 Removal of non-inflatable (semi-rigid) or inflatable (self-contained) penile prosthesis, without replacement of prosthesis
- 54416 Removal and replacement of non-inflatable (semi-rigid) or inflatable (self-contained) penile prosthesis at the same operative session
- 54417 Removal and replacement of non-inflatable (semi-rigid) or inflatable (self-contained) penile prosthesis through an infected field at the same operative session, including irrigation and debridement of infected tissue

Peyronie's disease**Males 18 years or older with one or more of the following:****ICD-9 diagnosis codes**

- 607.81 Balanitis xerotica obliterans, induratio penis plastica

ICD-9 procedure codes

- 64.4^a Repair and plastic operation on penis
- 64.42^a Release of chordee

CPT procedure codes

- 54110 Excision of penile plaque (Peyronie's disease)

Continued on next page

Table 1 (continued). Codes used in the diagnosis and management of erectile dysfunction and Peyronie's disease

54111	Excision of penile plaque (Peyronie's disease); with graft to 5 cm in length
54112	Excision of penile plaque (Peyronie's disease); with graft greater than 5 cm in length
54200	Injection procedure for Peyronie's disease
54205	Injection procedure for Peyronie's disease; with surgical exposure of plaque
54360	Plastic operation on penis to correct angulation

^aMust occur with diagnosis of 607.84 (impotence of organic origin) or 607.89 (other specified disorders of penis).

topical (e.g., testosterone patches and gels) therapies have become available and the public has become more aware of ED, the reported prevalence and severity of this condition have increased, and associated practice patterns have shifted. Comprehensive, validated scales have been developed (e.g., the International Index of Erectile Function (IIEF)) (6) to define ED presence, severity, and response to treatment. Symptom-based definitions are rapidly replacing the routine use of physiologic measures of erectile function such as penile tumescence. Thus the epidemiology of the disease and the methods of defining it are evolving. Table 1 presents diagnosis and procedure codes associated with ED and PD.

The diagnosis of ED requires a detailed sexual and medical history, physical examination, and laboratory tests. Self-administered questionnaires are useful adjuncts to the case history, but they are not sufficient to diagnose ED correctly or treat it safely. The definition of ED provided by the National Institutes of Health does not include the duration of dysfunction; subsequent recommendations by the World Health Organization specify a three-month minimum duration of symptoms to establish that diagnosis (7), except in cases of trauma or surgically induced ED. Objective physiologic testing may be used to support the diagnosis of ED, but it cannot substitute for the patient's self-report in establishing the diagnosis.

Pharmacological, psychophysiological, and radiological tests are used in efforts to determine the cause of ED. Intracavernosal injection, penile duplex Doppler ultrasonography, dynamic infusion cavernosometry and cavernosography, and internal pudendal arteriography all may be used to identify vasculogenic ED. Nocturnal penile tumescence testing can be useful to document an intact neurovascular axis, and the absence of nocturnal erectile activity may imply a neurogenic etiology. However, the sensitivity,

specificity, and clinical usefulness of these techniques have been questioned. Furthermore, since the introduction of oral PDE-I therapy and the acceptance of goal-oriented therapy for most cases of ED (8), the rationale for extensive testing has weakened, as reflected in decreasing rates of intracavernosal injection, nocturnal penile tumescence, and penile plethysmography between 1992 and 2001 (8).

Until 1998, rates of specialized diagnostic testing steadily increased for Medicare beneficiaries with a primary diagnosis of ED; in the following years, overall use of such testing declined significantly by 65% from 1995 to 2001 (Table 2, Figure 1). Previously divergent age-related rates of testing converged (Table 3, Figure 2), indicating that variability in utilization based on age may reflect different patient goals. For example, elderly patients may be less willing to undergo invasive testing for the evaluation and treatment of ED.

While urologists performed the majority of ED diagnostic testing prior to 1998, other specialists, especially primary care providers, also contributed to the increasing rates (Table 4). The data from 1998 and 2001 suggest that both primary care providers and urologists have dramatically changed the way they diagnose ED. Moreover, most patients with ED are now being diagnosed, evaluated, and treated by primary care doctors, the majority of whom rely on history and physical examination for diagnosis (9). Nocturnal penile tumescence and Doppler studies are rarely performed (Figure 3).

Only a small subset of men with ED benefit from vascular testing, which can identify specific arterial or venous dysfunction amenable to surgical reconstruction. For the vast majority, such testing is unlikely to change management strategy. Thus, specialized testing is now limited to PDE-I

Table 2. Physician office visits for use of intracavernosal injection, penile plethysmography, or nocturnal penile tumescence testing in Medicare beneficiaries with erectile dysfunction, count^a, rate^b (95% CI)

	1992		1995		1998		2001	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Intracavernosal Injection	20,640	14,294 (13,486–15,101)	39,880	19,865 (19,084–20,645)	24,520	7,808 (7,389–8,228)	13,440	7,003 (6,492–7,514)
Penile Plethysmography	10,580	7,327 (6,726–7,928)	17,180	8,557 (8,010–9,105)	9,400	2,993 (2,727–3,260)	1,260	657 (495–818)
Nocturnal Penile Tumescence Testing	10,280	7,119 (6,526–7,712)	14,760	7,352 (6,841–7,863)	14,520	4,624 (4,295–4,952)	3,080	1,605 (1,353–1,856)

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 Medicare beneficiaries 65 years and older with erectile dysfunction.

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

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

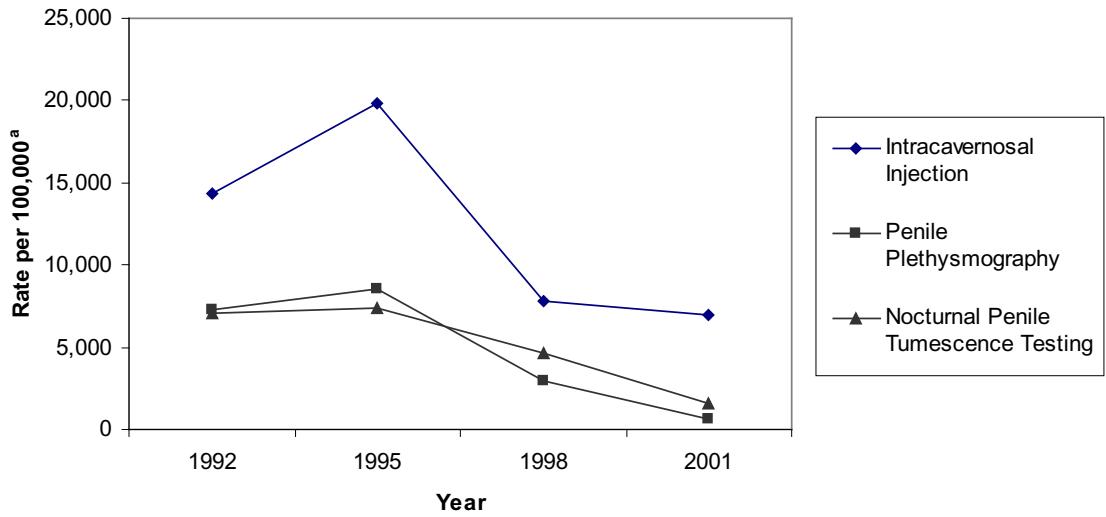


Figure 1. Physician office visits for use of intracavernosal injection, penile plethysmography, or nocturnal penile tumescence testing in Medicare beneficiaries with erectile dysfunction.
^aRate per 100,000 Medicare beneficiaries 65 years and older with erectile dysfunction, age-adjusted.

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

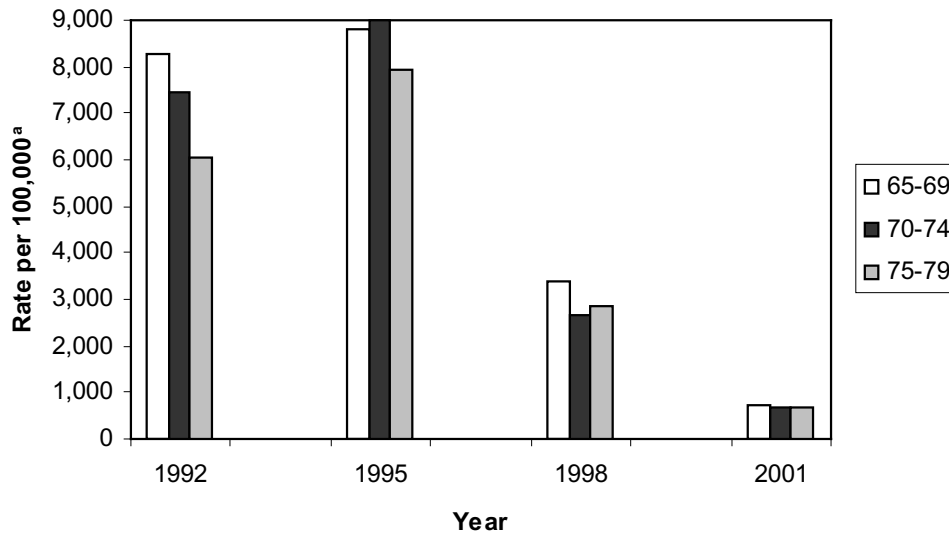


Figure 2. Physician office visits for the use of penile plethysmography among Medicare beneficiaries with erectile dysfunction.
^aRate per 100,000 Medicare beneficiaries in the same age group with erectile dysfunction, age-adjusted.

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

Table 3. Physician office visits for use of penile plethysmography in Medicare beneficiaries with erectile dysfunction, count^a, rate^b (95% CI), age-adjusted rate^c

	1992			1995		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total ^d	10,580	7,327 (6,726–7,928)	7,327	17,180	8,557 (8,010–9,105)	8,557
Age						
65–69	5,340	8,295 (7,342–9,247)	8,295	7,780	8,807 (7,971–9,643)	8,807
70–74	3,500	7,456 (6,394–8,519)	7,456	5,920	9,022 (8,041–10,002)	9,022
75–79	1,380	6,047 (4,664–7,430)	6,047	2,520	7,935 (6,605–9,264)	7,935
80–84	300	3,916 (1,974–5,859)	3,916	800	6,957 (4,877–9,036)	6,957
85+	60	2,778 (0–5,877)	2,778	140	5,036 (1,400–8,672)	5,036
Region						
Midwest	2,080	6,025 (4,903–7,148)	6,083	3,580	7,553 (6,489–8,617)	7,679
Northeast	1,080	5,384 (3,987–6,781)	5,583	2,400	8,333 (6,906–9,761)	8,472
South	5,460	8,678 (7,694–9,661)	8,551	9,620	10,713 (9,808–11,617)	10,601
West	1,760	6,886 (5,497–8,274)	6,964	1,280	3,926 (2,983–4,869)	3,865
Race/ethnicity						
White	9,000	7,277 (6,629–7,924)	7,245	14,800	8,433 (7,852–9,014)	8,319
Black	880	6,995 (5,002–8,989)	6,995	1,660	9,295 (7,390–11,199)	10,078
Asian	...	...	...	20	3,448 (0–10,089)	3,448
Hispanic	...	...	...	240	10,909 (5,083–16,735)	11,818
	1998			2001		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total ^d	9,400	2,993 (2,727–3,260)	2,993	1,260	657 (495–818)	657
Age						
65–69	4,140	3,375 (2,923–3,827)	3,375	540	721 (450–992)	721
70–74	2,780	2,671 (2,233–3,108)	2,671	420	700 (402–998)	700
75–79	1,680	2,843 (2,243–3,442)	2,843	240	658 (287–1,029)	658
80–84	640	3,022 (1,991–4,053)	3,022	40	266 (0–635)	266
85+	140	2,448 (657–4,238)	2,448	20	455 (0–1,343)	455
Region						
Midwest	1,900	2,448 (1,994–2,982)	2,461	140	318 (83–553)	363
Northeast	1,040	2,274 (1,663–2,885)	2,230	260	957 (439–1,474)	1,030
South	5,180	3,704 (3,261–4,146)	3,704	560	638 (403–874)	593
West	820	1,685 (1,174–2,197)	1,685	220	730 (300–1,160)	730
Race/ethnicity						
White	8,100	2,936 (2,654–3,218)	2,914	1,000	605 (438–772)	593
Black	880	3,343 (2,372–4,315)	3,419	100	569 (72–1,066)	455
Asian	20	1,099 (0–3,241)	1,099	40	3,333 (0–7,875)	3,333
Hispanic	220	4,151 (1,749–6,553)	4,151	100	2,778 (377–5,179)	2,778

... data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 Medicare beneficiaries 65 years and older with erectile dysfunction.

^cAge-adjusted to US Census-derived age distribution of the year under analysis.

^dPersons 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 4. Use of various procedures in Medicare beneficiaries with erectile dysfunction, by physician specialty, count^a, percent

Specialty	1992		1995		1998		2001	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Nocturnal Penile Tumescence Testing								
Total	10,280	100	14,760	100	14,520	100	3,080	100
General practice/Family medicine	420	4	2,480	17	4,120	28	100	3
Internal medicine	280	3	1,040	7	2,180	15	720	23
Urology	8,900	87	8,500	58	6,960	48	2,180	71
Other	680	7	2,740	19	1,260	9	80	3
Dynamic Cavernosometry								
Total	0	0	300	100	680	100	260	100
General practice/Family medicine	0	0	0	0	160	24	0	0
Internal medicine	0	0	0	0	40	6	220	85
Urology	0	0	240	80	300	44	40	15
Other	0	0	60	20	180	26	0	0
Intracavernosal Injection								
Total	20,640	100	39,880	100	24,520	100	13,440	100
General practice/Family medicine	140	1	2,020	5	3,200	13	440	3
Internal medicine	40	0	380	1	1,160	5	80	1
Urology	19,820	96	35,740	90	18,840	77	12,320	92
Other	640	3	1,740	4	1,320	5	600	4
Penile Plethysmography								
Total	10,580	100	17,180	100	9,400	100	1,260	100
General practice/Family medicine	460	4	3,140	18	1,700	18	100	8
Internal medicine	560	5	2,240	13	1,060	11	60	5
Urology	7,660	72	7,580	44	5,180	55	1,000	79
Other	1,900	18	4,220	25	1,460	16	100	8

^aUnweighted counts multiplied by 20 to arrive at values in the table.

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

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

nonresponders, young men with posttraumatic or primary ED, and medicolegal investigations.

RISK FACTORS

The prevalence and severity of ED increase with age, even after controlling for age-related conditions such as diabetes, heart disease, hypertension, dyslipidemia, depression, and use of certain medications (10, 11). The prevalence of ED rises with each decade of patient age (12). By the time men reach their seventies, 69.4% will have ED to some extent (Table 5). Other risk factors include hypertension, diabetes, smoking, hyperlipidemia, vascular disease, and poor socioeconomic status or education level (which correlate with the physiological risk factors).

