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Hospitalizations Associated With Rheumatic Disease in Alaska, 2015-2018

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Objective. Few studies have evaluated hospitalizations associated with rheumatic disease in Indigenous North American populations. The objective of this study was to determine the characteristics of people hospitalized with rheumatic disease in Alaska, including a comparison of hospitalizations for Alaska Native/American Indian (AN/AI) people in Alaska compared with those of other races.

Methods. We used statewide hospital discharge data from the Alaska Health Facilities Data Reporting Program from 2015 to 2018 for this study. Cases were ascertained based on discharge diagnosis (any listed) of a defined set of rheumatic diseases. We determined characteristics associated with rheumatic disease hospitalizations, including age, gender, and race. Using multivariate modeling, we determined risk factors for hospitalization overall, as well as for specific rheumatic diseases. We compared characteristics of hospital encounters for people with or without rheumatic diseases and by race.

Results. We identified 11,023 people ever hospitalized with rheumatic disease in the study period and 92,090 controls hospitalized but without any rheumatic disease diagnosis. Cases were older than controls and more likely to be female. The three most common types of rheumatic disease associated with hospitalization were osteoarthritis, gout, and rheumatoid arthritis. Compared with other races, AN/AI people were more likely to be hospitalized with rheumatic disease, and this association was true for all specific diseases other than gout.

Conclusion. Hospitalizations associated with rheumatic disease are common in Alaska, with an increased likelihood of hospitalization for AN/AI people. This adds to the literature on health disparities in Indigenous North American populations.

INTRODUCTION

Rheumatic diseases, chronic conditions including arthritis and autoimmune diseases affecting joints and other organs, are associated with substantial health care costs in the United States. Although much of the care for these conditions occurs in the ambulatory setting, hospitalizations for rheumatic disease or with rheumatic disease as a contributing factor are common. In 2013, it was estimated that 6.4 million hospitalizations in the United States, or 21.4% of all hospitalizations, had arthritis and other rheumatic conditions as a contributing factor (1). In 1997, hospitalizations for arthritis as a contributing factor were more than three times more common than hospitalizations for arthritis as a primary diagnosis (2), but in 2009, osteoarthritis had become the fourth leading primary diagnosis associated with hospitalizations and hospitalizations were projected to rise (3). The most common rheumatic disease associated with hospitalization in the United States in 2013 was osteoarthritis (46.0% of arthritis and other rheumatic condition-associated hospitalizations), with gout (13.4%), rheumatoid arthritis (RA; 8.0%), and spondyloarthritis (7.7%) as the next most common specific rheumatic diseases. Other studies in the United States have found higher rates of all-cause hospitalizations in people with many rheumatic diseases (4,5), as well as cause-specific hospitalizations for cardiovascular disease (6,7) or serious infection (8-10) among people with a diagnosis of rheumatic disease.

Studies in Canada have documented a higher rate of all-cause hospitalizations in First Nations people with osteoarthritis (11) and inflammatory arthritis (12) when compared with non-First Nations patients. Alaska Native (AN) people, like other Indigenous

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SIGNIFICANCE & INNOVATIONS

- This study is one of few to investigate disparities in hospitalizations for rheumatic diseases in Indigenous populations in the United States.
- Similar to studies in other populations, people hospitalized with a rheumatic disease diagnosis were older and more likely to be female.
- Differences by race included a higher rate of hospitalization for all rheumatic diseases in AN/AI people, with the exception of gout, for which hospitalization rates were lower.

North American populations, experience disparities in prevalence and incidence of several rheumatic diseases, including a high prevalence of RA, spondyloarthritis, and systemic lupus erythematosus (SLE) (13-16). Hospitalizations for rheumatic diseases have not been described in the AN population, and few national studies in the United States have included an evaluation of AN or American Indian (AI) hospitalizations associated with rheumatic diseases.

We designed this study to determine the characteristics of patients ever hospitalized with a diagnosis of rheumatic disease in Alaska; to describe the rates, causes, and characteristics of hospitalizations associated with rheumatic disease; and to compare hospitalizations associated with rheumatic disease between the AN/AI population and other races in Alaska.

