

# Deaths from Arthritis and Other Rheumatic Conditions, United States, 1979–1998

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**ABSTRACT.** *Objective.* To analyze US trends in deaths from arthritis and other rheumatic conditions (AORC). *Methods.* Multiple cause of death tapes from the National Center for Health Statistics from 1979 to 1998 were reviewed. Age, sex, and race-specific death rates were calculated. *Results.* During 1979–1998, the annual number of AORC deaths rose from 5537 to 9367. In 1979, the crude death rate from AORC was 2.46 per 100,000 population; by 1998, it was 3.48. Rates age-standardized to the year 2000 population were 2.75 and 3.51, respectively. Annual crude and age-standardized death rates were higher among women than men and higher among blacks than whites and increased for all groups over the 20 years. Death rates were dramatically higher with increasing age. Three categories of AORC accounted for almost 80% of deaths: diffuse connective tissue diseases (34%), other specified rheumatic conditions (23%), and rheumatoid arthritis (22%). *Conclusion.* There are marked age, sex, and race-specific disparities in AORC death rates. AORC death rates may be underestimated because of (1) nonrecognition of inflammatory arthritis and (2) attribution of cause of death to conditions made more likely by arthritis, e.g., cardiovascular disease, or to complications from arthritis therapy. Further research into the causes of the disparities in death rates and the increase in death rates for men, women, blacks, and whites is necessary. (J Rheumatol 2004;31:1823–8)

*Key Indexing Terms:*  
ARTHRITIS

MORTALITY

Arthritis and other rheumatic conditions (AORC) are common and rank as the leading cause of disability among adults<sup>1,2</sup>. Nevertheless, large gaps remain in our knowledge of its frequency and impact. Relatively few population-based data on arthritis occurrence exist, making it difficult to assess its relative importance and to monitor trends over time.

To better characterize AORC and its influence on the healthcare system and population for a single year, the Centers for Disease Control and Prevention (CDC) analyzed a variety of data for 1997 using a common definition of AORC<sup>1</sup>. The findings of one such analysis indicated that in 1997, 43 million Americans had arthritis and 7.9 million of them had activity limitations caused by arthritis<sup>3</sup>. Other analyses characterized the effect of AORC on the healthcare system and found there were 744,000 hospitalizations and 44 million ambulatory care visits for arthritis in 1997 in the US<sup>4–6</sup>.

While arthritis is generally not considered fatal, we thought examining 1997 arthritis-related fatalities might

shed additional light on the spectrum of manifestations of AORC. To place the 1997 deaths in perspective, we reviewed AORC deaths from 1979 to 1998.

## MATERIALS AND METHODS

We used National Center for Health Statistics Multiple Cause-of-Death Public Use Data Tapes for 1979 through 1998. These national mortality statistics were based on data from death certificates filed in state vital statistics offices. Demographic data (e.g., age and race/ethnicity) listed on death certificates were reported by funeral directors, usually from information provided by the decedent's family. Causes of death on death certificates were reported by a physician, medical examiner, or coroner.

Each cause of death listed on the certificate was assigned an International Classification of Diseases, 9th Revision (ICD-9) code number. We used the National Arthritis Data Workgroup (NADW) set of ICD-9-CM codes (see Appendix) thought to represent the constellation of AORC<sup>1</sup>. Decedents with one or more of these NADW-recommended codes listed anywhere on the death certificate were included in the analysis. Part I of a death certificate contains information on the underlying cause of death — i.e., the condition that initiated the chain of events that led to death. Part II of the certificate is for reporting all other significant conditions that contributed to death but did not directly result in the death. An AORC death was defined as any death of a US resident coded with an underlying cause of death of AORC from Part I. An AORC-associated death was a death in which the underlying or contributory cause was AORC (Part I or Part II). We also classified the type of AORC in a 10-category rubric (see Appendix) used previously by CDC to separate broad categories of AORC for analysis<sup>6</sup>.

Population death rates were calculated with annual deaths and corresponding US residential population estimates<sup>7</sup>. Rates were calculated for whites and blacks; death rates among persons of other races were not calculated because of the small numbers of deaths. Rates were age-adjusted to the recommended year 2000 standard<sup>8</sup>.