ED can be broadly categorized as psychogenic, organic, or mixed. Psychological factors overlay most cases of ED and are important in planning treatment, but in the majority of cases, the causes are considered

to be organic. Organic ED can be further divided into neurogenic, vasculogenic, myogenic, and hormonal etiologies. Neurogenic causes may be central (e.g., spinal cord injury, multiple sclerosis) or peripheral (e.g., radical pelvic surgery, sacral cord and nerve root compression or trauma, diabetic polyneuropathy). Vasculogenic ED encompasses arterial insufficiency related to arteriosclerosis, tobacco abuse, or trauma and venoocclusive insufficiency due to trauma, PD, or congenital anomalies. Dysfunction of the intrinsic smooth muscle cells of the erectile tissues may result from hypertension, radiation injury, benign prostatic hyperplasia, or the metabolic consequences of hyperglycemia and hyperlipidemia. Hormonal influences on both central proerectile pathways and end organ cavernosal tissues can be significant, although hypogonadism is not considered to be a principal cause of ED in the majority of patients. The interaction between neural, vascular, and hormonal signaling pathways in the pathophysiology of ED

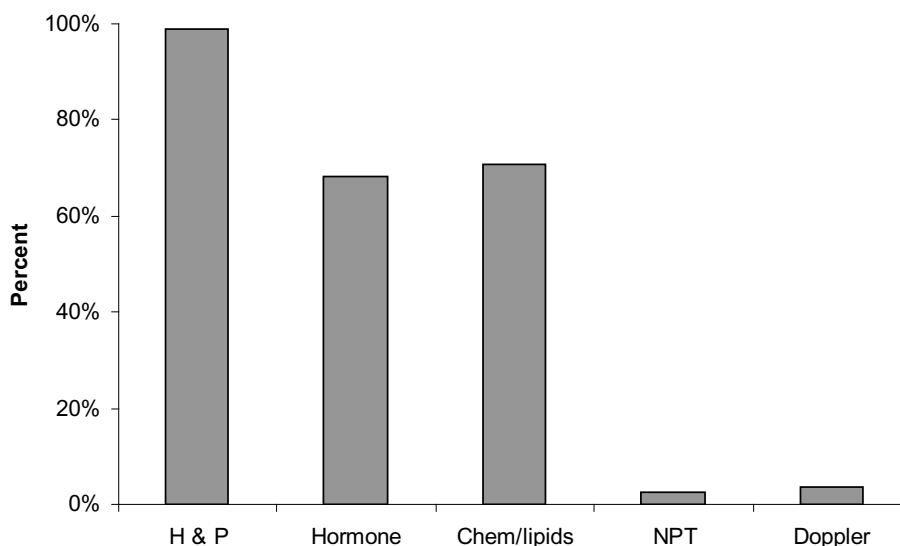


Figure 3. Use of diagnostic evaluations in men with erectile dysfunction in a survey of 85 family practitioners. H&P, history and physical examination; Hormone, serum hormonal levels; Chem/lipids, serum chemistry and lipid profile; NPT, nocturnal penile tumescence studies; Doppler, arterial Doppler ultrasound.

Source: Adapted from *Urology*, 57, Rutchik SD, Baudiere M, Wade M, Sullivan G, Rayford W, Goodman J, Practice patterns in the diagnosis and treatment of erectile dysfunction among family practice physicians, 146–150, Copyright 2001, with permission from Elsevier.

remains incompletely understood but is being actively investigated.

TREATMENT

Treatment options for ED have evolved considerably over the past decade to encompass psychological counseling; oral, topical, intraurethral, and intracavernosal vasoactive therapy; oral therapies with other or unknown mechanisms; hormone replacement; vacuum constriction devices; and surgery, including vascular bypass procedures and penile implants. The goal of treatment is to restore satisfactory erections with minimal adverse effects. Men have demonstrated a strong preference for oral treatments even if they have low efficacy (13), suggesting that efforts to optimize treatment of ED should not only target physiologic and clinical measures of improvement but should also address patient/partner satisfaction and preference. The costs associated with oral pharmacotherapy will become significant burdens on the US healthcare system as

preferences for new, less-invasive treatments increase the number of men seeking evaluation and treatment of ED.

PREVALENCE AND INCIDENCE

The Massachusetts Male Aging Study, a population-based study conducted prior to the

Age	Prevalence
50–54	26.0%
55–59	34.9%
60–64	46.9%
65–69	57.8%
70–76	69.4%

SOURCE: Adapted from *Annals of Epidemiology*, 10, Ansong KS, Lewis C, Jenkins P, Bell J, Epidemiology of ED: a community-based study in rural New York state, 293–296, 2000.

Table 6: Frequency of responses to the question, "How would you describe your ability to get and keep an erection adequate for satisfactory intercourse? Would you say that you are..." (95% CI), by age

	Always or almost always able	Usually Able	Sometimes Able	Never Able
Total	65% (62–68)	17% (15–18)	12% (11–14)	6% (5–8)
Age				
20–29	81% (78–84)	12% (9–16)	5% (3–7)	2% (1–3)
30–39	88% (84–92)	8% (5–11)	3% (1–5)	0% (0–1)
40–49	72% (67–76)	20% (15–25)	7% (4–10)	1% (0–3)
50–59	56% (50–63)	20% (14–26)	20% (15–25)	4% (1–7)
60–69	29% (22–35)	28% (22–33)	27% (23–31)	17% (11–22)
70–74	19% (11–27)	21% (14–29)	39% (29–48)	22% (14–29)
75+	6% (1–10)	17% (12–21)	30% (24–36)	47% (40–55)

NOTE: Based on data from the National Health and Nutrition Examination Survey.

SOURCE: Reprinted from Archives of Internal Medicine, 166(2), Saigal CS, Wessells H, Wilt T, Predictors and prevalence of erectile dysfunction in a racially diverse population, 207–212, Copyright © 2000, American Medical Association. All rights reserved.

Table 7: Frequency of responses to the question, "How would you describe your ability to get and keep an erection adequate for satisfactory intercourse?", by race/ethnicity

Race/Ethnicity	Response to Erectile Function Question	Mean (95% CI)	Count
Caucasian	Always or almost always able	66% (61–70)	42,166,116
	Usually able	15% (12–18)	9,720,185
	Sometimes able	12% (11–14)	7,719,754
	Never able	7% (5–9)	4,513,273
Black (non-Hispanic)	Always or almost always able	62% (57–66)	5,320,404
	Usually able	22% (20–25)	1,930,336
	Sometimes able	13% (9–16)	1,092,557
	Never able	4% (1–6)	307,653
Mexican American	Always or almost always able	64% (60–69)	4,254,622
	Usually able	20% (15–25)	1,331,461
	Sometimes able	10% (7–13)	668,185
	Never able	6% (4–7)	374,352
Other Hispanic	Always or almost always able	64% (52–75)	3,019,237
	Usually able	14% (1–27)	657,696
	Sometimes able	19% (3–35)	882,115
	Never able	4% (1–6)	166,660
Other or Multi-Racial	Always or almost always able	63% (50–76)	1,766,502
	Usually able	26% (13–39)	727,977
	Sometimes able	10% (3–17)	289,029
	Never able	1% (0–3)	23,673

NOTE: Based on data from the National Health and Nutrition Examination Survey.

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introduction of oral medical therapy, documented a prevalence of moderate or complete ED of almost 35% in Caucasian men between the ages of 40 and 70 (14). However, the data failed to address either national variations in race and ethnicity or the prevalence of ED in men over 70. Estimates from the National Health and Social Life Survey suggested a similar prevalence of ED based on a 1992 sample of adult men 59 years of age and younger (15). Recognizing that the prevalence of ED rises with age, Bacon and colleagues recently reported information on sexual function in men older than 50 (16). The age-standardized prevalence of ED was 33% in a cohort of health professionals who disproportionately tended to be Caucasian, healthier, and of higher socioeconomic status than the general population. The National Institutes of Health Consensus Panel on Impotence identified a clear need for national epidemiologic data to provide answers to questions regarding prevalence and risk factors for ED (1).

To obtain a better understanding of the national estimates of prevalence and risk factors for ED, we examined data from the 2001–2002 release of the National Health and Nutrition Examination Survey (NHANES) (17). This survey has the advantage of being population-based and administered after the introduction of Viagra™; also, it oversamples certain racial and ethnic groups to provide more realistic estimates. Although NHANES used only a single question to identify men with ED, this limitation is shared by most of the other major studies. As shown in Table 6, almost one in five males experienced ED, as defined by respondents' self-reports of being "sometimes or never able to get and keep an erection adequate for satisfactory intercourse." More than 75% of the men over 75 years of age met this criterion. Fewer than 7% of men younger than 60 stated that they were never able to have and maintain an erection satisfactory for intercourse, compared with 47% of men age 75 and older. ED also varied by race (Table 7). Hispanic men were approximately twice as likely to report ED as Caucasians, after controlling for other factors known to be associated with ED, including diabetes, obesity, and hypertension (Table 8). The increased prevalence in Hispanics overall was primarily due to high prevalence in those younger than 50 (17).

Table 8. Odds ratios associated with various correlates of erectile dysfunction

	Odds Ratio (95% CI)	
Age (vs 20–29)		
30–39	0.6	(0.3–1.3)
40–49	1.2	(0.7–2.3)
50–59	3.8	(2.4–6.1)
60–69	9.0	(4.8–17)
> 70	31.0	(16–60)
Race (vs White)		
Hispanic	1.9	(1.2–2.9)
Black	1.0	(0.7–1.4)
Other	0.7	(0.3–1.5)
Comorbid State (vs absence of comorbidity)		
Diabetes	2.7	(1.6–4.5)
Obesity	1.6	(1.1–2.3)
Heart disease	1.4	(0.9–2.4)
Hypertension	1.6	(1.7–2.3)
Currently smoking	1.7	(1.2–2.6)
Former smoker	1.4	(1.0–2.1)

NOTE: Based on data from the National Health and Nutrition Examination Survey.

SOURCE: Reprinted from Archives of Internal Medicine, 166(2), Saigal CS, Wessells H, Wilt T, Predictors and prevalence of erectile dysfunction in a racially diverse population, 207–212, Copyright © 2000, American Medical Association. All rights reserved.

TRENDS IN HEALTHCARE RESOURCE UTILIZATION

Outpatient Care

Recent trends suggest that the greatest increases in utilization and expenditures for ED in the future will be for outpatient evaluation and treatment. The age-adjusted rate of physician office visits by Medicare beneficiaries primarily for ED doubled between 1992 and 1998, from 1,609 per 100,000 to 3,387 per 100,000, before decreasing in 2001 (Table 9). A similar trend was seen for national hospital outpatient visits with ED listed as any diagnosis (Table 10), which more than doubled between 1994–1996 and 1998–2000 (Table 11). These temporal trends were present across all racial, regional, and age categories.

The 1998 peak in rates for physician office visits and hospital outpatient visits (Tables 9 and 10) by Medicare beneficiaries may be associated with the introduction of Viagra™. Many physician offices had

Table 9. Physician office visits by Medicare beneficiaries with erectile dysfunction listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	1992				1995			
	Count	Rate		Age-Adjusted Rate	Count	Rate		Age-Adjusted Rate
Total ^d	239,720	1,609	(1,581–1,638)	1,609	377,400	2,480	(2,445–2,515)	2,480
Total < 65	41,240	1,320	(1,264–1,377)		65,180	1,892	(1,828–1,956)	
Total 65+	198,480	1,686	(1,653–1,719)		312,220	2,652	(2,611–2,693)	
Age								
65–69	89,420	2,197	(2,133–2,261)		138,880	3,605	(3,522–3,689)	
70–74	67,160	2,066	(1,996–2,135)		103,160	3,094	(3,011–3,177)	
75–79	29,420	1,300	(1,234–1,366)		50,040	2,206	(2,120–2,291)	
80–84	9,540	728	(663–793)		16,300	1,173	(1,093–1,253)	
85–89	2,680	449	(374–525)		3,440	540	(460–621)	
90+	260	128	(59–198)		400	189	(106–272)	
Race/ethnicity								
White	197,120	1,570	(1,539–1,600)	1,557	321,160	2,471	(2,433–2,508)	2,459
Black	26,500	2,077	(1,966–2,187)	2,138	41,760	3,016	(2,888–3,143)	3,095
Asian	...	...		...	1,120	1,537	(1,137–1,936)	1,454
Hispanic	...	...		...	4,420	2,226	(1,936–2,516)	2,246
N. American Native	...	...		...	380	1,889	(1,049–2,729)	1,988
Region								
Midwest	51,420	1,386	(1,333–1,439)	1,401	81,460	2,113	(2,049–2,177)	2,135
Northeast	33,400	1,053	(1,003–1,103)	1,065	55,580	1,748	(1,683–1,812)	1,756
South	109,700	2,094	(2,039–2,149)	2,088	176,020	3,209	(3,143–3,274)	3,203
West	42,740	1,769	(1,695–1,844)	1,743	60,200	2,596	(2,504–2,688)	2,561

	1998				2001			
	Count	Rate		Age-Adjusted Rate	Count	Rate		Age-Adjusted Rate
Total ^d	490,380	3,387	(3,345–3,429)	3,387	256,960	1,666	(1,638–1,695)	1,666
Total < 65	80,580	2,345	(2,273–2,416)		52,800	1,387	(1,335–1,440)	
Total 65+	409,800	3,711	(3,661–3,761)		204,160	1,758	(1,724–1,792)	
Age								
65–69	162,080	4,800	(4,698–4,902)		78,320	2,213	(2,145–2,282)	
70–74	137,160	4,496	(4,392–4,600)		66,040	2,145	(2,073–2,218)	
75–79	76,300	3,341	(3,237–3,445)		40,320	1,644	(1,572–1,715)	
80–84	27,520	1,997	(1,893–2,102)		15,180	1,014	(943–1,086)	
85–89	5,880	904	(801–1,007)		3,660	506	(433–579)	
90+	820	387	(265–498)		620	268	(174–362)	
Race/ethnicity								
White	413,300	3,380	(3,335–3,425)	3,369	209,240	1,600	(1,570–1,630)	1,593
Black	54,200	4,061	(3,911–4,211)	4,130	31,060	2,117	(2,012–2,221)	2,157
Asian	2,200	1,604	(1,307–1,902)	1,531	1,920	937	(751–1,123)	888
Hispanic	9,820	2,926	(2,671–3,181)	2,920	7,120	1,895	(1,700–2,090)	1,874
N. American Native	580	2,074	(1,327–2,822)	2,146	80	240	(6.0–474)	240
Region								
Midwest	110,680	2,993	(2,915–3,071)	3,023	53,700	1,414	(1,361–1,467)	1,419
Northeast	72,480	2,608	(2,524–2,692)	2,619	41,760	1,429	(1,368–1,490)	1,441
South	230,440	4,293	(4,217–4,370)	4,286	118,060	2,033	(1,982–2,084)	2,037
West	70,100	3,135	(3,032–3,237)	3,078	37,920	1,532	(1,464–1,601)	1,497