PATIENTS AND METHODS

This observational study was approved by the Alaska Area Institutional Review Board (IRB) as expedited research (AAIRB# 2019-03-021) with a waiver of consent. In addition to IRB approval, tribal approval was obtained from the Alaska Native Tribal Health Consortium and other participating regional tribal health organizations.

Data source and study population. The Alaska Health Facilities Data Reporting System (HFDR) collects inpatient and outpatient discharge data from Alaska health care facilities to create the Alaska Inpatient Database and Alaska Outpatient Database. These datasets may be used for population health assessment, research, or health care operations. Regulations mandating reporting became effective in December 2014. Datasets were available for this study from 2015 to 2018. Reporting is mandated from hospitals and some other health care facilities, but not from all clinics where outpatient visits also occur. Therefore, the outpatient data are not as complete for statewide analysis as the inpatient data, and only inpatient data were used for this study. The datasets are deidentified with respect to protected health information and thus cannot be linked with other datasets to identify cohorts of patients. However, data do include age, gender, race, and location of residence. For inpatient hospitalizations, the dataset includes primary diagnosis and all listed diagnoses, length of stay, in-hospital mortality, and discharge status (to home or other).

The HFDR Alaska Inpatient Database includes data from all regions of Alaska, for people of all races. The population denominators are defined by the State of Alaska using state databases (Department of Labor and Workforce Development) by year, race, and region. For this study, we included all patients aged 18 and over at the time of the hospital encounter. The population denominators allowed for multiple races, whereas the HFDR only included one field for race. Therefore, multiracial counts in the denominator were assigned as AN/AI people if they included AN/AI and another race. For multiracial individuals who were not AN/AI in combination with another race, counts were assigned to single races proportionate to the population distribution. Population denominators for White race were based on single race estimates only. We excluded patients with an out-of-state residence listed at the time of the encounter, as well as excluded patients with missing identification numbers when we analyzed patient-based summary statistics.

As noted earlier, we were interested in comparisons between hospitalizations for AN/AI people and people of other races. For data analysis, an individual person's race was determined by the category listed in the HFDR, which included AN/AI, White, Black, Asian, Native Hawaiian/Pacific Islander, or Other. For comparisons of race, persons with missing race in the HFDR were excluded. In our analyses, we compared AN/AI people with non-AN/AI people overall and then compared hospitalization rates for three population groups: AN/AI, White, and Other (which in this case included Black, Asian, Native Hawaiian/Pacific Islander, and Other as listed in the HFDR), because of observed differences between White and Other race categories.

Case definitions. For this study, cases were defined based on having any hospitalization with any listed diagnosis of one or more of the rheumatic diseases of interest at any time during the 4 years of the study period. Controls had at least one hospitalization during the study period without any listed diagnosis of rheumatic disease. The set of rheumatic diseases of interest and associated International Classification of Disease, 9th Revision (ICD)-9 and International Classification of Disease, 10th Revision (ICD-10) codes included the following: osteoarthritis (ICD-9 715.x; ICD10 M15-M19), gout (ICD-9 274.x; ICD-10 M10.x, M1A.x), RA (ICD-9 714.x; ICD-10 M05-M06), spondyloarthritis (ICD-9 720.x, 696.0, 099.3; ICD-10 M45, M46.0, M46.1, M46.8, M46.9, M02.1, M02.3, M02.8, M02.9, L40.5x), SLE or mixed connective tissue disease (MCTD) (ICD-9 710.0, 710.8, 710.9; ICD-10 M32, M35.1, M35.8, M35.9), systemic sclerosis (SSc) (ICD-9 710.1; ICD-10 M34, L94.0, L94.1), vasculitis (ICD-9

446.0, 446.2, 446.4, 446.5, 446.7, 447.6; ICD-10 D69.0, M30, M31), Sjögren syndrome (ICD-9 710.2; ICD-10 M35.0), and inflammatory myopathy (ICD-9 710.3, 710.4; ICD-10 M33, G72.4, G72.41, G72.49).