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## RESULTS

During 1979–1998, the annual number of AORC deaths increased from 5537 to 9367, with a total of 146,377 deaths reported during this 20-year period (Table 1). Almost 5 times that number (731,823) listed AORC somewhere on the death certificate as an underlying or contributing cause of death. Of all AORC deaths, 12.1% occurred among persons aged 15–44 years, 23.3% among those aged 45–64 years, and 63.8% among those 65 years and older. Women accounted for 68.9% of AORC deaths.

In 1979, the crude death rate from AORC was 2.46 per 100,000 population; in 1998, it was 3.48 (Table 2). For each year during this period, crude death rates were higher among women than men, higher among blacks than whites, and increased sharply with age group. Moreover, the female to male death rate ratio increased over time and the black to white death rate ratio fell. Age-specific death rates increased most dramatically over time in the oldest age group. Age-standardized rates also revealed increases in death rates over the 20 years for the whole population and for both sexes and races (Table 3, Figure 1).

Analysis of sex- and age-specific death rates by race revealed marked racial disparities in death rates among females, with rates for black females far exceeding rates for white females except in the oldest age group; for males, the same pattern was observed, although it was somewhat attenuated (Figures 2 and 3).

Of the 10 categories of AORC, 3 accounted for almost 80% of deaths: diffuse connective tissue diseases (34% in

1997), other specified rheumatic conditions (23% in 1997), and rheumatoid arthritis (RA; 22% in 1997). Age-standardized death rates from all 3 categories appeared to be increasing over time (Figure 4). Most deaths in the diffuse connective tissue disease category were from systemic lupus erythematosus and systemic sclerosis. Most deaths in the other specified rheumatic conditions category were from polyarteritis nodosa and unspecified arteritis.

## DISCUSSION

Our analysis reveals that deaths from AORC occurred among all age groups (even those under 15 years of age) and that most deaths occurred from 3 categories of arthritis. Age-standardized death rate data showed increases in rates over the 20 years for both sexes and races. Analysis also showed that there are marked age, sex, and race-specific disparities in AORC death rates and that death rates have increased about 70% from 1979 through 1998 among black and white females aged 65 years and older. Older persons, women, and blacks had higher AORC death rates. The reasons for these potentially important differences are difficult to elucidate with these cross-sectional mortality data, and few studies have addressed these differences.

The racial differences in death rates could be a result of a higher incidence of AORC among younger black females and males. Unfortunately, there are no ongoing population-based studies of AORC incidence that allow us to ascertain to what degree the increase in the mortality rate is a function of a change in incidence, prevalence, or severity of the

Table 1. Numbers of deaths from AORC, by age, sex, and race, US, 1979–1998. Numbers for demographic groups might not sum to the total or all ages total because of missing data.

Year	All Ages	Underlying Cause of Death								AORC Associated Cause of Death
		< 15	Age Group, yrs			Sex		Race		
			15–44	45–64	65+	Female	Male	White	Black	
1979	5537	62	767	1640	3068	3627	1910	4614	843	31,381
1980	5980	62	815	1743	3360	3985	1995	5042	863	32,586
1981	6173	59	809	1792	3513	4201	1972	5192	882	32,386
1982	6207	45	776	1630	3756	4243	1964	5234	879	32,723
1983	6291	49	805	1677	3760	4243	2048	5260	926	33,465
1984	6496	51	765	1706	3974	4429	2067	5479	928	33,640
1985	6418	47	807	1643	3921	4360	2058	5365	946	33,286
1986	6317	56	809	1485	3967	4395	1922	5229	987	32,989
1987	6446	39	757	1447	4203	4431	2015	5392	951	33,868
1988	6862	43	829	1563	4427	4779	2083	5683	1052	34,955
1989	7553	47	954	1689	4863	5175	2378	6244	1168	35,881
1990	7686	54	864	1697	5071	5334	2352	6399	1143	36,986
1991	7556	45	901	1623	4987	5209	2347	6258	1173	37,296
1992	7678	57	954	1604	5063	5235	2443	6379	1143	37,722
1993	8109	46	921	1671	5471	5664	2445	6789	1162	40,370
1994	8590	58	957	1797	5778	5937	2653	7166	1235	41,499
1995	8853	62	1050	1883	5858	6187	2666	7335	1339	42,577
1996	8918	51	1023	1879	5965	6228	2690	7366	1344	42,931
1997	9340	54	1102	1944	6240	6552	2788	7687	1428	42,605
1998	9367	50	1069	2026	6222	6660	2707	7766	1399	42,677
Total	146,377	1037	17,734	34,139	93,467	100,874	45,503	121,879	21,791	731,823

Table 2. Crude death rates per 100,000 population from AORC, by age, sex, and race, US, 1979–1998.