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.^cAge-adjusted to the US Census-derived age distribution of the year under analysis.^dPersons 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 10. Hospital outpatient visits by Medicare beneficiaries with erectile dysfunction listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	9,860	66 (60-72)	66	13,240	87 (80-94)	87	23,180	160 (151-169)	160	17,840	116 (108-123)	116
Total < 65	3,580	115 (98-131)		4,460	129 (112-146)		7,460	217 (195-239)		6,660	175 (156-194)	
Total 65+	6,280	53 (47-59)		8,780	75 (68-82)		15,720	142 (132-152)		11,180	96 (88-104)	
Age												
65-69	3,200	79 (66-91)		4,220	110 (95-124)		6,840	203 (181-224)		4,620	131 (114-147)	
70-74	1,840	57 (45-68)		3,200	96 (81-111)		5,000	164 (144-184)		3,440	112 (95-128)	
75-79	920	41 (29-52)		740	33 (22-43)		2,840	124 (104-145)		2,000	82 (66-98)	
80-84	280	21 (10-33)		460	33 (20-47)		740	54 (36-71)		580	39 (25-53)	
85-89	40	6.7 (0-16)		140	22 (5.7-38)		240	37 (16-58)		380	53 (29-76)	
90-94	0	0		20	9.5 (0-28)		60	28 (0-60)		160	69 (21-117)	
95-97	0	0		0	0		0	0		0	0	
98+	0	0		0	0		0	0		0	0	
Race/ethnicity												
White	6,600	53 (47-58)	53	8,540	66 (59-72)	65	16,120	132 (123-141)	131	11,980	92 (84-99)	91
Black	2,460	193 (159-227)	191	3,780	273 (234-312)	280	4,940	370 (324-416)	369	4,240	289 (250-328)	296
Asian	...	...	...	40	55 (0-130)	55	200	146 (55-236)	146	80	39 (1.0-77)	39
Hispanic	...	...	...	240	121 (52-189)	111	840	250 (175-326)	250	700	186 (125-248)	186
N. American	...	...	...	0	0	0	140	501 (132-869)	501	20	60 (0-177)	60
Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	4,020	108 (93-123)	107	4,940	128 (112-144)	129	7,100	192 (172-212)	190	5,160	136 (119-152)	131
Northeast	2,080	66 (53-78)	65	2,700	85 (71-99)	87	5,020	181 (158-203)	181	3,860	132 (113-151)	133
South	2,120	40 (33-48)	41	3,360	61 (52-71)	61	7,300	136 (122-150)	138	5,740	99 (87-110)	101
West	1,620	67 (52-82)	68	2,200	95 (77-113)	90	3,640	163 (139-186)	160	3,060	124 (104-143)	125

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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 11. Hospital outpatient visits for erectile dysfunction listed as any diagnosis, 1994–2000 (merged), count, rate^a (95% CI), annualized rate^b, age-adjusted rate^c

	1994–2000			1994–1996			1998–2000					
	Count	4-Year Rate (321–550)	Annualized Rate	4-Year Age-Adjusted Rate	Count	2-Year Rate (76–186)	Annualized Rate	2-Year Age-Adjusted Rate	Count	2-Year Rate (201–398)	Annualized Rate	2-Year Age-Adjusted Rate
Total ^d	403,193	435	109	432	117,636	131	66	129	285,557	150	300	
Age												
18–34	*	*	*	*	*	*	*	*	*	*	*	
35–44	63,318	299 (162–436)	75		*	*	*	*	*	*	*	
45–54	127,949	801 (373–1,228)	200		*	*	*	*	*	*	*	
55–64	146,799	1,422 (749–2,094)	356		*	*	*	*	*	*	*	
65+	*	*	*		*	*	*	*	*	*	*	
Race/ethnicity												
White	242,073	347 (226–469)	87	327	77,717	113 (48–179)	56	106	164,356	232 (131–334)	116	219
Black	112,449	1,150 (597–1,704)	288	1,256	*	*	*	*	88,622	877 (368–1,386)	438	958
Region												
Midwest	106,523	492 (240–744)	123	488	*	*	*	*	*	*	*	*
Northeast	132,271	731 (397–1,066)	183	711	*	*	*	*	*	*	*	*
South	105,622	328 (142–515)	82	322	*	*	*	*	*	*	*	*
West	*	*	*	*	*	*	*	*	*	*	*	*
MSA												
MSA	340,012	477 (335–618)	119	477	109,642	160 (89–231)	80	166	230,370	311 (192–430)	156	319
Non-MSA	*	*	*	*	*	*	*	*	*	*	*	*

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

^aRate 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 adult male civilian non-institutionalized population.

^bAverage annualized rate per year.

^cAge-adjusted to the US Census-derived age distribution of the midpoint of years.

^dPersons 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: National Hospital Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

Table 12. Physician office visits for erectile dysfunction listed as any diagnosis, count, rate^a (95% CI), age-adjusted rate^b

	1992			1994		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total ^c	967,388	1,101 (772–1,430)	1,101	1,238,019	1,403 (1,076–1,729)	1,403
MSA						
MSA	808,963	1,283 (826–1,659)	1,283	1,134,201	1,723 (1,297–2,149)	1,774
Non-MSA	*	*	*	*	*	*

	1996			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total ^c	1,810,291	1,968 (1,496–2,441)	1,968	2,641,367	2,801 (2,073–3,529)	2,801
MSA						
MSA	1,653,870	2,321 (1,724–2,917)	2,388	2,151,747	2,937 (2,101–3,773)	3,017
Non-MSA	*	*	*	*	*	*

	2000		
	Count	Rate	Age-Adjusted Rate
Total ^c	2,804,098	2,916 (2,146–3,686)	2,916
MSA			
MSA	2,370,559	3,169 (2,253–4,085)	3,249
Non-MSA	*	*	*

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

^aRate 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 adult male civilian non-institutionalized population.

^bAge-adjusted to the US Census-derived age distribution of the year under analysis.

^cPersons of missing MSA are included in the totals.

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

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

Table 13. VA users with erectile dysfunction listed as primary diagnosis, 1998–2003, count, age-adjusted rate^a

	1998		1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	69,501	2,115	68,783	1,960	74,663	2,012	82,647	2,023	90,117	2,014	94,279	1,981
Age	79,500	2,142	73,002	1,967	74,663	2,012	75,256	2,028	75,081	2,023	73,796	1,988
< 25	55	187	58	199	66	225	68	231	71	244	75	256
25–34	567	343	679	410	741	447	879	531	980	592	1,055	637
35–44	3,394	928	3,599	984	4,208	1,150	4,627	1,265	4,849	1,325	5,143	1,406
45–54	18,656	2,276	18,484	2,255	20,249	2,470	21,869	2,668	22,314	2,722	22,184	2,706
55–64	22,332	3,576	20,168	3,230	20,542	3,290	20,238	3,241	19,878	3,183	19,428	3,111
65–74	25,459	2,643	22,149	2,299	21,522	2,234	20,652	2,144	20,261	2,103	19,600	2,034
75–84	8,787	1,290	7,624	1,119	7,090	1,041	6,716	986	6,506	955	6,110	897
85+	249	402	241	390	245	396	207	334	222	358	202	326
Race/ethnicity												
White	47,470	2,261	46,000	2,007	48,830	1,962	53,190	1,907	55,688	1,835	54,398	1,761
Black	15,895	3,364	15,825	3,281	17,195	3,542	18,275	3,745	18,873	3,863	18,326	3,846
Hispanic	2,021	2,228	2,156	2,296	2,357	2,449	2,462	2,451	2,910	2,821	2,967	2,937
Other	1,002	2,355	960	2,148	873	1,877	1,056	2,163	1,018	2,034	980	2,001
Unknown	3,113	536	3,842	643	5,408	911	7,664	1,163	11,628	1,457	17,608	1,688
Insurance Status												
No insurance/self-pay	48,450	2,023	48,234	1,914	49,284	2,000	51,275	2,078	53,517	2,112	54,091	2,146
Medicare	5,387	2,110	6,828	1,746	11,555	1,775	16,740	1,694	20,185	1,617	22,681	1,519
Medicaid	67	3,054	59	2,162	109	2,844	172	2,766	272	3,133	284	2,979
Private Insurance/HMO	15,262	2,455	13,104	2,266	12,953	2,278	13,602	2,288	15,143	2,330	16,096	2,308
Other Insurance	335	2,990	558	3,212	757	3,226	838	3,106	971	3,184	1,096	3,061
Unknown	0	0	0	0	5	573	20	1,049	29	1,027	31	1,796
Region												
Eastern	9,464	1,977	8,701	1,691	9,286	1,665	11,057	1,624	12,336	1,588	12,298	1,539
Central	12,510	2,168	13,030	2,080	13,966	2,158	15,971	2,197	18,303	2,043	20,318	1,929
Southern	25,492	2,040	24,897	1,861	29,064	2,011	32,045	1,975	37,258	2,063	40,239	2,072
Western	22,035	2,248	22,155	2,149	22,347	2,105	23,574	2,236	22,220	2,231	21,424	2,223

^aRate 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.

waiting lists of ED patients anticipating approval of the drug and experienced large numbers of new patient visits subsequent to its launch. Consistent with this hypothesis is a corresponding large decline in ED-related inpatient surgery rates and expenditures in Centers for Medicare and Medicaid Services (CMS) data (Table 17).

The subsequent decline in the rate of outpatient visits for ED listed as the primary diagnosis in the Medicare databases may reflect the management of ED without physiologic testing or diagnostic coding by primary care providers. Patients in these settings may have other conditions as the primary reason for their clinic visit. For example, NAMCS data on rates of office visits for ED listed as any diagnosis indicate that the age-adjusted rate of visits did not drop off from 1998 to 2000 but increased slightly (Table 12). Likewise, the rate of male Veterans Affairs (VA) patients having ED listed as the primary diagnosis remained constant from 2000 to 2003 (2,012 per 100,000 in 2000 vs 1,981 in 2003) (Table 13). However, male veterans with ED listed as any diagnosis increased by more than 2,000 per 100,000 (3,161 per 100,000 in 2000 vs 5,236 per 100,000 in 2003) (Table 14). Possible undercoding of ED in primary care settings is supported by data from the VA Pharmacy Benefits Management Group, which demonstrate that the frequency of individual veterans receiving prescriptions for specific ED drugs as a class increased ninefold from 1999 to 2003 (from 23,913, or 681 per 100,000 in 1999, to 291,884, or 6,120 per 100,000 in 2003) (Table 15).

Racial Trends

Striking racial differences in rates of outpatient visits for ED were seen in all administrative databases. African American men had the highest rates in all sampled populations; the difference between African American and Caucasian rates ranged from three to fivefold. The greatest age-adjusted discrepancies for hospital outpatient visits with ED listed as any diagnosis were seen in the National Hospital Ambulatory Medical Care Survey (NHAMCS) (Table 11). Although adjusted for age, these analyses do not control for medical comorbidities, access to healthcare, or socioeconomic and educational factors, all of which may contribute to the higher prevalence of ED and rate of outpatient visits for African American men. Hypertension and diabetes are more prevalent in

ethnic minorities than in Caucasians, which may explain some of the observed differences (18-21). In the VA system, where financial access to healthcare is equal across races, the rate for African American men with ED as a primary diagnosis or all diagnoses is nearly double that of Caucasian men (Table 13). It is not known whether this is related to differences in comorbid conditions or in healthcare-seeking behavior. In contrast to findings in NHANES data (Table 7), rates of ED diagnosis did not differ notably between Caucasian and Hispanic male veterans.

Geographical Trends

Regional utilization of outpatient care for ED did not show clear patterns across databases. Rates of physician office visits by male Medicare beneficiaries were nearly 50% higher in the South than in the rest of the country. Conversely, hospital outpatient visits for this population were lowest in the South. The NAMCS ED data showed the lowest age-adjusted rates for both physician office visits and outpatient hospital visits in the South (Table 11). This geographical variation may reflect regional differences in healthcare delivery, referral patterns, or racial population distribution. In the VA system, age-adjusted rates of ED as any diagnosis increased in all regions over time. However, the East had substantially lower rates (approximately 75% lower) than other regions (Tables 13 and 14).