The primary diagnosis for each hospitalization encounter was specified in the HFDR database using ICD-9 or ICD-10 codes, as appropriate for the date of hospitalization. In addition, the HFDR included major diagnostic category, which categorizes diagnoses into 18 chapters. As earlier, the case definition included any listed diagnosis of rheumatic disease, but some of our analyses focused on hospitalizations with a primary diagnosis of rheumatic disease.

Statistical analysis. We identified people ever hospitalized with any listed diagnosis of rheumatic disease (primary or any alternate) during the study period (cases) and compared with individuals hospitalized during that time period with no listed rheumatic disease diagnosis on any admission (controls). Differences in estimates for characteristics of cases and controls were compared using χ^2 tests for categorical measures and *t* tests for comparison of statistics based on continuous measurements such as mean age (or Wilcoxon rank sum test where appropriate). Characteristics of interest for cases compared with controls included age, sex, mean number of hospitalizations, and major diagnostic category. Pregnancy-related hospitalizations were included when

Table 1. Characteristics of cases (ever hospitalized with some diagnosis of rheumatic disease between 2015 and 2018) and controls (hospitalized, but never with a diagnosis of rheumatic disease)

Characteristic	All cases	All controls	Non-AN/AI cases	Non-AN/AI controls	AN/AI cases	AN/AI controls
Number of patients	11,023	92,090	8250	64,642	2112	23,074
Age, y, mean	65.1	47.2	65.6	49.1	62.5	42.2
Age category[a]						
18-39 y	672 (6.1%)	41,092 (44.6%)	441 (5.3%)	26,457 (40.9%)	202 (9.6%)	12,597 (54.6%)
40-64 y	4226 (38.3%)	29,450 (32.0%)	3114 (37.7%)	21,281 (32.9%)	896 (42.4%)	6849 (29.7%)
65+ y	6125 (55.6%)	21,548 (23.4%)	4695 (56.9%)	16,904 (26.2%)	1014 (48.0%)	3628 (15.7%)
Sex[b]						
Female	5918 (53.7%)	57,405 (62.3%)	4223 (51.2%)	39,454 (61.0%)	1342 (63.5%)	15,128 (65.6%)
Male	5105 (46.3%)	34,683 (37.7%)	4027 (48.8%)	25,186 (39.0%)	770 (36.5%)	7946 (34.4%)
Mean number of hospitalizations of any type per person, 2015-2018	2.84	1.71	2.61	1.61	3.51	1.93
Major diagnostic category[c]						
Musculoskeletal system[d]	4532 (41.1%)	14,085 (15.3%)	3636 (44.1%)	10,966 (17.0%)	634 (30.0%)	2608 (11.3%)
Circulatory system	2603 (23.6%)	10,074 (10.9%)	1920 (23.3%)	7684 (11.9%)	503 (23.8%)	1857 (8.1%)
Infectious & parasitic diseases	1961 (17.8%)	7929 (8.6%)	1284 (15.6%)	5280 (8.2%)	518 (24.5%)	2216 (9.6%)
Respiratory system	1902 (17.2%)	7950 (8.6%)	1231 (14.9%)	5319 (8.2%)	504 (23.9%)	2118 (9.2%)
Digestive system	1887 (17.1%)	9571 (10.4%)	1276 (15.5%)	6459 (10.0%)	449 (21.3%)	2558 (11.1%)
Nervous system	1402 (12.7%)	6654 (7.2%)	1025 (12.4%)	4788 (7.4%)	278 (13.2%)	1487 (6.4%)
Kidney and urinary tract	1106 (10.0%)	3620 (3.9%)	761 (9.2%)	2507 (3.9%)	241 (11.4%)	888 (3.9%)
Endocrine and metabolic[e]	740 (6.7%)	3307 (3.6%)	524 (6.4%)	2445 (3.8%)	160 (7.6%)	673 (2.9%)

Abbreviation: AN/AI, Alaska Native/American Indian.
Note: All comparisons of AN/AI versus non-AN/AI cases were significant with $P < 0.01$.
[a]Age at first hospitalization if multiple hospitalizations.
[b]Sex missing for two controls, excluded.
[c]Totals do not sum to 100% because some cases had more than one hospitalization with different major diagnostic categories and are included in more than one category. Table includes eight most common major diagnostic categories, listed from most to least common among overall cases.
[d]Full title: Musculoskeletal System and Connective Tissue.
[e]Full title: Endocrine, Nutritional, and Metabolic Diseases and Disorders.

comparing cases with controls but were excluded for some analyses in which their inclusion was more likely to generate somewhat misleading estimates, as specified subsequently.