Year	All Ages	< 15	Age Group, yrs			Sex		Race	
			15–44	45–64	65+	Female	Male	White	Black
1979	2.46	0.12	0.74	3.69	12.01	3.12	1.76	2.38	3.19
1980	2.65	0.12	0.78	3.92	13.07	3.41	1.83	2.60	3.26
1981	2.71	0.12	0.76	4.03	13.40	3.57	1.79	2.66	3.29
1982	2.70	0.09	0.72	3.67	14.02	3.57	1.77	2.66	3.23
1983	2.71	0.10	0.74	3.77	13.74	3.54	1.83	2.66	3.36
1984	2.77	0.10	0.69	3.83	14.26	3.66	1.83	2.75	3.33
1985	2.72	0.09	0.72	3.69	13.80	3.57	1.80	2.67	3.35
1986	2.65	0.11	0.71	3.33	13.68	3.57	1.67	2.59	3.45
1987	2.68	0.08	0.66	3.23	14.19	3.57	1.73	2.65	3.28
1988	2.83	0.08	0.72	3.44	14.70	3.82	1.77	2.77	3.58
1989	3.08	0.09	0.83	3.68	15.85	4.10	2.00	3.03	3.92
1990	3.10	0.10	0.74	3.67	16.23	4.18	1.96	3.08	3.77
1991	3.02	0.08	0.77	3.47	15.69	4.04	1.93	2.98	3.80
1992	3.03	0.10	0.82	3.32	15.68	4.01	1.99	3.01	3.64
1993	3.16	0.08	0.78	3.37	16.67	4.30	1.96	3.18	3.64
1994	3.32	0.10	0.81	3.53	17.40	4.46	2.11	3.33	3.81
1995	3.39	0.11	0.89	3.61	17.42	4.61	2.10	3.38	4.08
1996	3.38	0.09	0.86	3.50	17.57	4.59	2.10	3.37	4.04
1997	3.48	0.09	0.91	3.51	18.30	4.78	2.13	3.47	4.19
1998	3.48	0.09	0.90	3.54	18.09	4.82	2.07	3.50	4.09

Table 3. Age-standardized\* death rates per 100,000 population from AORC, overall, and by sex and race, US, 1979–1998.

Year	Overall	Sex		Race	
		Female	Male	White	Black
1979	2.75	3.16	2.27	2.57	4.27
1980	2.96	3.46	2.34	2.79	4.35
1981	3.01	3.60	2.22	2.84	4.37
1982	3.00	3.55	2.31	2.78	4.34
1983	2.99	3.52	2.35	2.80	4.48
1984	3.04	3.60	2.35	2.87	4.44
1985	2.96	3.48	2.29	2.77	4.40
1986	2.87	3.46	2.11	2.67	4.53
1987	2.88	3.42	2.19	2.71	4.30
1988	3.03	3.64	2.26	2.82	4.73
1989	3.28	3.88	2.50	3.04	5.19
1990	3.29	3.93	2.49	3.08	5.01
1991	3.18	3.78	2.45	2.97	5.03
1992	3.17	3.73	2.49	2.97	4.79
1993	3.30	3.97	2.45	3.11	4.81
1994	3.44	4.10	2.58	3.23	5.07
1995	3.49	4.22	2.54	3.26	5.30
1996	3.45	4.18	2.52	3.22	5.23
1997	3.55	4.33	2.57	3.31	5.39
1998	3.51	4.34	2.45	3.30	5.21

\* Standardized to the year 2000 standard<sup>8</sup>.