Age-Related Trends

Although the prevalence of ED rises with each decade of patient age, data show a pattern of differential age-related utilization for outpatient treatment. VA users with any diagnosis of ED have the highest rate between ages 55 and 64 (7,885 per 100,000 in 2003) (Table 14). In NAMCS, which includes younger patients, utilization rises sharply after age 45 and peaks in the 65–74 age range (6,025 per 100,000) (Table 16). In the Medicare population, men 80 or older have only one-half the outpatient treatment rate of men 65 to 69 (Table 9). Hospital outpatient visits for Medicare beneficiaries show a similar trend, with the exception that men under 65 have higher-than-expected utilization, which can be attributed to the confounding effect of chronic disease states that cause disability and allow early enrollment in Medicare (Table 10). The decrease in treatment-seeking among the elderly likely reflects declining patient interest

Table 14. VA users with erectile dysfunction listed as any diagnosis, 1998–2003, count, age-adjusted rate^a

	1998		1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	94,120	2,865	98,061	2,794	117,337	3,161	154,838	3,790	201,988	4,515	249,120	5,236
Age	107,879	2,907	104,224	2,808	117,337	3,161	140,432	3,784	167,011	4,500	193,121	5,203
< 25	69	234	69	236	83	283	92	314	106	360	126	428
25–34	718	433	863	521	1,057	638	1,351	816	1,639	990	2,047	1,236
35–44	4,490	1,227	4,911	1,342	6,101	1,667	7,770	2,124	9,454	2,584	11,710	3,201
45–54	24,469	2,985	25,392	3,098	30,337	3,701	37,841	4,616	45,393	5,538	52,567	6,413
55–64	30,062	4,814	28,492	4,563	31,637	5,066	37,077	5,938	43,141	6,909	49,238	7,885
65–74	35,138	3,647	32,621	3,386	35,737	3,710	41,901	4,349	50,400	5,232	58,368	6,059
75–84	12,571	1,845	11,488	1,686	11,996	1,761	13,998	2,054	16,408	2,408	18,555	2,723
85+	362	586	388	627	389	629	402	650	470	760	510	825
Race/ethnicity												
White	65,282	3,109	66,912	2,920	78,977	3,173	103,596	3,715	130,533	4,302	149,477	4,840
Black	20,606	4,361	21,301	4,416	24,813	5,111	29,815	6,109	35,822	7,332	40,694	8,540
Hispanic	2,602	2,869	2,856	3,042	3,321	3,451	3,909	3,892	4,987	4,834	5,874	5,815
Other	1,347	3,166	1,389	3,108	1,388	2,985	1,806	3,699	2,110	4,216	2,344	4,786
Unknown	4,283	738	5,603	938	8,838	1,488	15,712	2,384	28,536	3,576	50,731	4,863
Insurance Status												
No insurance/self-pay	64,909	2,710	67,587	2,682	75,431	3,062	91,781	3,720	113,099	4,464	133,255	5,286
Medicare	7,745	3,034	10,518	2,689	19,758	3,035	35,035	3,546	50,649	4,057	66,950	4,485
Medicaid	82	3,737	91	3,335	146	3,809	280	4,502	482	5,552	574	6,021
Private Insurance/HMO	20,954	3,371	19,091	3,302	20,822	3,661	26,206	4,408	35,766	5,502	45,758	6,561
Other Insurance	430	3,838	773	4,449	1,173	4,999	1,494	5,537	1,888	6,190	2,494	6,965
Unknown	0	0	1	328	7	803	42	2,202	104	3,683	89	5,156
Region												
Eastern	12,254	2,560	11,949	2,323	13,564	2,432	18,724	2,750	26,556	3,419	33,932	4,247
Central	16,333	2,830	17,672	2,822	20,968	3,240	29,359	4,038	43,546	4,862	59,240	5,625
Southern	35,016	2,802	36,150	2,702	46,592	3,224	61,257	3,775	84,219	4,664	105,465	5,430
Western	30,517	3,114	32,290	3,132	36,213	3,411	45,498	4,315	47,677	4,785	50,483	5,239

^aRate 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.

Table 15. Use of prescription drugs for erectile dysfunction among veterans, count , rate^a

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	23,913	681 (673–690)	33,428	901 (891–910)	101,467	2,484 (2,469–2,499)
Age						
< 25	13	40 (18–62)	12	41 (18–64)	42	152 (106–198)
25–34	164	91 (77–105)	225	136 (118–154)	649	420 (388–453)
35–44	1,038	267 (251–283)	1,525	417 (396–438)	4,766	1,391 (1,351–1,430)
45–54	5,709	717 (698–735)	8,462	1,032 (1,010–1,054)	27,529	3,222 (3,184–3,260)
55–64	6,581	1,131 (1,103–1,158)	9,060	1,451 (1,421–1,481)	27,582	3,899 (3,853–3,945)
65–74	8,067	894 (874–913)	10,851	1,126 (1,105–1,148)	30,882	2,855 (2,824–2,887)
75–84	2,291	398 (382–414)	3,213	472 (455–488)	9,790	1,168 (1,145–1,191)
85+	50	96 (70–123)	80	129 (101–158)	227	288 (251–326)
Race/ethnicity						
White	16,262	714 (703–725)	22,123	896 (884–908)	65,240	2,364 (2,346–2,382)
Black	5,694	1,188 (1,157–1,129)	7,996	1,660 (1,623–1,696)	22,474	4,647 (4,587–4,708)
Hispanic	621	646 (595–696)	713	720 (667–773)	1,640	1,584 (1,508–1,661)
Other	322	740 (659–820)	394	874 (788–960)	1,331	2,823 (2,671–2,974)
Unknown	1,014	165 (155–175)	2,202	357 (342–372)	10,782	1,559 (1,530–1,589)
Insurance Status						
No insurance/self-pay	16,045	637 (627–647)	21,296	864 (853–876)	61,651	2,499 (2,479–2,518)
Medicare	2,801	716 (690–743)	6,015	924 (901–947)	22,592	2,286 (2,256–2,316)
Medicaid	28	1,026 (646–1406)	67	1,748 (1,329–2,167)	231	3,714 (3,235–4,193)
Private Insurance/HMO	4,833	836 (812–859)	5,697	1,002 (976–1,028)	15,966	2,686 (2,644–2,727)
Other Insurance	206	1,186 (1,024–1,348)	349	1,487 (1,331–1,643)	1,000	3,706 (3,477–3,936)
Unknown	0	0	4	459 (9–908)	27	1,416 (882–1,950)
Region						
Eastern	2,394	465 (447–484)	2,654	476 (458–494)	7,689	1,129 (1,104–1,155)
Central	5,285	844 (821–867)	8,328	1,287 (1,259–1,314)	26,577	3,656 (3,612–3,700)
Southern	6,892	515 (503–527)	10,008	693 (679–706)	33,262	2,050 (2,028–2,072)
Western	9,342	906 (888–924)	12,438	1,172 (1,151–1,192)	33,939	3,219 (3,184–3,253)

Continued on next page

Table 15 (continued). Use of prescription drugs for erectile dysfunction among veterans, count , rate^a

	2002			2003		
	Count	Rate		Count	Rate	
Total	199,126	4,451	(4,431–4,470)	291,184	6,120	(6,098–6,142)
Age						
< 25	49	178	(128–228)	83	299	(234–363)
25–34	1,276	864	(816–911)	1,940	1,336	(1,276–1,395)
35–44	9,191	2,818	(2,761–2,876)	13,293	4,233	(4,161–4,305)
45–54	53,248	6,017	(5,966–6,068)	72,182	8,437	(8,376–8,499)
55–64	56,964	6,888	(6,831–6,944)	93,258	9,330	(9,270–9,390)
65–74	57,880	4,940	(4,900–4,981)	80,284	6,675	(6,629–6,721)
75–84	20,023	2,026	(1,998–2,054)	29,341	2,704	(2,673–2,735)
85+	495	490	(447–533)	803	627	(583–670)
Race/ethnicity						
White	120,232	4,139	(4,116–4,162)	153,784	5,551	(5,523–5,579)
Black	41,053	8,556	(8,474–8,639)	56,127	12,204	(12,103–12,305)
Hispanic	3,773	3,541	(3,428–3,654)	6,792	6,543	(6,388–6,699)
Other	2,170	4,605	(4,411–4,798)	2,897	6,601	(6,360–6,841)
Unknown	31,898	3,409	(3,372–3,446)	71,584	5,187	(5,149–5,225)
Insurance Status						
No insurance/self-pay	116,713	4,607	(4,580–4,633)	166,389	6,601	(6,569–6,632)
Medicare	47,234	3,783	(3,749–3,817)	72,461	4,854	(4,819–4,890)
Medicaid	506	5,829	(5,321–6,337)	720	7,552	(7,000–8,104)
Private Insurance/HMO	32,630	5,020	(4,965–5,074)	48,493	6,953	(6,891–7,015)
Other Insurance	1,951	6,397	(6,113–6,681)	3,024	8,445	(8,144–8,746)
Unknown	92	3,258	(2,592–3,924)	97	5,620	(4,502–6,738)
Region						
Eastern	18,113	2,332	(2,298–2,366)	26,678	3,339	(3,299–3,379)
Central	52,145	5,822	(5,772–5,872)	81,736	7,762	(7,708–7,815)
Southern	81,712	4,525	(4,494–4,556)	124,279	6,398	(6,363–6,434)
Western	47,156	4,734	(4,692–4,777)	58,491	6,070	(6,020–6,119)

^aRate per 100,000 veterans using the VA system, age-adjusted to 2000.

SOURCE: Pharmacy Benefits Management Version 3.0 (PBM), Department of Veterans Affairs.

Table 16. Physician office visits for erectile dysfunction listed as any diagnosis, 1992–2000 (merged), count, rate^a (95% CI), annualized rate^b, age-adjusted rate^c

	1992–2000			
	Count	5-Year Rate	Annualized Rate	5-Year Age-Adjusted Rate
Total ^d	9,461,163	10,316 (9,037–11,595)	2,063	10,287
Age				
18–34	*	*	*	
35–44	780,715	3,758 (2,129–5,387)	752	
45–54	2,331,217	15,133 (10,913–19,354)	3,027	
55–64	2,521,095	24,561 (19,105–30,017)	4,912	
65–74	2,434,590	30,127 (22,938–37,317)	6,025	
75+	833,258	16,226 (11,706–20,745)	3,245	
Race/ethnicity				
White	7,467,491	10,748 (9,227–12,269)	2,150	10,089
Black	1,140,747	11,820 (8,307–15,332)	2,364	14,350
Hispanic	694,687	7,750 (3,651–11,849)	1,550	11,212
Region				
Midwest	2,653,649	12,319 (9,642–14,997)	2,464	12,103
Northeast	1,681,436	9,313 (7,075–11,552)	1,863	9,077
South	2,669,680	8,410 (6,428–10,392)	1,682	8,222
West	2,456,398	12,055 (8,639–15,472)	2,411	12,868
MSA				
MSA	8,119,340	11,590 (10,041–13,140)	2,318	11,692
Non-MSA	1,341,823	6,194 (4,140–8,249)	1,239	5,810

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

^aRate 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 adult male civilian non-institutionalized population.

^bAge-adjusted to the US Census-derived age distribution of the midpoint of years.

^cAverage annualized rate per year.

^dPersons of other races, 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.

in ED treatments, despite a higher prevalence of the condition (22).

Inpatient and Ambulatory Surgery Care

Penile implants were once the only efficacious treatment for ED and for many years accounted for the majority of hospitalizations and expenditures for it. Whereas expenditures for office visits related to ED have increased in the past decade, ambulatory surgery and inpatient expenses remained relatively constant from 1992 to 2001 and became a proportionally smaller overall percentage of expenditures until the most recent year studied, when they rose (Table 17). Nationally representative data indicate that inpatient and ambulatory surgery accounted for nearly three-

quarters of all expenditures for ED in 1994, but less than 50% in 2000 (Table 18). Between 82% and 88% of inpatient stays for men with a primary diagnosis of ED were for penile implant (Table 19).

Despite the increasing rates of ED diagnosis, the rate of inpatient hospital stays decreased from 8.0 per 100,000 in 1994 to 4.7 per 100,000 in 2000 (Table 19). This rate reached a nadir in 1998 (3.8 per 100,000), coincident with the introduction of ViagraTM, before rebounding in 2001, the most recent year surveyed. In contrast to the increase in outpatient visits, the rate of inpatient stays for ED in 2001 was approximately half what it was in 1992 (Table 20). The decline was first evident in 1998 but in the Medicare population persisted long after the introduction of ViagraTM.

Table 17. Expenditures for Medicare beneficiaries for treatment of erectile dysfunction, by site of service (% of total)

Service Type	Age 65 and over							
	1992		1995		1998		2001	
Hospital Outpatient	\$1,400,440	2.6%	\$1,009,700	1.7%	\$1,493,400	2.7%	\$1,062,100	1.9%
Physician Office	\$6,748,320	12.5%	\$11,864,360	20.1%	\$20,080,200	36.1%	\$12,657,920	22.9%
Ambulatory Surgery	\$15,553,520	28.9%	\$19,624,500	33.2%	\$14,077,760	25.3%	\$15,004,880	27.1%
Emergency Room	\$146,280	0.3%	\$221,720	0.4%	\$217,280	0.4%	\$453,460	0.8%
Inpatient	\$29,937,600	55.7%	\$26,348,220	44.6%	\$19,756,620	35.5%	\$26,154,120	47.3%
TOTAL	\$53,786,160		\$59,068,500		\$53,625,260		\$55,332,480	

Service Type	Under 65							
	1992		1995		1998		2001	
Hospital Outpatient	\$275,660	1.5%	\$628,860	3.0%	\$768,380	3.7%	\$626,040	3.0%
Physician Office	\$1,402,160	7.5%	\$2,607,200	12.4%	\$4,109,580	19.8%	\$3,907,200	18.7%
Ambulatory Surgery	\$3,842,800	20.7%	\$6,045,000	28.8%	\$5,193,840	25.0%	\$6,079,580	29.1%
Emergency Room	\$74,740	0.4%	\$92,400	0.4%	\$83,160	0.4%	\$150,880	0.7%
Inpatient	\$12,996,680	69.9%	\$11,652,500	55.4%	\$10,599,520	51.1%	\$10,156,160	48.5%
TOTAL	\$18,592,040		\$21,025,960		\$20,754,480		\$20,919,860	

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

Table 18. Expenditures for erectile dysfunction, by site of service (% of total)

Service Type	1994		1996		1998		2000	
Hospital Outpatient	\$6,438,236	3.5%	\$7,011,462	2.7%	\$13,563,958	4.7%	\$12,941,222	3.9%
Physician Office	\$44,778,518	24.2%	\$71,307,056	27.5%	\$129,426,983	45.1%	\$165,872,253	50.6%
Ambulatory Surgery	\$49,553,150	26.7%	\$104,065,170	40.2%	\$81,689,636	28.5%	\$72,854,610	22.2%
Emergency Room	---	0.0%	---	0.0%	---	0.0%	---	0.0%
Inpatient	\$84,524,707	45.6%	\$76,573,597	29.6%	\$62,444,428	21.7%	\$75,958,763	23.2%
TOTAL	\$185,294,611		\$258,957,285		\$287,125,005		\$327,626,849	

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

Table 19. Inpatient hospital stays for erectile dysfunction listed as primary diagnosis, by procedure rates for penile implants, count, rate^a (95% CI), rate per visits^b (95% CI)

	1994			1996		
	Count	Rate per 100,000 population	Rate per 100,000 visits for Erectile Dysfunction	Count	Rate per 100,000 population	Rate per 100,000 visits for Erectile Dysfunction
Total Primary Diagnosis for ED						
Prosthesis or IPP	6,285	7.1 (6.8–7.5)	88,709 (84,263–93,155)	5,066	5.5 (5.2–5.8)	85,864 (81,119–90,627)
Semi-rigid Prosthesis	1,206	1.4 (1.3–1.5)	17,022 (15,709–18,335)	859	0.9 (0.8–1.0)	14,559 (13,271–15,831)
IPP	5,079	5.8 (5.4–6.1)	71,687 (67,608–75,752)	4,208	4.6 (4.3–4.8)	71,322 (66,983–75,644)
	1998			2000		
	Count	Rate per 100,000 population	Rate per 100,000 visits for Erectile Dysfunction	Count	Rate per 100,000 population	Rate per 100,000 visits for Erectile Dysfunction
Total Primary Diagnosis for ED						
Prosthesis or IPP	2,927	3.1 (2.9–3.3)	81,396 (75,250–87,514)	3,767	3.9 (3.6–4.2)	82,573 (75,712–89,413)
Semi-rigid Prosthesis	437	0.5 (0.4–0.5)	12,152 (10,234–14,043)	639	0.7 (0.6–0.8)	14,007 (11,881–16,133)
IPP	2,490	2.6 (2.4–2.8)	69,244 (63,654–74,833)	3,128	3.2 (3.0–3.5)	68,566 (63,218–73,915)

IPP, inflatable penile prosthesis

^aRate per 100,000 is based on 1994–2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US adult male civilian non-institutionalized population.