We calculated rates of the following: any hospitalization overall, any rheumatic disease hospitalization, specific rheumatic disease hospitalizations, and primary diagnosis of rheumatic disease hospitalization. These rates were calculated per 1000 person-years and were age adjusted to the 2000 standard US population (using 10-year age groups). Rates were calculated overall and by race (White, AN/AI, and Other). Pregnancy-related hospitalizations were excluded from hospitalization rate analysis. Time trends were not considered given the short time frame of the collected data (4 years). Age-adjusted rates were calculated by region of Alaska and race for any hospitalization and for any rheumatic disease hospitalization. We also constructed separate multivariate Poisson models to better understand risk factors for each type of rheumatic disease hospitalization, including in the models age group, sex, and race as predictor variables. Results are presented as rate ratios with associated 95% confidence intervals.

Finally, we compared the characteristics of hospitalization encounters (rather than hospitalized individuals) for cases and controls (overall and by race). Comparisons included length of stay (median, and categorical measure indicating less than or equal to 3 days vs. more than 3 days), discharge status (to home, in-hospital mortality, or other), and patient residence (urban or rural). We again used χ^2 test, *t* tests, and Wilcoxon rank sum tests as appropriate to compare estimates.

RESULTS

The characteristics of people hospitalized at least once with a rheumatic disease diagnosis during the study period (cases, n = 11,023) compared with those hospitalized during the same time period but never with any rheumatic disease diagnosis (controls, n = 92,090) are presented in Table 1. The table includes the characteristics of the overall study population (all cases and all controls), as well as a comparison between AN/AN and non-AN/AI cases. As shown in the table, cases were older than controls across all population groups, though AN/AI cases were slightly younger than non-AN/AI cases. Cases were more likely to be female across all subgroups, but this was more pronounced in the AN/AI population. Cases had more total hospitalizations for any cause than controls over the study period, and this difference was more pronounced among AN/AI people. The most common major diagnostic categories for all hospitalizations during the period differed between cases and controls, as well as between AN/AI people and non-AN/AI people.

Age-adjusted rates of any hospitalization for different conditions are presented in Table 2. Comparisons include rates of any hospitalization for any condition, with a rheumatic disease diagnosis at any time, and with a primary diagnosis of rheumatic disease. Within rheumatic disease hospitalizations, rates are presented for specific conditions. Rates are shown for the overall population and by race (including White, Other, and AN/AI categories for race). Overall, the three rheumatic diseases with the highest hospitalization rates were osteoarthritis, gout, and RA. Although these were the top three conditions and osteoarthritis was most commonly associated with hospitalization across all racial groups, in the AN/AI population, the hospitalization rates with RA were higher than gout. Figure 1 presents similar data to Table 2 but stratified by region of Alaska and by race. As demonstrated by Figure 1, age-adjusted rates of hospitalization for any condition and any hospitalization with any rheumatic disease at any time varied by race and region. For all regions except the Matanuska-Susitna region, overall hospitalization rates and rheumatic disease hospitalization rates were higher among AN/AI people compared with White people. The disparities in rheumatic disease

Table 2. Age-adjusted rate of any hospitalization per 1000 person-years by diagnosis and race