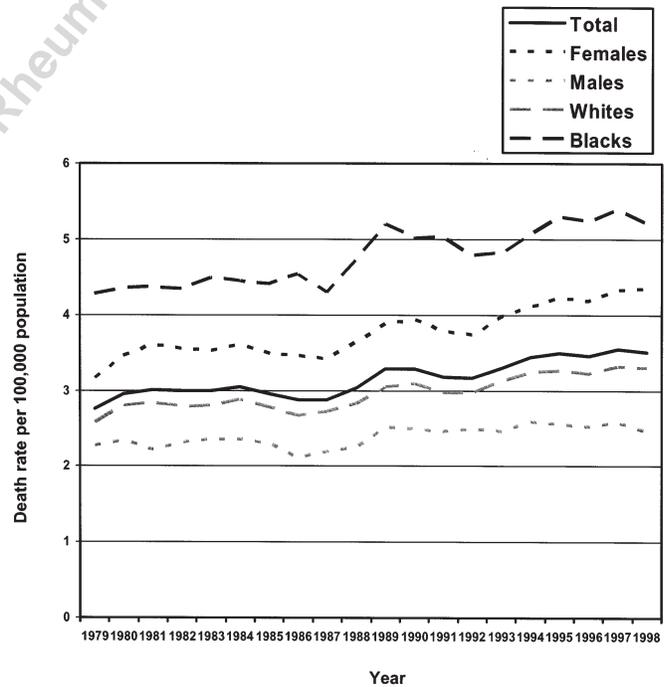


Figure 1. Age-standardized death rates for arthritis and other rheumatic conditions, by sex and race, US, 1979–98.

disease. Beyond a change in incidence, other potentially remediable reasons for higher AORC mortality rates among younger blacks include later diagnosis, problems in access to care, less effective treatments, poorer adherence with

treatment, and socioeconomic differences<sup>9</sup>. Differential ascertainment and reporting of AORC deaths by race are possible but likely do not account for the magnitude of observed differences.

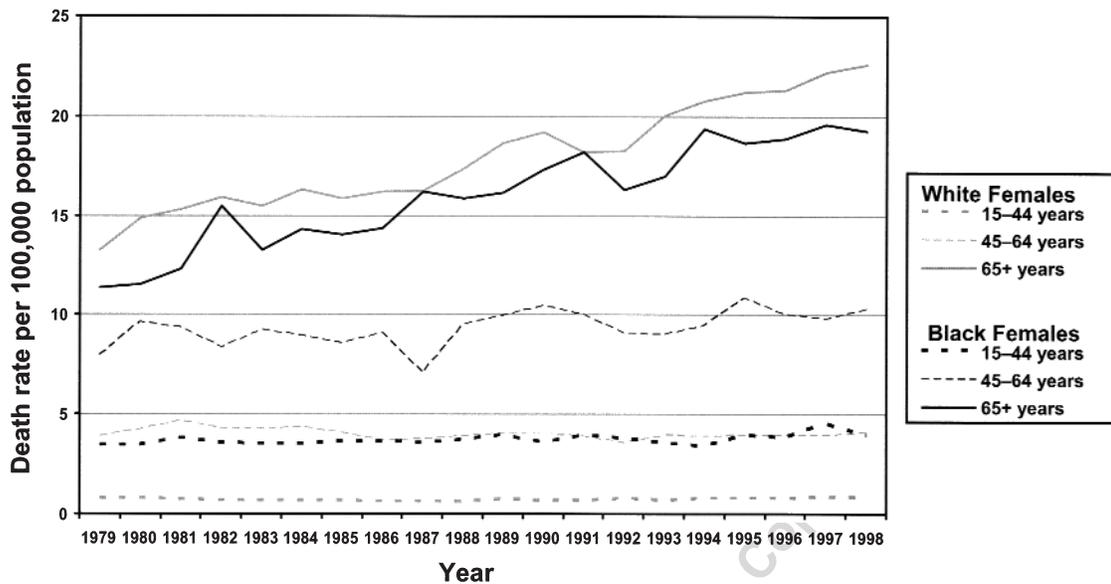


Figure 2. Age-specific death rates for arthritis and other rheumatic conditions for females, by race and age group, US, 1979–98.