^bRate per 100,000 adult male visits is based on estimated number of visits for ED in HCUP_NIS 1994–2000.

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

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

This trend is mirrored in the HCUP data on inpatient hospital stays, although the magnitude of the age-adjusted decline from 1994–1995 to 2000–2001 is greater in HCUP (14 per 100,000 to 8.5 per 100,000) than in Medicare (34 per 100,000 to 25 per 100,000) (Table 20 and 21).

The databases indicate racial, geographical, and age-related differences in rates of inpatient hospitalization as well. African American men have a higher rate of hospitalization than Caucasian men, and the South has the highest age-adjusted rates. Hospitalization rates are also higher in urban than in rural regions. Rates of hospitalization for younger men dropped notably more than rates for older men during the past decade (Tables 20 and 21), probably due to the better responsiveness to PDE-I in younger men. Potential explanations for the differences in hospitalization rates include the shift of implant surgery from inpatient facilities to ambulatory surgery centers; comorbid medical conditions that vary with age, race, or geography; and variation in secondary insurance coverage. Data from several sources support these explanations. The National Survey of Ambulatory Surgery measured rates of ED visits only from 1994 to 1996. Therefore, Medicare data are more useful. Age-adjusted rates of ambulatory surgery visits for ED as a primary diagnosis in Medicare beneficiaries have not increased concomitant with the reduction in inpatient hospitalizations (Table 22). Rather, the rates have paralleled those observed in inpatient Medicare beneficiaries, rising from 1992 to 1995 and then dropping in 1998 before rising again in 2001. Age-adjusted rates for ambulatory surgery visits showed the same racial and geographical trends as seen with inpatients, except for the absence of any age-related trends.

Surgical Trends

The total number of penile implants performed per year has dropped over the past decade, corresponding to the approval of pharmacological treatments for ED (alprostadil penile injections, alprostadil urethral suppositories, and oral Viagra™ in 1994, 1996, and 1998, respectively) (Table 19). Type of implant, length of stay, and hospital volume provide insight into the changing delivery of surgical care for ED. A greater percentage of penile implants are inflatable rather than semirigid or malleable. In 1994, 81% of penile

prostheses implanted were inflatable, whereas in 2000, 83% were (Table 19). No randomized trials have compared treatment satisfaction and other clinically relevant outcomes for inflatable and semirigid devices. The mean number of implant surgeries performed per year at hospitals that perform at least one implant per year decreased from 22.0 in 1994 to 16.1 in 2000 (23). As the effect of surgeon and hospital volume on patient outcome is increasingly appreciated for other types of urologic surgery (23), monitoring implant outcomes as a function of provider volume may become valuable for ED surgery as well. The average length of stay for implant surgery has decreased, owing to pressure from insurers and the general trends toward reduced length of stay for all types of surgical procedures. The VA National Surgical Quality Improvement Program (NSQIP) database shows a reduction in postoperative length of stay from 2.3 days in 1998 to 1.6 days in 2003 (Table 23). HCUP data from 1994 and 2000 demonstrate that mean length of stay for a primary diagnosis or procedure for ED decreased through the 1990s from 2.8 to 2.4 days (Table 24). No regional variation in surgical practices was noted. However, African Americans and Hispanics had a higher mean length of stay than Caucasians. It is unclear whether this reflects comorbid conditions requiring longer periods of hospitalization and antibiotics or other causes.

Complications and Adverse Events of Surgical Procedures for ED

The VA NSQIP provides data on 706 veterans undergoing surgical treatment for ED in 1998–2003 (Table 23). Of these treatments, 621 (88%) occurred in either 1998 or 1999. NSQIP captures only a representative sampling (approximately 20%) of surgical procedures in VA hospitals and cannot be used to estimate total surgical volume accurately. Sampling strategies did not change between 1998 and 2003; thus, the steep decline is likely real and probably due to the availability of oral therapies. However, allocation of resources for implants is controlled regionally within the VA healthcare system, so the decrease in implants could reflect restricted access based on budgetary decisions. Total counts were too low to establish patterns of care or complications according to age, race, or region. Summary data from 1998–2003 are useful, however: the mean operating-room time for a

Table 20. Inpatient stays by Medicare beneficiaries with erectile dysfunction listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	6,640	45 (40-49)	45	5,120	34 (30-38)	34	3,580	25 (21-28)	25	3,800	25 (21-28)	25
Total < 65	2,020	65 (52-77)		1,580	46 (36-56)		1,240	36 (27-45)		1,120	29 (22-37)	
Total 65+	4,620	39 (34-44)		3,540	30 (26-34)		2,340	21 (17-25)		2,680	23 (19-27)	
Age												
65-69	2,480	61 (50-72)		1,520	39 (31-48)		720	21 (14-28)		1,100	31 (23-39)	
70-74	1,480	46 (35-56)		1,360	41 (31-50)		740	24 (16-32)		740	24 (16-32)	
75-79	460	20 (12-29)		440	19 (11-28)		580	25 (16-35)		540	22 (14-30)	
80-84	180	14 (4.7-23)		160	12 (3.5-20)		240	17 (7.5-27)		200	13 (5.1-22)	
85+	20	3.4 (0-9.9)		60	9.4 (0-20)		0	0 0		40	5.5 (0-13)	
Race/ethnicity												
White	4,980	40 (35-45)	39	3,580	28 (24-32)	28	2,740	22 (19-26)	22	3,000	23 (19-27)	23
Black	1,220	96 (72-120)	99	1,080	78 (57-99)	78	600	45 (29-61)	45	600	41 (26-56)	41
Asian	...	...	...	20	27 (0-81)	27	0	0	0	20	9.8 (0-29)	9.8
Hispanic	...	...	...	300	151 (75-228)	141	100	30 (3.6-56)	36	100	27 (3.2-50)	27
N. American Native	...	...	...	0	0	0	0	0	0	20	60 (0-177)	60
Region												
Midwest	1,340	36 (27-45)	36	1,080	28 (21-35)	27	780	21 (14-28)	21	680	18 (12-24)	17
Northeast	1,080	34 (25-43)	35	700	22 (15-29)	23	620	22 (14-30)	22	760	26 (18-34)	27
South	2,660	51 (42-59)	51	2,140	39 (32-46)	38	1,500	28 (22-34)	29	1,700	29 (23-35)	30
West	1,420	59 (45-72)	57	1,040	45 (33-57)	45	640	29 (19-39)	28	540	22 (14-30)	21

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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 21. Inpatient hospital stays for erectile dysfunction listed as primary diagnosis, count, rate^a (95% CI), age-adjusted rate^b

	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 ^c	11,931	14 (12-15)	14	9,925	11 (9.4-12)	11	7,396	7.8 (6.8-8.9)	7.8	8,158	8.5 (7.2-9.8)	8.5
Age												
18-24	*	*		*	*		*	*		*	*	
25-34	388	1.9 (1.3-2.6)		*	*		165	0.9 (0.5-1.2)		214	1.2 (0.8-1.6)	
35-44	733	3.7 (2.9-4.5)		807	3.8 (3.0-4.6)		450	2.1 (1.6-2.6)		520	2.4 (1.7-3.0)	
45-54	2,392	17 (15-20)		2,003	13 (11-15)		1,466	8.8 (7.4-10)		1,473	8.3 (6.5-10)	
55-64	3,640	38 (32-43)		3,082	31 (27-35)		2,118	20 (16-24)		2,419	22 (18-25)	
65-74	3,699	47 (40-54)		2,943	36 (30-42)		2,401	30 (24-35)		2,585	32 (27-38)	
75+	982	21 (16-26)		883	17 (14-21)		741	13 (11-16)		901	15 (13-18)	
Race/ethnicity												
White	7,077	10 (9.1-12)	9.8	5,962	8.6 (7.4-9.8)	7.9	3,991	5.7 (4.8-6.5)	5.2	4,326	6.1 (5.1-7.0)	5.6
Black	1,614	17 (14-21)	21	1,812	19 (15-23)	22	1,130	11 (8.9-14)	13	1,000	9.8 (7.5-12)	12
Hispanic	617	7.5 (5.6-9.4)	12	496	5.5 (3.7-7.3)	9.0	*	*	9.4	787	7.6 (4.9-10)	12
Region												
Midwest	1,776	8.5 (6.7-10)	8.6	1,413	6.6 (5.2-8.0)	6.4	1,167	5.4 (3.8-7.0)	5.3	1,376	6.2 (4.0-8.2)	6.2
Northeast	3,058	17 (12-22)	16	2,620	14 (9.5-19)	14	1,376	7.6 (5.0-10)	7.32	2,049	11 (6.9-16)	11
South	4,704	16 (13-19)	16	4,112	13 (11-15)	13	3,672	11 (8.8-13)	11	3,457	10 (7.8-12)	9.9
West	2,392	12 (9.4-15)	13	1,780	8.7 (6.7-11)	9.5	1,180	5.6 (4.0-7.1)	5.9	1,276	5.9 (4.6-7.2)	6.3
MSA												
Rural	1,186	5.3 (3.3-7.2)	4.8	1,093	5.3 (3.6-6.9)	4.7	789	3.8 (2.4-5.1)	3.4	705	3.3 (2.1-4.5)	2.9
Urban	10,729	19 (14-18)	17	8,825	12 (11-14)	13	6,556	9.0 (7.6-10)	9.3	7,444	10 (8.3-12)	10

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

^aRate 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 adult civilian non-institutionalized population.^bAge-adjusted to the US Census-derived age distribution of the year under analysis.^cPersons 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 22. Ambulatory surgery visits by Medicare beneficiaries with erectile dysfunction listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	5,320	36 (31-40)	36	6,400	42 (37-47)	42	4,300	30 (26-34)	30	5,080	33 (29-37)	33
Total < 65	1,040	33 (24-42)		1,500	44 (34-53)		1,020	30 (22-38)		1,340	35 (27-44)	
Total 65+	4,280	36 (31-41)		4,900	42 (36-47)		3,280	30 (25-34)		3,740	32 (28-37)	
Age												
65-69	2,080	51 (41-61)		2,100	55 (44-65)		1,320	39 (30-49)		1,840	52 (41-63)	
70-74	1,440	44 (34-55)		1,880	56 (45-68)		1,080	35 (26-45)		1,060	34 (25-44)	
75-79	540	24 (15-33)		720	32 (21-42)		500	22 (13-30)		640	26 (17-35)	
80-84	140	11 (2.7-19)		160	12 (3.5-20)		340	25 (13-36)		160	11 (3.3-18)	
85+	60	10 (0-22)		20	3.1 (0-9.3)		20	3.1 (0-9.1)		40	5.5 (0-13)	
Race/ethnicity												
White	4,420	35 (31-40)	35	5,080	39 (34-44)	39	3,480	28 (24-33)	28	3,840	29 (25-34)	29
Black	600	47 (30-64)	47	900	65 (46-84)	64	540	40 (25-56)	40	820	56 (39-73)	55
Asian	...	...	...	20	27 (0-81)	27	20	15 (0-43)	15	0	0	0
Hispanic	...	...	...	100	50 (6.0-95)	50	200	60 (23-97)	60	280	75 (35-114)	69
N. American Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	1,160	31 (23-39)	31	980	25 (18-33)	25	720	19 (13-26)	20	1,100	29 (21-37)	28
Northeast	380	12 (6.6-17)	11	380	12 (6.6-17)	12	240	8.6 (3.7-14)	8.6	460	16 (9.3-22)	14
South	2,860	55 (46-64)	55	3,900	71 (61-81)	71	2,760	51 (43-60)	51	3,000	52 (43-60)	52
West	920	38 (27-49)	37	1,100	47 (35-60)	46	560	25 (16-34)	25	460	19 (11-26)	19

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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 23. Complications, by age, race/ethnicity, region, and type, within 30 days following surgery for erectile dysfunction among VA users

	1998		1999		2000		2001		2002		2003	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	303	318	23	11	19	32						
Age												
≤ 39	6 (2.0)	3 (0.9)	0	1 (9.1)	0	0						
40–44	13 (4.3)	7 (2.2)	0	0	1 (5.3)	0						
45–54	77 (25.4)	86 (27.0)	11 (47.8)	5 (45.5)	3 (15.8)	4 (12.5)						
55–64	112 (37.0)	108 (34.0)	9 (39.1)	3 (27.3)	5 (26.3)	8 (25.0)						
65–74	82 (27.1)	93 (29.3)	3 (13.0)	2 (18.2)	3 (15.8)	16 (50.0)						
75–84	13 (4.3)	21 (6.6)	0	0	7 (36.8)	4 (12.5)						
Race/ethnicity												
White	212 (70.0)	209 (65.7)	17 (73.9)	8 (72.7)	11 (57.9)	14 (43.8)						
Black	65 (21.5)	80 (25.2)	3 (13.0)	2 (18.2)	4 (21.1)	5 (15.6)						
Asian	0	0	0	0	1 (5.3)	0						
N. American Native	2 (0.7)	0	0	0	0	0						
Unknown	11 (3.6)	19 (6.0)	1 (4.4)	1 (9.1)	2 (10.5)	11 (34.4)						
Region												
East	49 (16.2)	61 (19.2)	5 (21.7)	5 (45.5)	4 (21.1)	0						
Central	63 (20.8)	67	5 (21.7)	1 (9.1)	4 (21.1)	7 (21.9)						
South	130 (42.9)	113 (21.1)	11 (47.8)	3 (27.3)	5 (26.3)	18 (56.3)						
West	61 (20.1)	77 (24.2)	2 (8.7)	2 (18.2)	6 (31.6)	7 (21.9)						
30-Day Complications, unadjusted for age												
1 or More Complications	17 (5.6)	19 (6.0)	2 (8.7)	0	2 (10.5)	2 (6.3)						
Wound Events	14 (4.6)	16 (5.0)	2 (8.7)	0	2 (10.5)	1 (3.1)						
Respiratory Events	2 (0.7)	1 (0.3)	0	0	0	0						
Renal Events (Urinary Tract Infection)	0	1 (0.3)	0	0	1 (5.3)	0						
Central Nervous System Events	2 (0.7)	1 (0.3)	0	0	0	0						
Cardiac Events	1 (0.3)	0	0	0	0	0						
Other Complications	0	2 (0.6)	0	0	1 (5.3)	1 (3.1)						
Death within 30 Days	1 (0.3)	0	0	1 (9.1)	0	0						
Returns to the OR	10 (3.3)	16 (5.0)	0	0	2 (10.5)	2 (6.3)						
Operative Time (hours), mean ± SD	2.0 ± 0.9	1.9 ± 0.8	2.0 ± 1.2	2.4 ± 1.8	2.2 ± 1.5	1.8 ± 0.8						
Postoperative Length of Stay (days), mean ± SD	2.3 ± 4.3	1.9 ± 2.2	2.8 ± 2.6	1.8 ± 0.7	1.4 ± 0.7	1.6 ± 1.5						
All Years												

SOURCE: VA National Surgical Quality Improvement Program (NSQIP), 1998–2003.