Type of hospitalization	Age-adjusted overall rate	Age-adjusted White rate	Age-adjusted AN/AI rate	Age-adjusted other race rate
Any hospitalization for any diagnosis	48.70	41.00	68.10	49.90
Any hospitalization with some rheumatic disease diagnosis	5.50	4.84	7.12	6.36
Osteoarthritis	3.29	3.06	4.07	2.98
Gout	1.49	1.31	0.97	3.06
Rheumatoid arthritis	0.86	0.60	2.11	0.71
SLE or MCTD	0.19	0.15	0.27	0.28
Spondyloarthritis	0.15	0.13	0.25	0.10
Myopathy	0.02	0.02	0.04	0.02
Vasculitis	0.07	0.07	0.12	0.09
Sjögren syndrome	0.08	0.06	0.18	0.03
Systemic sclerosis	0.04	0.03	0.10	0.03
Any rheumatic disease *primary* diagnosis hospitalization	0.83	0.85	0.61	0.70

Abbreviations: AN/AI, Alaska Native/American Indian; MCTD, mixed connective tissue disease; SLE, systemic lupus erythematosus.
Note: Age-adjusted to 2000 US standard population using 10-year age groups.

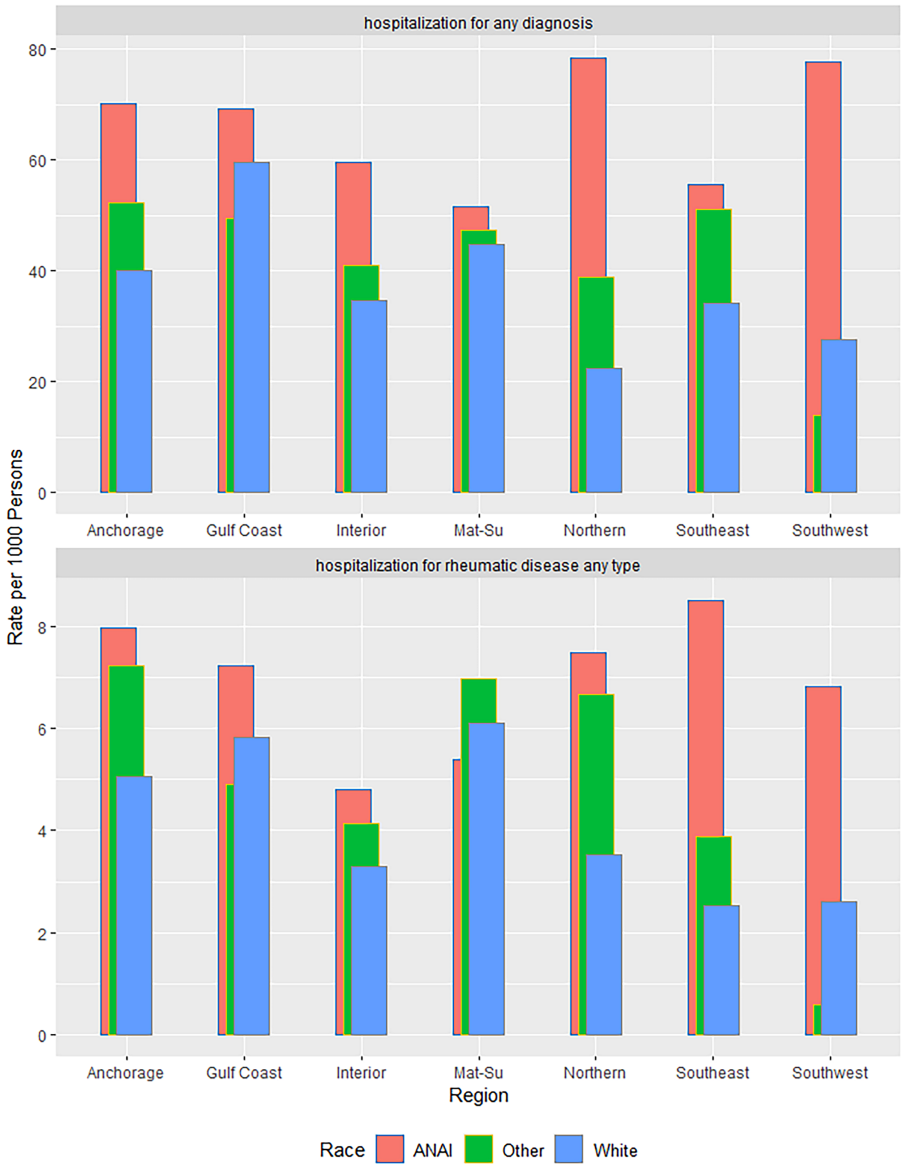

Figure 1. Age-adjusted rates of hospitalization per 1000 person-years by region of Alaska and race. The top panel shows hospitalization for any diagnosis by region and race. The bottom panel shows hospitalization for any rheumatic disease diagnosis by region and race. Regions are listed on the x-axis, using the State of Alaska Public Health Regions based on the Alaska Department of Labor and Workforce Development's Economic Regions. Race is categorized by color as follows: AN/AI (pink), Other (green), and White (blue). ANAI, Alaska Native/American Indian; Mat-Su: Matanuska-Susitna Region.

hospitalizations were most pronounced in Northern, Southeast, and Southwestern Alaska.

Multivariate models of risk factors for any hospitalization overall and for hospitalization with specific conditions are presented in Table 3. Increased age was associated with all types of hospitalization, with the strongest associations found for odds of hospitalization for osteoarthritis and gout in people over 65 years of age, compared with the reference group aged 18-39 years.

Female sex was most strongly associated with odds of hospitalization for SLE/MCTD and Sjögren syndrome. Notable differences between hospitalizations for AN/AI people compared with the White reference group were higher odds of hospitalization for RA, myopathy, and SSc (odds ratio greater than 3 for all), and lower odds of hospitalization for gout (odds ratio, 0.78; 95% confidence interval: 0.68-0.88). In contrast, persons of Other race had higher odds of hospitalization for gout than the White reference group (odds ratio, 2.59; 95% confidence interval: 2.36-2.83).