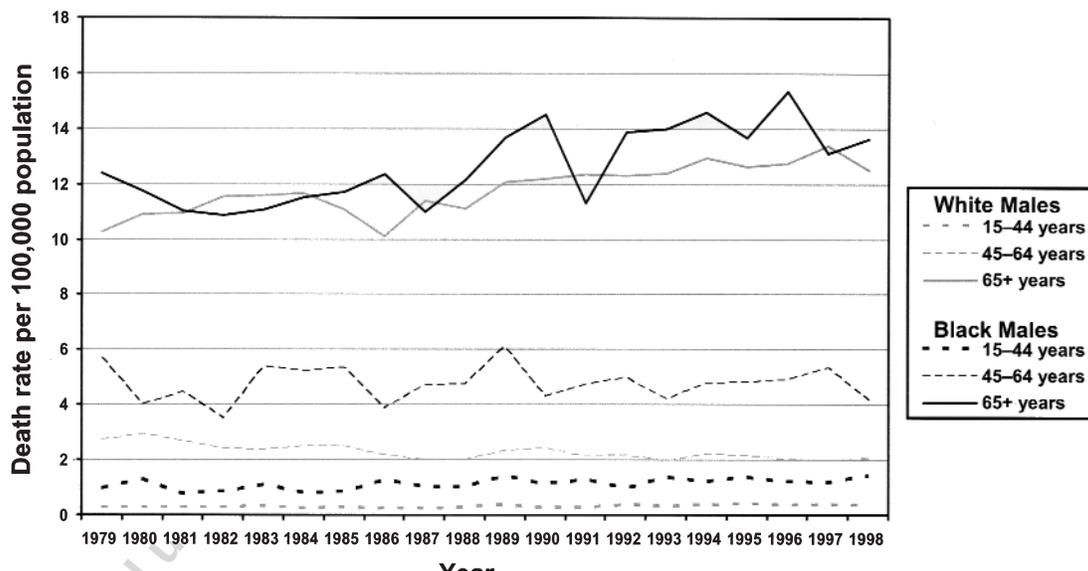


Figure 3. Age-specific death rates for arthritis and other rheumatic conditions for males, by race and age group, US, 1979–98.

Our findings are subject to several limitations. First, the mortality figures could be vastly underestimated. Reasons other than AORC might have been listed as the underlying cause of death. As has been pointed out, “the cause of death in patients with chronic rheumatic diseases often is not recognized as rheumatic disease, but rather, as an acute process, such as infection or a cardiovascular event”<sup>10</sup>. Because osteoarthritis or other forms of arthritis limit

mobility and physical activity, obesity and cardiovascular disease may result and be listed as the cause of death. Deaths from complications of arthritis therapy (e.g., gastrointestinal bleeding from antiinflammatory medications, neoplasms from some agents used to treat RA) or from pulmonary embolism from increasingly popular joint replacement surgery may be attributed to those causes instead of arthritis. An additional 585,446 persons who died

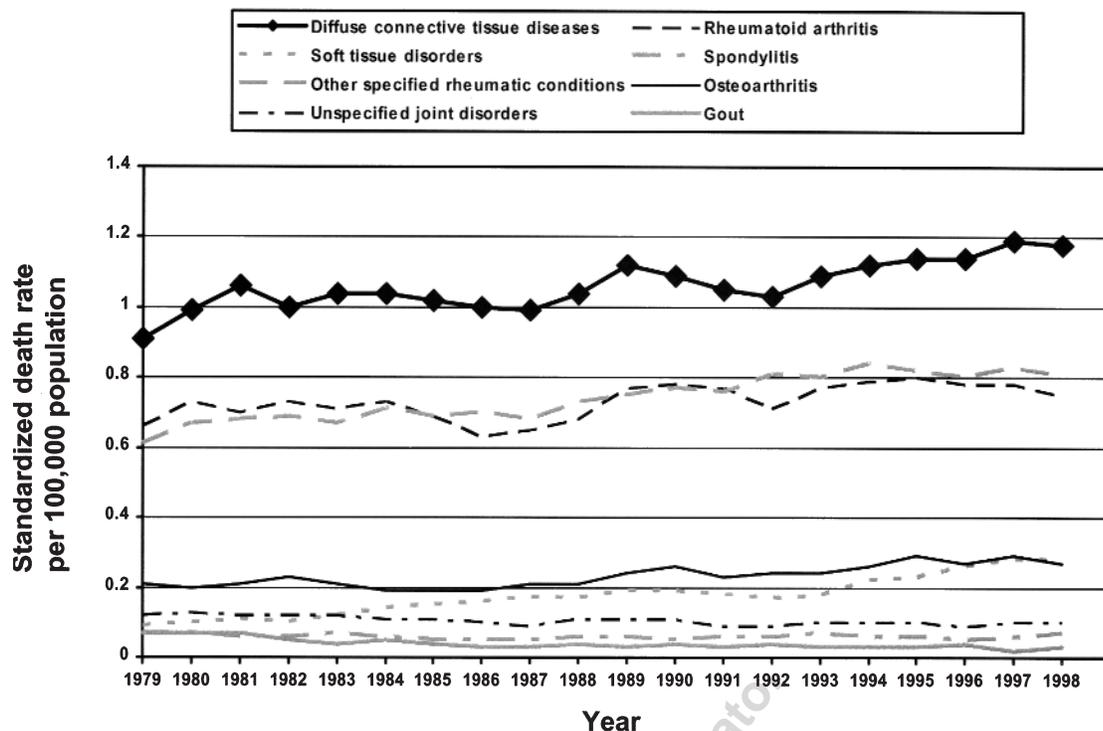


Figure 4. Standardized death rates for various categories of arthritis and other rheumatic conditions, US, 1979–98.