Table 24. Length of stay (LOS) for primary diagnosis for erectile dysfunction

	1994			1996			1998			2000		
	Count	LOS (Mean)	LOS (Median)	Count	LOS (Mean)	LOS (Median)	Count	LOS (Mean)	LOS (Median)	Count	LOS (Mean)	LOS (Median)
Total ^a	11,931	2.8	2	9,925	2.6	2	7,396	2.6	1	8,158	2.4	1
Age												
18-24	97	3	3	64	1.6	1	53	2.6	3	47	2.4	1
25-34	388	3.2	2	143	3.1	2	165	2.5	2	214	2.2	1
35-44	733	2.9	2	807	3.6	2	450	3	2	520	2.8	2
45-54	2,392	3	2	2,003	2.3	2	1,466	2.7	2	1,473	2.2	1
55-64	3,640	2.6	2	3,082	2.1	1	2,118	2.4	1	2,419	2.2	1
65-74	3,699	2.6	2	2,943	2.8	2	2,401	2.6	1	2,585	2.6	1
75+	982	3.6	2	883	2.9	2	741	3.1	2	901	2.8	1
Race/ethnicity												
White	7,077	2.5	2	5,962	2.3	1	3,991	2.6	1	4,326	2.3	1
Black	1,614	3.8	2	1,812	3.1	2	1,130	3	1	1,000	2.7	1
Hispanic	617	3.2	2	496	3.3	2	539	2.8	2	787	2.4	1
Region												
Northeast	3,058	2.9	2	2,620	2.5	1	1,376	2.9	1	2,049	2.7	1
Midwest	1,776	3.2	2	1,413	2.7	2	1,167	2.5	2	1,376	2.4	1
South	4,704	2.8	2	4,112	2.8	2	3,672	2.6	1	3,457	2.4	1
West	2,392	2.2	1	1,780	2	1	1,180	2.5	2	1,276	2.1	1
MSA												
Rural	1,186	3.2	2	1,093	2.6	2	789	2.2	1	705	2.3	1
Urban	10,729	2.7	2	8,825	2.6	2	6,556	2.7	2	7,444	2.4	1

MSA, metropolitan statistical area.

US adult males 18+ civilian non-institutionalized population.

^aMales of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

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

Table 25. Emergency room visits by Medicare beneficiaries with erectile dysfunction listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	1,800	12 (9.6-15)	12	1,760	12 (9.1-14)	12	1,780	12 (9.7-15)	12	2,400	16 (13-18)	16
Total < 65	740	24 (16-31)		840	24 (17-32)		660	19 (13-26)		820	22 (15-28)	
Total 65+	1,060	9.0 (6.6-11)		920	7.8 (5.6-10)		1,120	10 (7.5-13)		1,580	14 (11-17)	
Age												
65-69	480	12 (7.1-16)		220	5.7 (2.3-9.1)		300	8.9 (4.4-13)		200	5.7 (2.1-9.2)	
70-74	140	4.3 (1.1-7.5)		240	7.2 (3.1-11)		200	6.6 (2.5-11)		560	18 (11-25)	
75-79	120	5.3 (1.1-9.5)		100	4.4 (0.5-8.3)		160	7.0 (2.1-12)		400	16 (9.2-23)	
80-84	160	12 (3.7-21)		240	17 (7.5-27)		140	10 (2.6-18)		220	15 (6.0-23)	
85-89	140	23 (6.0-41)		80	13 (0.3-25)		180	28 (9.5-46)		100	14 (1.7-26)	
90+	20	9.9 (0-29)		40	19 (0-45)		60	28 (0-60)		100	43 (5.2-81)	
Race/ethnicity												
White	1,300	10 (7.8-13)	9.9	1,200	9.2 (6.9-12)	9.4	1,200	9.8 (7.3-12)	9.8	1,580	12 (9.4-15)	12
Black	480	38 (23-53)	42	460	33 (20-47)	30	400	30 (17-43)	28	700	48 (32-64)	49
Asian	...	...	...	40	55 (0-130)	55	0	0	0	20	9.8 (0-29)	9.8
Hispanic	...	...	...	0	0	0	120	36 (7.2-64)	42	20	5.3 (0-16)	5.3
N. American Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	460	12 (7.3-18)	12	400	10 (5.8-15)	9.9	400	11 (6.1-16)	10	520	14 (8.4-19)	14
Northeast	340	11 (5.6-16)	10	400	13 (7.1-18)	12	340	12 (6.4-18)	13	380	13 (7.2-19)	12
South	860	16 (12-21)	18	780	14 (9.8-19)	15	920	17 (12-22)	17	1,200	21 (15-26)	21
West	140	5.8 (1.5-10)	3.3	180	7.8 (2.7-13)	6.9	100	4.5 (0.5-8.4)	5.4	300	12 (6.0-18)	12

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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 26. Use of sildenafil, 1998–2002, by age, percent (SE)

Age	1998	1999	2000	2001	2002
Total	1.5 (0.01)	1.3(0.02)	1.5 (0.02)	2.2 (0.02)	2.9 (0.02)
18–45	0.3 (0.01)	0.3 (0.01)	0.4 (0.01)	0.6 (0.01)	0.9 (0.01)
46–55	2.0 (0.04)	1.9 (0.04)	2.3 (0.05)	3.3 (0.05)	4.3 (0.06)
56–65	4.7 (0.09)	3.7 (0.08)	4.0 (0.09)	5.3 (0.08)	6.9 (0.09)
65+	5.7 (0.13)	4.2 (0.13)	3.8 (0.11)	4.9 (0.10)	5.8 (0.11)

NOTE: Data are from national pharmacy claims. The prevalence of use is defined as having one or more sildenafil claims during respective year; SE, standard error of the prevalence estimate.

SOURCE: Adapted by permission from Macmillan Publishers LTD: International Journal of Impotence Research, Delate T, Simmons VA, Motheral BR, Patterns of use of sildenafil among commercially insured adults in the United States: 1998–2002, 16(4), 313–318, Copyright 2004.

penile implant during this period was 2.0 hours (\pm 0.9 hour). One or more complications occurring within 30 days was recorded in 42 of 706 men (5.9%), the most frequent complication being “wound events” (83% of all complications). This rate is similar to infection rates in published series. Approximately 4% of men required a return to the operating room within 30 days; only 2 men (0.3%) died within 30 days of the procedure.

Emergency Room Care

Emergency room (ER) care is rarely required in the management of medical problems directly related to the diagnosis or treatment of ED. The rate of ER utilization for ED as a primary diagnosis is only 1% the rate of physician office visits (16 per 100,000 vs 1,666 per 100,000, Tables 25 and 9). Acute complications of

surgical treatments occur after 2% to 4% of implant surgeries and in most cases require hospitalization for removal of an infected device. Priapism is the most significant complication of pharmacological therapy, although these visits likely do not list a primary diagnosis of ED. In rare instances, men using phosphodiesterase-5 inhibitors have reported priapism. Intracavernosal injection of vasodilators such as prostaglandin E1 result in priapism in 0.35% to 4% of patients (8); for these patients, the condition usually can be resolved in the ER. Rarely, priapism associated with chronic medical conditions, such as sickle cell anemia, may prompt ER evaluation.

Some patients may use ER visits as a major point of access to healthcare, despite the fact that new-onset ED is rarely related to an emergent medical condition. This conjecture is supported by the trend in ER costs

Table 27. Relative use of sildenafil, by age and gender

	1998	1999	2000	2001	2002
Females					
18–45	1.0	0.7	0.9	1.0	1.1
46–55	1.0	0.7	0.8	0.8	0.8
56–65	1.0	0.6	0.6	0.5	0.5
65+	1.0	0.5	0.4	0.4	0.4
Males					
18–45	1.0	1.0	1.4	2.1	3.1
46–55	1.0	0.9	1.2	1.6	2.2
56–65	1.0	0.8	0.8	1.1	1.5
65+	1.0	0.7	0.7	0.9	1.0

NOTE: Change is relative to 1998; values adjusted for gender differences and age between years.

SOURCE: Adapted by permission from Macmillan Publishers LTD: International Journal of Impotence Research, Delate T, Simmons VA, Motheral BR, Patterns of use of sildenafil among commercially insured adults in the United States: 1998–2002, 16(4), 313–318, Copyright 2004.

Table 28. Specialty of sildenafil prescribers

	1998 (n = 5,801)	1999 (n = 5,128)	2000 (n = 5,862)	2001 (n = 11,010)	2002 (n = 13,428)
Primary care	58%	62%	65%	66%	69%
Urology	25%	21%	18%	16%	13%
Other specialty	16%	18%	17%	18%	18%

n=number of unique prescribers in the respective year.

NOTE: Prescribers defined as healthcare providers with one or more sildenafil claims attributed to their DEA number during their respective year.

SOURCE: Adapted by permission from Macmillan Publishers LTD: International Journal of Impotence Research, Delate T, Simmons VA, Motheral BR, Patterns of use of sildenafil among commercially insured adults in the United States: 1998–2002, 16(4), 313–318, Copyright 2004.

and rates of utilization over the past decade. Despite a decrease in the rates and expenditures for inpatient hospitalization, the yearly costs of ER treatment as a percentage of total expenditures have increased in the Medicare population (Table 17), where the rate of ER visits for ED as the primary diagnosis increased between 1992 and 2001 from 12 to 16 per 100,000 (Table 25). The rate of ER utilization by African Americans was three to four times the rate for Caucasians, and men under 65 had nearly twice the rate of older men (Table 25).

PHARMACOLOGIC MANAGEMENT OF ED

National pharmacy claims data indicate that the prevalence of Viagra™ use among males increased from 1.5% in 1998 to 2.9% in 2002 (Table 26) (24). Use increased with age—approximately 6% of men over 55 had one or more Viagra™ claims in 2002—though the greatest relative increase was in men between 18 and 45 (3.1 in 2002 vs 1.0 in 1998) (Tables 26 and 27). The vast majority of Viagra™ prescribers were primary care physicians (69% of all claims in 2002, compared with 13% for urologists) (Table 28).

Data from the Department of Veterans Affairs indicate that the number of veterans receiving prescriptions for ED treatment (excluding testosterone therapy) increased ninefold between 1999 and 2003 (Tables 15 and 29). The increase was seen across all age, race, region, and insurance categories. It was particularly striking that in 2003 among those aged 55–64, 9.3% reported having filled a prescription for ED agents in 2003. The rate of African American men filling a prescription for ED agents in 2003 (12.2%) was more than twice that for men in other racial

groups. The greatest change in ED prescriptions was the marked increase in utilization of Viagra™. By 2003, approximately 85% of all pharmacologic agents prescribed for ED were Viagra™ (VA formulary policies mandated Viagra™ as the PDE-I of choice). Use of alprostadil remained stable at 427 per 100,000 men, likely reflecting contraindications to or adverse effects from Viagra™ or Viagra™ failures (Table 29). Papaverine was used in 0.05% of men during the years examined. The use of pharmacologic agents by men with ED increased from 17,458 per 100,000 in FY 1999 to 56,716 per 100,000 in FY 2003 (Table 29). That ED is underreported is reflected in the observation that many more men receive prescriptions for ED medications than carry a diagnosis of ED.

The number of men undergoing radical prostatectomy has increased markedly in the past decade, as described in the prostate cancer chapter of this compendium. Stanford and colleagues (25) demonstrated that both the level of interest in and the frequency of sexual activity declined over the 24-month period after radical prostatectomy. Nearly 60% of Medicare recipients said that they did not have erections firm enough for sexual intercourse at 24 months after radical prostatectomy, and 42% said that this was at least a moderate-to-serious problem (Table 30) (25). These individuals make up a large and increasing population at risk for ED.

In the VA system, use of ED medications by men with prostate cancer and those undergoing radical prostatectomy has increased markedly (Table 29). In men with a diagnosis of prostate cancer, the use of pharmacologic agents increased from 3,065 per 100,000 in 1999 to 9,474 per 100,000 in 2003. In 1999, 9,419 per 100,000 men filled prescriptions for ED

Table 29. Pharmacologic management of erectile dysfunction in VA users, count, age-adjusted rate^a

	1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Erectile dysfunction medications for all males	23,913	681	33,428	901	101,467	2,484	199,126	4,451	291,184	6,120
Alprostadil	18,583	529	20,010	539	20,128	493	20,569	460	20,339	427
Papaverine	1,900	54	1,722	46	1,564	38	1,219	27	1,014	21
Sildenafil	4,224	121	12,996	350	83,280	2,039	182,141	4,071	275,254	5,785
Erectile dysfunction medications for all males with a diagnosis of erectile dysfunction	17,119	17,458	22,171	18,895	59,570	38,472	103,838	51,408	141,290	56,716
Erectile dysfunction medications for all males ≥ 40 years	3,341	3,065	4,113	3,324	8,627	5,756	13,793	7,938	18,143	9,474
With prostate cancer	154	9,419	228	12,486	399	21,044	656	27,007	682	31,371
After radical prostatectomy										
Use of sildenafil for all males ≥ 40 years	494	453	1,152	931	5,872	3,918	11,183	6,436	15,549	8,119
With prostate cancer	31	1,896	106	5,805	333	17,563	493	24,430	641	29,485
After radical prostatectomy										

^aRate per 100,000 veterans using the VA system, age-adjusted to 2000.

SOURCE: Pharmacy Benefits Management Version 3.0 (PBM), Department of Veterans Affairs.