Characteristics of hospitalization encounters for cases and controls, overall and for non-AN/AI compared with AN/AI people, are presented in Table 4. The median length of stay was slightly longer for AN/AI cases compared with non-AN/AI cases, with a higher proportion (52.3% vs. 47.6%) having encounters with a length of stay greater than 3 days. In-hospital mortality occurred in 2.9% of encounters for cases overall and did not differ by race.

Table 3. Multivariate models of risk factors for any hospitalization by type of hospitalization

Outcomes	AI/AN race rate ratio vs. White (95% CI)	Other race rate ratio vs. White (95% CI)	Female sex rate ratio vs. male (95% CI)	Age group 40-64 rate ratio vs. 18-39 (95% CI)	Age group 65+ rate ratio vs. 18-39 (95% CI)
Any hospitalization for any diagnosis[a]	1.78 (1.75-1.81)	1.67 (1.64-1.70)	0.98 (0.96-0.99)	2.01 (1.97-2.05)	5.05 (4.95-5.15)
Hospitalization with no rheumatic disease diagnosis[a]	1.81 (1.78-1.85)	1.14 (1.11-1.17)	0.96 (0.94-0.97)	1.79 (1.75-1.82)	3.96 (3.88-4.05)
Any rheumatic disease hospitalization	1.45 (1.38-1.52)	1.30 (1.23-1.38)	1.17 (1.13-1.22)	6.31 (5.82-6.85)	26.81 (24.7-29.1)
Osteoarthritis hospitalization	1.24 (1.16-1.33)	0.94 (0.87-1.03)	1.39 (1.32-1.46)	11.12 (9.67-12.8)	50.76 (44.2-58.3)
Gout hospitalization	0.78 (0.68-0.88)	2.59 (2.36-2.83)	0.37 (0.34-0.41)	9.52 (7.78-11.7)	53.94 (44.2-65.8)
Rheumatoid arthritis hospitalization	3.45 (3.12-3.82)	1.12 (0.95-1.33)	2.75 (2.47-3.06)	4.27 (3.64-5.01)	13.27 (11.3-15.6)
SLE or MCTD hospitalization	1.70 (1.34-2.16)	1.71 (1.31-2.23)	7.71 (5.71-10.43)	1.73 (1.36-2.2)	3.49 (2.69-4.54)
Spondyloarthritis hospitalization	1.93 (1.50-2.48)	0.80 (0.54-1.20)	1.08 (0.87-1.35)	2.75 (2.05-3.68)	4.45 (3.22-6.15)
Myopathy hospitalization	3.41 (1.81-6.42)	1.88 (0.72-4.92)	1.09 (0.60-1.96)	1.66 (0.66-4.18)	8.32 (3.58-19.4)
Vasculitis hospitalization	1.82 (1.26-2.64)	1.56 (1.00-2.45)	1.04 (0.76-1.41)	2.07 (1.33-3.24)	8.22 (5.35-12.6)
Sjögren syndrome hospitalization	2.84 (2.02-3.98)	0.53 (0.24-1.14)	11.41 (6.16-21.13)	2.73 (1.64-4.56)	10.64 (6.49-17.5)
Systemic sclerosis hospitalization	3.42 (2.12-5.51)	1.15 (0.51-2.59)	3.71 (2.01-6.84)	2.16 (1.12-4.16)	5.49 (2.81-10.7)
Rheumatic disease primary diagnosis hospitalization	0.73 (0.63-0.84)	0.81 (0.69-0.95)	1.17 (1.06-1.28)	9.92 (7.84-12.60)	34.12 (27.0-43.1)