during 1979–1998 had AORC listed as an associated cause of death on their death certificate (Table 1). Second, AORC, especially inflammatory conditions, can be difficult to diagnose clinically<sup>11</sup>. While deaths reported with AORC as the underlying cause probably had sufficient data supporting the diagnosis, it is unclear how many additional AORC deaths were not recognized as such and were classified as due to other causes. Third, differences in reporting may have occurred over the 20 years. For example, if, as many clinicians believe, treatment for RA and diffuse connective tissue diseases has improved over time, then the increase in death rates may be a result of more accurate attribution and coding of the underlying condition rather than a true increase in mortality. Fourth, rates for races other than white and black were not calculated because of their small numbers. Evidence exists that these groups may have elevated rates of AORC<sup>10,11</sup>. Finally, we calculated population death rates rather than case fatality rates because prevalence estimates for AORC are variable. Moreover, we used intercensal projections for denominators, which may be inaccurate.

Although the impact of AORC is most pronounced in terms of its effects on quality of life and disability, it also has a measurable effect on severe outcomes like death. Preventing premature arthritis deaths involves suspicion of the diagnosis, early recognition and diagnosis (especially

for inflammatory arthritis), appropriate therapeutic management of acute manifestations and longterm consequences, and compliance with treatment.

One of the approaches outlined in The National Arthritis Action Plan, A Public Health Strategy<sup>12</sup>, is to better define issues surrounding specific types of rheumatic conditions. Further research into the overall and type-specific causes of the marked age, sex, and race disparities in death rates and the change in death rates over time appears warranted.

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**APPENDIX.** Categorization of International Classification of Diseases, 9th Revision, codes and disease or condition used to define "arthritis and other rheumatic conditions," as selected by the National Arthritis Data Workgroup (NADW).

<u>CATEGORIZATION</u>	<u>INCLUDED NADW-RECOMMENDED CODES</u>
Soft tissue disorders (excluding back)	726 – Peripheral enthesopathies and allied disorders 727 – Other disorders of synovium/tendon/bursa 728.0-.3, .6-.9 – Disorders of muscle/ligament/fascia 729.0 – Rheumatism, unspecified and fibrositis 729.4 – Fasciitis, unspecified
Joint pain, effusion and other unspecified joint disorders	716.1, .3-.6, .9 – Other unspecified arthropathies 719.0, .4-.9 – Other and unspecified joint disorders
Osteoarthritis and allied disorders	715 – Osteoarthritis and allied disorders
Rheumatoid arthritis (RA)	714 – RA and other inflammatory polyarthropathies
Myalgia/myositis unspecified	729.1—Myalgia and myositis unspecified
Carpal tunnel syndrome	354.0 — Carpal tunnel syndrome
Spondylosis/spondylitis and allied disorders	720 – Ankylosing spondylitis/inflammatory spondylopathies 721 – Spondylosis and allied disorders 99.3 – Reiter's disease 696.0 – Psoriatic arthropathy
Diffuse connective tissue disease	710 – Diffuse connective tissue disease
Gout and other crystal arthropathies	274 – Gout 712 – Crystal arthropathies
Other specified rheumatic conditions	711 – Arthritis associated with infections 713 – Arthropathy associated with disorders classified elsewhere 716.0, .2, .8 – Specified arthropathies 719.2, .3 – Specified joint disorders 725 – Polymyalgia rheumatica 95.6 – Syphilis of muscle 95.7 – Syphilis of synovium/tendon/bursa 98.5 – Gonococcal infection of joint 136.1 – Behcet's syndrome 277.2 – Other disorders of purine/pyrimidine metabolism 287.0 – Allergic purpura 344.6 – Cauda equina syndrome 353.0 – Brachial plexus/thoracic outlet lesions 355.5 – Tarsal tunnel syndrome 357.1 – Polyneuropathy in collagen vascular disease 390 – Rheumatic fever w/o heart disease 391 – Rheumatic fever w/heart disease 437.4 – Cerebral arteritis 443.0 – Raynaud's syndrome 446 – Polyarteritis nodosa and allied conditions 447.6 – Arteritis, unspecified

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