Table 30. Distribution (percentage) of sexual function before and after radical prostatectomy in a cohort of 1,291 prostate cancer patients treated for clinically localized disease^a

Measure	Baseline	6 Months	12 Months	24 Months
Level of interest in sexual activity				
None	6.7	25.8	12.4	12.8
A little or some	46.4	45.9	53.3	49.4
A lot	36.0	16.0	21.4	16.5
Frequency of sexual activity				
None	13.2	54.4	37.6	34.1
≥ Once a month	32.3	18.9	26.1	21.0
≥ Once a week	43.0	14.0	22.9	23.2
Erections firm enough for sexual intercourse				
No	15.8	80.2	71.8	59.9
Yes	72.7	7.9	14.7	18.5
Difficulty keeping an erection				
None	44.5	1.9	4.6	6.7
A little or some	25.8	6.4	11.3	13.7
A lot	9.7	10.2	14.5	13.0
Do not get erections	8.0	68.0	54.6	44.2
Mean sexual function score	71.5	25.6 ^b	36.2 ^b	38.6 ^b
How big a problem is sexual function				
No problem	50.3	10.2	12.3	14.0
Small problem	20.2	15.4	20.9	22.6
Moderate-to-big problem	17.9	60.9	52.0	41.9

^aResults are adjusted for sampling weights; percentages do not total 100% because of missing data.

^bP < 0.001 for change from baseline.

SOURCE: Reprinted from Journal of the American Medical Association, 283, Stanford JL, Feng Z, Hamilton AS, Gilliland FD, Stephenson RA, Eley JW, Albertsen PC, Harlan LC, Potosky AL, Urinary and sexual function after radical prostatectomy for clinically localized prostate cancer: the Prostate Cancer Outcomes Study, 354–360, Copyright © 2000, American Medical Association. All rights reserved.

treatment after radical prostatectomy (Table 29). The rate increased to 31,371 per 100,000 in 2003 (Table 29). Thus, nearly one-third of the men who underwent radical prostatectomy for prostate cancer in 2003 filled a prescription for ED pharmacologic therapy, the most common being ViagraTM (93%); most of these men were relatively younger and non-Caucasian.

ECONOMIC IMPACT

Annual expenditures for ED in the United States reached nearly \$330 million in 2000, increasing substantially from \$185 million in 1994 (exclusive of pharmaceutical costs) (Table 18). This increase was driven by expenditures for physician office visits, which almost quadrupled between 1994 and 2000 and

accounted for about 85% of the increase over the study period. Physician office visits accounted for more than half of ED expenditures in 2000. Costs also increased for ambulatory surgery and hospital outpatient services, while expenditures for inpatient services decreased slightly. Observed trends in national expenditures for ED have almost certainly been influenced by the introduction of phosphodiesterase-5 inhibitors (ViagraTM, LevitraTM, CialisTM) which have increased public awareness of ED and increased the number of physician office visits related to the condition. This phenomenon may also have increased usage of other services by patients for whom pharmaceutical management of ED is not an option.

Patterns of expenditures for ED in the Medicare population age 65 and older differed from those in

Table 31. Estimated annual expenditures of privately insured employees with and without a medical claim for erectile dysfunction in 2002^a

	Annual Expenditures (per person)					
	Males without Erectile Dysfunction (N=281,277)			Males with Erectile Dysfunction (N=4,054)		
	Medical	Rx Drugs	Total	Medical	Rx Drugs	Total
Total	\$2,670	\$1,036	\$3,706	\$3,498	\$1,315	\$4,813
Age						
18–34	\$1,289	\$654	\$1,943	\$2,371	\$888	\$3,259
35–44	\$2,146	\$870	\$3,016	\$2,957	\$1,742	\$4,699
45–54	\$3,045	\$1,207	\$4,252	\$3,915	\$1,551	\$5,466
55–64	\$3,214	\$1,139	\$4,353	\$3,918	\$1,038	\$4,956
Region						
Midwest	\$2,582	\$1,023	\$3,605	\$3,382	\$1,308	\$4,690
Northeast	\$2,624	\$1,117	\$3,741	\$3,436	\$1,442	\$4,878
South	\$2,721	\$968	\$3,689	\$3,563	\$1,222	\$4,785
West	\$2,880	\$1,063	\$3,943	\$3,771	\$1,372	\$5,143

Rx, Prescription.

^aThe 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.

the general population (Table 17). These Medicare enrollees accounted for \$55 million in expenditures in 2001. There was little change since 1992, indicating a decrease in real expenditures over the study period when inflation is taken into account. The lack of change was a function of the fact that increases in physician office and ER visit costs only slightly outpaced the decreases in costs for inpatient services, hospital outpatient services, and ambulatory surgery. Approximately 47% of costs were still for inpatient services in 2001. Because Medicare did not cover prescription drug costs during the study period, expenditures on pharmaceuticals were not captured in these data. Therefore, it is possible that the observed decreases in inpatient costs resulted from the availability of an effective pharmaceutical option. Not captured in the estimates are the national sales of ViagraTM, reported to be \$1.6 billion in 2005, CialisTM, reported to be \$747 million in 2005, and LevitraTM, reported to be \$327 million in 2005 (26-28).

Expenditures for ED by Medicare enrollees under the age of 65 totaled \$21 million in 2001 and have increased more slowly than inflation since 1992 (Table 17). Decreases in inpatient expenditures were offset by

a doubling of costs for all other service types between 1992 and 2001. Despite these trends, inpatient services continued to constitute a plurality of ED expenditures in this population.

Individual-level expenditures for ED were estimated using risk-adjusted regression models controlling for age, work status, income, urban or rural residence, and health plan characteristics (Table 31). Among 18- to 64-year-old males with employer-provided insurance, average annual expenditures were \$4,813 for those treated for ED, compared with \$3,706 for similar men not treated for the condition; thus an incremental cost of \$1,107 was associated with a diagnosis of ED. Pharmaceuticals such as phosphodiesterase-5 inhibitors, which have become an increasingly important source of costs related to ED, accounted for about 25% of the incremental costs. ED appeared to be more expensive for younger men than older men, the highest excess expenditures occurring among men between 35 and 44. Men in this age group with an ED diagnosis spent \$872 more on pharmaceuticals than men with no ED diagnosis. Pharmaceuticals accounted for more than half of the

Table 32. Average annual work loss of males treated for erectile dysfunction, 1999 (95% CI)

	Number of Workers ^a	% Missing Work	Average Work Absence (hrs)		
			Inpatient ^b	Outpatient ^b	Total
Total	633	14%	0.2 (0–0.5)	3.4 (2.1–4.7)	3.6 (2.3–4.9)
Age					
18–29	22	18%	0	1.7 (0–3.5)	1.7 (0–3.5)
30–39	86	16%	0	5.5 (0.3–10.7)	5.5 (0.3–10.7)
40–49	164	15%	0	3.5 (0.9–6.1)	3.5 (0.9–6.1)
50–64	361	12%	0.4 (0–0.9)	2.9 (1.5–4.4)	3.3 (1.8–4.8)
Region					
Midwest	145	13%	0	3.9 (0.9–7.0)	3.9 (0.9–7.0)
Northeast	56	13%	0.6 (0–1.7)	4.3 (0–8.9)	4.8 (0.1–9.5)
South	289	12%	0.3 (0–1.0)	3.1 (1.2–4.9)	3.4 (1.5–5.4)
West	69	23%	0	5.7 (1.4–9.9)	5.7 (1.4–9.9)
Unknown	74	4%	0	0.8 (0–1.8)	0.8 (0–1.8)

^aIndividuals with an inpatient or outpatient claim for erectile dysfunction and for whom absence data were collected. Work loss based on reported absences contiguous to the admission or discharge dates of each hospitalization or the date of the outpatient visit.

^bInpatient and outpatient include absences that start or stop the day before or after a visit.

Source: Marketscan Health and Productivity Management, 1999.

excess costs in this age group. Regional differences in individual-level expenditures were negligible.

Fourteen percent of men with a diagnosis of ED missed some work, with younger men missing work more frequently than older men (Table 32). The proportion was highest in the West (23%) and lowest in the South (12%). On average, men with an ED diagnosis missed 3.6 hours of work per year; the confidence intervals were too wide to assess differences by age and region. Each outpatient visit for ED resulted in 3.4 hours of missed work; and again, data were too sparse to assess differences by age and region. The relatively small amount of work loss associated with ED is most likely due the infrequency of inpatient stays and the availability of effective pharmaceutical treatment.

The economic burden of ED is significant in the United States. While work loss is relatively low, expenditures for treatment are sizable. Although expenditures for inpatient services have been declining slightly, they have been outpaced by increases in expenditures for other services. Although excess individual-level costs were moderate for each patient, ED is relatively common—nearly 1.5% of privately insured males between the ages of 18 and 64 had at least one claim related to ED in 2002. Expenditures for ED were greater in the general population than among Medicare beneficiaries, probably due to the greater age of most Medicare enrollees. Overall, younger men

with ED appear to have a more substantial economic impact than older men.

PEYRONIE'S DISEASE

DEFINITION AND DIAGNOSIS

Peyronie's disease (PD) was first described in the medical literature by de La Peyronie in 1743, although depictions of penile curvature date to antiquity. No consensus exists with regard to the etiology, prevalence, treatment, or even the definition of this condition (29). Also known as plastic induration of the penis, PD is usually associated with the presence of an inflammatory reaction and fibrotic plaque within the tunica albuginea of one or both penile corpora cavernosa. The common presenting symptoms of PD include a palpable indurated penile plaque, pain with erection, and curvature or deformity of the erect penis (pointing toward the plaque). ED can also occur due to disruption of normal mechanisms of venoocclusion that depend on the compliance of the tunica albuginea. The impact of PD on quality of life is suggested by the fact that 77% of respondents in one study complained of psychological effects from the condition, and 65% stated that the problem concerned them frequently. Pain and impotence have been recorded in about half of community-dwelling men diagnosed with PD (30).

RISK FACTORS, PREVALENCE AND INCIDENCE

Estimates of prevalence, severity, and health impact depend on populations studied, definition criteria, and assessment methods. Previous studies have shown prevalence ranging from 0.4% to 23%. The lowest estimates are based on medical record reviews of residents of Rochester, MN, and thus likely reflect the burden of illness among Caucasians (30). The highest estimate is based on histological determination of chronic inflammation and fibrosis in an autopsy series of 100 penises (31). A recent community-based German study (32) noted a patient-reported prevalence of 3.2% in men 30 to 80 years of age, while a questionnaire-based Italian study (33) revealed a prevalence of 7% in men 50 to 69. A study of 534 US men presenting for a prostate cancer screening program reported that 8.9% had a penile plaque palpable by the examining urologist (29). Only 67% of these patients reported having noticed penile curvature deformity or plaque. Men with PD based on physician

diagnosis had worse scores on the five-item Sexual Health Inventory for Men (SHIM) questionnaire that measures erectile function. In univariate analysis, the prevalence of PD was associated with increased age (Odds Ratio = 2.0 for every 10-year age increase), hypertension, diabetes, and ED. A smoking history was negatively associated with PD. The prevailing theory of etiology suggests that overt or unnoticed trauma to the erect penis (34), usually during sexual intercourse, initiates an inflammatory response that is prolonged and abnormal in susceptible individuals. The role of transforming growth factor β and other growth factors in this process has been demonstrated in animal models and human plaque specimens (35, 36).

TRENDS IN HEALTHCARE RESOURCE UTILIZATION

Inpatient Care

Data that could be used to estimate the burden of disease due to PD are limited. Few administrative datasets contain enough observations to allow for thoughtful inference. A code specific to PD (607.85) was added to the ICD-9 classification system after 2001. Data presented here use an ICD-9 administrative code-based definition of PD which is thought to represent coding patterns in use prior to the introduction of the specific PD code. This definition may differ in sensitivity and specificity from data which would have been generated had the specific PD code been in existence. Because surgical management is rarely used, office visits and global utilization provide the most relevant information. Sources used in this analysis are physician office visits by Medicare beneficiaries and user rates by veterans (Tables 33 and 34).

Outpatient Care

Outpatient utilization by male Medicare beneficiaries with PD listed as the primary diagnosis is a minute fraction (1.4%) of visits for ED, as determined by age-adjusted rates in 2001 (23 per 100,000 for PD vs 1,666 per 100,000 for ED) (Tables 33 and 9). Rates of office visits were similar in earlier years. VA Information Resource Center (VIREC) data show a similar difference in period prevalence, with 31 per 100,000 VA users having any diagnosis of PD in 2001, as compared with 3,790 per 100,000 for ED

Table 33. Physician office visits by Medicare beneficiaries with Peyronie's disease listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	6,700	45 (40-50)	45	5,080	33 (29-37)	33	5,440	38 (33-42)	38	3,520	23 (19-26)	23
Total < 65	1,500	48 (37-59)		780	23 (16-30)		800	23 (16-30)		740	19 (13-26)	
Total 65+	5,200	44 (39-50)		4,300	37 (32-41)		4,640	42 (37-47)		2,780	24 (20-28)	
Age												
65-69	3,020	74 (62-86)		2,220	58 (47-68)		2,060	61 (49-73)		1,020	29 (21-37)	
70-74	1,560	48 (37-59)		1,280	38 (29-48)		1,320	43 (33-54)		760	25 (17-33)	
75-79	460	20 (12-29)		560	25 (16-34)		800	35 (24-46)		520	21 (13-29)	
80-84	120	9.2 (1.8-16)		160	12 (3.5-20)		180	13 (4.5-22)		240	16 (6.9-25)	
85-89	40	6.7 (0-16)		80	13 (0.3-25)		180	28 (9.5-46)		220	30 (12-48)	
90+	0	0		0	0		100	46 (5.6-87)		20	8.6 (0-26)	
Race/ethnicity												
White	5,840	47 (41-52)	46	4,600	35 (31-40)	36	4,920	40 (35-45)	40	3,300	25 (21-29)	25
Black	240	19 (8.2-30)	19	280	20 (9.6-31)	19	320	24 (12-36)	22	60	4.1 (0-8.7)	4.1
Asian	...	...	...	60	82 (0-176)	55	0	0	0	20	9.8 (0-29)	9.8
Hispanic	...	...	...	20	10 (0-30)	10	80	24 (0.6-47)	24	40	11 (0-25)	11
N. American Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	1,400	38 (29-47)	39	1,000	26 (19-33)	26	1,020	28 (20-35)	27	880	23 (16-30)	23
Northeast	900	28 (20-37)	28	740	23 (16-31)	23	880	32 (22-41)	31	560	19 (12-26)	19
South	3,120	60 (50-69)	59	2,320	42 (35-50)	42	2,260	42 (34-50)	43	1,460	25 (19-31)	25
West	1,260	52 (39-65)	52	1,000	43 (31-55)	41	1,200	54 (40-67)	54	580	23 (15-32)	24