Abbreviations: AI/AN, Alaska Native/American Indian; CI, confidence interval; MCTD, mixed connective tissue disease; SLE, systemic lupus erythematosus.
Note: References for all models are as follows: age group 18-39 years, male sex, and White race; persons with unknown race excluded.
[a]Excludes persons with only pregnancy-related hospitalizations.

Discharge to home occurred in 83.7% overall, with a slightly higher proportion of AN/AI cases discharged to home (85.2% vs. 83.5%, $P < 0.01$). AN/AI people ever hospitalized with rheumatic diseases were more likely to reside in rural communities than non-AN/AI cases.

DISCUSSION

In this study of hospitalizations associated with a rheumatic disease diagnosis in Alaska, we found that people ever hospitalized with a rheumatic disease of any type were older and more likely to be female than people hospitalized during the same time frame but without any diagnosis of rheumatic disease. Hospitalization rates varied by race and region. Multivariate analyses indicated that the factors associated with hospitalization (and their magnitude), such as gender and race, differed depending on the specific rheumatic disease. Unsurprisingly, older patients had increased odds for hospitalization for all types of rheumatic disease. Overall, hospitalizations for people with any rheumatic disease diagnosis had a median length of stay of 3 days, resulted mostly in discharge to home, and were associated with approximately 3% risk of in-hospital mortality.

In other studies in the United States, hospitalizations for arthritis and other rheumatic conditions similarly were more likely in older people, especially for individuals aged 65 years and older (1). In addition, US studies have found that specific conditions, such as RA and diffuse connective tissue diseases (such as SLE and Sjögren syndrome), are more common in women, whereas gout is more common in men (1), both of which are consistent with our study findings. We found that the types of hospitalizations with the most significant increase with age (odds ratios over 20 in the age group 65 years and older relative to the youngest age group in multivariate analysis) included gout and osteoarthritis. The conditions associated with female sex included Sjögren syndrome, SLE or MCTD, SSc, RA, and osteoarthritis. Gout and myopathy diagnoses were more common in males, whereas there was little evidence of an association of sex with spondyloarthritis or vasculitis.

In addition to differences by age and sex, we found differences in the types of hospitalizations by race. The most common types of rheumatic disease associated with any hospitalization in our study included osteoarthritis, gout, and RA. Although osteoarthritis was the most common rheumatic disease overall and among the AN/AI population, RA was more commonly associated with hospitalization than gout in the AN/AI population, whereas gout was more common than RA in the non-AN/AI population. The prevalence of RA is known to be high in AN/AI people and other Indigenous North American populations (13), which is likely to contribute to the difference in ranking of rheumatic diseases when compared with the non-AN/AI population. In addition, in our study hospitalizations for gout were more likely in people of Other race (which included Black, Native Hawaiian/Pacific Islander, and Asian) than White race and less likely in AN/AI people relative to White persons. Both of these observations are