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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 34. VA users with Peyronie's disease as any diagnosis in 1998-2003, count, age-adjusted rate^a

	1998		1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	1,195	36	1,245	35	1,237	33	1,247	31	1,189	27	1,160	24
Age-adjusted Total	1,354	36	1,320	36	1,237	33	1,129	30	981	26	891	24
Age												
< 25	2	6	3	9	4	14	2	7	2	7	6	22
25-34	24	15	22	13	16	10	9	5	16	9	17	10
35-44	78	21	76	21	59	16	74	20	65	18	52	14
45-54	365	45	358	44	348	42	288	35	259	32	237	29
55-64	358	57	336	54	307	49	317	51	224	36	239	38
65-74	372	39	353	37	325	34	304	32	277	29	232	24
75-84	142	21	161	24	162	24	122	18	125	18	98	14
85+	14	22	11	17	16	26	14	23	12	19	9	15
Gender												
Male	1,195	36	1,245	35	1,237	33	1,247	31	1,189	27	1,160	24
Female	0	0	0	0	0	0	0	0	0	0	0	0
Race/Ethnicity												
White	837	40	895	39	858	34	869	31	780	26	726	24
Black	181	38	181	38	185	38	166	34	175	36	151	32
Hispanic	85	94	69	73	72	75	72	72	60	58	46	46
Other	14	33	12	27	22	47	17	35	16	32	14	29
Unknown	78	13	88	15	100	17	123	19	158	20	223	21
Insurance Status												
No insurance/self-pay	877	37	897	36	849	34	784	32	716	28	646	26
Medicare	89	35	117	30	203	31	253	26	279	22	299	20
Medicaid	1	46	0	0	1	26	1	16	2	23	2	21
Private Insurance/HMO	221	36	221	38	176	31	202	34	181	28	204	29
Other Insurance	7	62	10	58	8	34	5	19	10	33	9	25
Unknown	0	0	0	0	0	0	2	0	1	0	0	0
Region												
Eastern	155	32	158	31	133	24	196	29	204	26	172	22
Central	234	41	213	34	253	39	233	32	226	25	262	25
Southern	462	37	453	34	475	33	459	28	455	25	452	23
Western	344	35	421	41	376	35	359	34	304	31	274	28

^aRate 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.

Table 35. Ambulatory surgery visits by Medicare beneficiaries with Peyronie's disease listed as primary diagnosis, count^a, rate^b (95% CI), age-adjusted rate^c

	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 ^d	380	2.6 (1.4-3.7)	2.6	600	3.9 (2.5-5.4)	3.9	600	4.1 (2.7-5.6)	4.1	620	4.0 (2.6-5.4)	4.0
Total < 65	100	3.2 (0.4-6.0)		100	2.9 (0.3-5.5)		80	2.3 (0.1-4.6)		160	4.2 (1.3-7.1)	
Total 65+	280	2.4 (1.1-3.6)		500	4.2 (2.6-5.9)		520	4.7 (2.9-6.5)		460	4.0 (2.3-5.6)	
Age												
65-69	120	2.9 (0.6-5.3)		280	7.3 (3.5-11)		220	6.5 (2.7-10)		240	6.8 (2.9-11)	
70-74	100	3.1 (0.4-5.8)		160	4.8 (1.5-8.1)		140	4.6 (1.2-8.0)		100	3.2 (0.4-6.1)	
75-79	20	0.9 (0-2.6)		20	0.9 (0-2.6)		80	3.5 (0.1-6.9)		40	1.6 (0-3.9)	
80-84	40	3.1 (0-7.3)		40	2.9 (0-6.8)		60	4.4 (0-9.3)		60	4.0 (0-8.6)	
85-89	0	0		0	0		0	0		20	2.8 (0-8.2)	
90+	0	0		0	0		0	0		0	0	
Race/ethnicity												
White	180	1.4 (0.5-2.4)	1.3	340	2.6 (1.4-3.9)	2.5	600	4.9 (3.1-6.7)	4.9	520	4.0 (2.4-5.5)	3.8
Black	160	13 (3.8-21)	14	220	16 (6.5-25)	17	0	0	0	0	0	0
Asian	...	...	...	0	0	0	0	0	0	0	0	0
Hispanic	...	...	...	20	10 (0-30)	10	0	0	0	20	5.3 (0-16)	5.3
N. American Native	...	...	...	0	0	0	0	0	0	0	0	0
Region												
Midwest	180	4.9 (1.7-8.0)	5.4	320	8.3 (4.2-12)	8.8	200	5.4 (2.1-8.8)	5.4	60	1.6 (0-3.4)	1.6
Northeast	40	1.3 (0-3.0)	1.3	60	1.9 (0-4.0)	1.3	60	2.2 (0-4.6)	2.2	80	2.7 (0.1-5.4)	2.1
South	120	2.3 (0.5-4.1)	1.9	120	2.2 (0.4-3.9)	2.2	240	4.5 (1.9-7.0)	4.5	400	6.9 (3.9-9.9)	6.9
West	40	1.7 (0-3.9)	0.8	80	3.4 (0.1-6.8)	3.4	100	4.5 (0.5-8.4)	4.5	60	2.4 (0-5.2)	2.4

...data not available.

^aUnweighted counts multiplied by 20 to arrive at values in the table.

^bRate per 100,000 male Medicare beneficiaries in the same demographic stratum.

^cAge-adjusted to the US Census-derived age distribution of the year under analysis.

^dPersons 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.

(0.8%) (Tables 34 and 14). Rates of office visits for PD decreased approximately 50% between 1992 and 2001 (Table 33), with declines occurring across all age and ethnic groups and geographic regions. Whether this decline (from a maximum of 45 per 100,000 in 1992) reflects a trend toward more accurate coding and a shift of patients to a primary diagnosis of ED is unclear. The true prevalence of PD is unlikely to have changed. The condition affects a younger population than ED does. Rates were highest in the Medicare beneficiaries aged 65 to 69. Among VA users, those 55 to 64 had the highest rate of diagnosis, followed by those 45 to 54. Racial differences were difficult to interpret in Centers for Medicare & Medicaid Services (CMS) data due to low numbers of ethnic minorities. Caucasian men had a much higher rate of PD-related visits than other ethnic groups, with African Americans having the lowest rate. Conversely, in the VA data, Hispanic men had the highest rate—twice that of Caucasians.

Hospital outpatient visits, ER visits, and inpatient surgical visits were exceedingly rare across all temporal, age, race, and geographic categories (< 0.1%). Age-adjusted ambulatory surgery visit rates for male Medicare beneficiaries increased from 2.6 per 100,000 in 1992 to 4.0 per 100,000 in 2001 (Table 35). This rate is approximately one-tenth that of office visits. This difference may reflect variability due to low sample size; however, another possible explanation is increased use of outpatient facilities for surgical procedures, including tunica albuginea plication, plaque incision or excision and grafting, and intralesional injections.

Veterans

VIREC provides information on both inpatient and outpatient diagnosis of PD among male users of VA medical centers (Tables 34 and 36). PD was listed under “all diagnoses” in less than 1% of male veterans. The age-adjusted period prevalence of PD listed as a primary diagnosis decreased approximately 40%, from 23 per 100,000 male veteran users in 2000 to 14 per 100,000 in 2003. As one of any diagnoses, it declined nearly one-third, from 33 per 100,000 to 24 per 100,000. It was rarely recorded in men under 45 years of age and was most common in men between 55 and 64. Higher prevalence rates were recorded in men of Hispanic ethnicity, with African American

and Caucasian ethnicities having respectively lower rates. Rates were lowest in the East and the South. The reason for this variation is not known.

CONCLUSIONS

Erectile dysfunction was self-reported by nearly 1 in 5 adult men in NHANES, corresponding to 15 million Americans over the age of 20. The prevalence of ED increases with age, with more than 60% of men 70 or older (5.5 million) reporting that they are sometimes or never able to get and keep an erection adequate for satisfactory intercourse. ED may be more commonly reported in Hispanic men and in those with modifiable risk factors, including a history of diabetes, obesity, smoking, and hypertension. In most databases, African American men have rates of utilization for office visits and inpatient hospital care twice those of other racial groups, although these rates do not control for comorbid conditions or other regional and socioeconomic factors.

The treatments used for ED, as measured by hospital outpatient, ambulatory surgery, and physician office visits, as well as cost reimbursement data, suggest shifting forms of healthcare utilization. The frequency of hospital treatment for ED, including penile implants, has declined since 1992, while the diagnoses and treatment of ED in outpatient settings (especially primary care clinics) has increased. The use of diagnostic tests such as plethysmography and nocturnal penile tumescence has markedly decreased, suggesting that the diagnosis of ED is being established by history and physical examination. Age-related differences in utilization of resources for ED are evident, with lower rates of both outpatient and inpatient visits in older age groups. Pharmacologic therapy, especially with oral phosphodiesterase-5 inhibitors, as measured by VA pharmacy data, has markedly increased. Pharmacologic therapy is particularly common in men who have received a radical prostatectomy for treatment of prostate cancer (in 2003, 31% of male veterans over 40 years of age who had received a radical prostatectomy were receiving pharmacologic therapy for ED, and nearly 90% of these received phosphodiesterase-5 inhibitors). Penile implant surgery continues to be performed, despite the success of PDE-I therapy, with most patients electing inflatable devices. Inpatient length of stay

Table 36. VA users with Peyronie's disease listed as primary diagnosis in 1998-2003, count, age-adjusted rate^a

	1998		1999		2000		2001		2002		2003	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	863	26	877	25	839	23	772	19	740	17	663	14
Age-adjusted Total	978	26	929	25	839	23	700	19	612	16	507	14
Age												
< 25	2	6	2	6	2	7	2	7	2	7	5	18
25-34	17	11	18	11	15	9	5	3	12	7	9	6
35-44	61	17	58	16	44	12	48	13	44	12	28	8
45-54	252	31	255	31	244	30	193	24	167	20	127	16
55-64	261	42	231	37	202	32	186	30	122	19	128	21
65-74	268	28	243	25	208	22	171	18	170	18	139	14
75-84	104	15	111	16	112	16	85	12	85	13	65	9
85+	12	20	10	15	12	19	9	15	10	16	5	9
Race/Ethnicity												
White	602	29	609	27	573	23	519	19	481	16	403	13
Black	132	28	137	28	138	28	117	24	129	26	97	20
Hispanic	59	65	53	56	48	50	49	49	37	36	29	29
Other	9	21	10	22	9	19	11	23	4	8	8	16
Unknown	61	11	68	11	71	12	76	12	89	11	126	12
Insurance Status												
No insurance/self-pay	642	27	640	25	578	23	494	20	447	18	378	15
Medicare	60	24	72	18	130	20	155	16	180	14	182	12
Medicaid	1	46	0	0	1	26	1	16	2	23	2	21
Private Insurance/HMO	156	25	157	27	124	22	118	20	107	16	97	14
Other Insurance	4	36	8	46	6	26	3	11	4	13	4	11
Unknown	0	0	0	0	0	0	1	0	0	0	0	0
Region												
Eastern	118	25	120	23	106	19	127	19	131	17	88	11
Central	179	31	160	26	160	25	151	21	156	17	177	17
Southern	324	26	306	23	309	21	258	16	251	14	230	12
Western	242	25	291	28	264	25	236	22	202	20	168	17

^aRate 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.

has decreased, and hospital implant volumes have decreased as well.

Men with ED incur increased healthcare expenditures due to both ED-specific therapies and other coexisting conditions. One estimate of the burden of disease is the additional cost of medical care for men with ED, estimated at \$1,100 per year. Extrapolating from the population-based estimates of ED prevalence from NHANES, the cost of treatment nationwide could reach \$15 billion if all men sought treatment.

Variability and reliability in administrative databases for ED is of concern, primarily due to the fact that ED is frequently diagnosed and treated in outpatient settings on the basis of patient self-reports, with little to no additional diagnostic testing. There is likely little incentive for primary care providers to code consistently for this condition, and in many databases, specific treatments for ED are not included, while some therapies such as testosterone replacement are frequently also used to treat vague symptoms of male androgen deficiency such as loss of libido or energy or for low serum testosterone levels. Updated prevalence, severity, and health-impact surveys that are representative of a national US adult population and that control for comorbid conditions are needed.

Peyronie's disease can result in considerable clinical morbidity. However, available administrative data indicate that PD reaches clinical significance in relatively few men. There is minimal use of surgical intervention for the condition, and few surgical procedures are performed for Medicare beneficiaries or VA users. For the vast majority of men diagnosed with PD, treatments are office-based. Available data are limited and it is difficult to assess accurately the true prevalence and impact of PD. This is likely due partially to the variability in diagnostic criteria used; lack of standardized symptom scales; periods of relatively asymptomatic penile plaques and deformities that may not cause patients concern or that they may not wish to address with their physicians; or the fact that PD may not be accurately diagnosed or coded in medical records. The estimates available from administrative data suggest that the prevalence of PD has actually decreased, despite the overall increase in patient and provider awareness and treatment for men's sexual health.

RECOMMENDATIONS

A better understanding of male sexual health is clearly needed. The American College of Physicians nominated this topic for review in 2005–2006 by the federal Agency for Healthcare Research and Quality's evidenced-based practice centers. This review will address the diagnosis and treatment of ED. Preliminary key questions include:

- What are accepted definitions of ED?
- What is the prevalence of underlying causes of sexual dysfunction in primary care and referral populations?
- What is the yield of measurements of blood levels of testosterone, prolactin, luteinizing hormone, and follicle-stimulating hormone for treatable causes of ED?
- What is the effectiveness of pharmaceutical treatments for patients with ED, including those with underlying medical disorders (e.g., diabetes, neuropathy)?
- What is the evidence of harms of pharmaceutical treatment for patients with ED?

Future administrative and survey research should use validated questionnaires to establish the prevalence, severity, health impact, and treatments utilized for ED and PD. Analysis should establish risk factors for ED, racial influences on the pathogenesis, and treatment-seeking behavior. Factors influencing the use of diagnostic testing should be investigated, and guidelines for appropriate and selective use are necessary. Factors that might explain patient preference for therapies, success of treatments, and relative satisfaction with oral pharmacotherapy and penile implants need to be studied. The growth of the aging male population will require economic modeling to predict future costs of evaluation and treatment. Additional research is also needed to assess aspects of male sexual health not evaluated in this chapter, including premature ejaculation, sexual desire, vitality, ejaculatory and orgasmic function, partner intimacy, psychosocial aspects, the role of testosterone replacement therapy, and male "andropause." Finally, female sexual health deserves evaluation as well. Administrative data systems and survey research are needed to capture the relevant information accurately.

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