Table 4. Characteristics of hospitalization encounters for cases versus controls

	All cases	All controls	Non-AN/AI cases	Non-AN/AI controls	AN/AI cases	AN/AI controls
Number of encounters	16,914	176,567	12,819	121,346	3353	46,294
Median length of stay in days (IQR)	3 (2-7)	3 (2-6)	3 (2-7)	3 (2-6)	4 (2-7)	3 (2-5)
Length of stay in days						
≤3 d	8745 (51.7%)	103,236 (58.5%)	6715 (52.4%)	69,213 (57.0%)	1598 (47.7%)	28,050 (60.6%)
>3 d	8166 (48.3%)	73,284 (41.5%)	6101 (47.6%)	52,088 (42.9%)	1755 (52.3%)	18,242 (39.4%)
Discharge status, n (%)						
Home	14,161 (83.7)	150,357 (85.2)	10,705 (83.5)	104,105 (85.8)	2856 (85.2)	39,800 (86.0)
In-hospital mortality	487 (2.9)	4412 (2.5)	356 (2.8)	3313 (2.7)	111 (3.3)	899 (1.9)
Other	2239 (13.2)	19,990 (11.3)	1754 (13.7)	13,850 (11.4)	376 (11.2)	4995 (10.8)
Patient residence						
Urban	11,747 (69.5%)	113,475 (64.3%)	9585 (74.8%)	87,882 (72.4%)	1611 (48.0%)	20,674 (44.7%)
Rural	5146 (30.4%)	62,731 (35.5%)	3217 (25.1%)	33,205 (27.4%)	1739 (51.9%)	25,539 (55.2%)

Abbreviations: AN/AI, Alaska Native/American Indian; IQR, interquartile range.
Note: All *P* values for comparisons of AN/AI vs. non-AN/AI cases were significant at <0.01 except proportion of in-hospital death not significantly different ($P = 0.11$).

consistent with findings of other studies, which show high prevalence of gout and hyperuricemia in Black, Pacific Islander, New Zealand Maori, and Asian populations (13,17–19); low prevalence of gout in the few studies of Indigenous North American populations (13); and low rates of hospitalization for gout in Indigenous North American populations in Canada (12).

We noted disparities in hospitalization rates by both race and region of residence within Alaska. Although the hospitalization rates were higher for AN/AI compared with White populations in all regions but one, the disparities were more notable in a few regions of the state. There are several possible explanations for these findings. These include different prevalence of rheumatic disease in the AN/AI population in different regions of the state. Previous studies have found high rates of RA and SLE in Southeast Alaska (20), with high rates of spondyloarthritis in Northern and Southwestern Alaska (15). However, differences in hospitalization rates could also relate to community demographics or other characteristics or access to care (either primary care or specialty care).

The characteristics of hospitalizations in Alaska differed somewhat from other US studies with respect to length of stay and discharge status. In one study of national data in 2013, the mean length of stay for hospitalizations with arthritis and other rheumatic conditions was 4.9 days (1), whereas we found a median of 3 days for length of stay. Other studies using US National Inpatient Sample (NIS) data have been more consistent with our results, with a median length of stay of 3.4 days for any osteoarthritis hospitalization and 3.4 days for any gout hospitalization (10,21). The 2013 study did not present median length of stay, and the mean may be skewed toward longer length of stay because of outliers with long hospital stays. Length of stay was longer in the setting of serious infection associated with osteoarthritis and gout than it was for overall hospitalizations (10,21). Discharge to home was common in our study (83% overall, with 17% not discharged to home), whereas discharge to "Other than home" was observed in 44% of all hospitalizations with arthritis and other rheumatic conditions in the United States in 2013. In the studies of osteoarthritis and gout using the NIS data, discharge to home ranged from 65% to 76% depending on condition and presence or absence of serious infection (10,21). Of note, the population hospitalized in Alaska includes a much larger proportion of people residing in rural communities than general US population studies, so it is possible that there are fewer resources available for alternate discharge locations than exist in other parts of the United States. It is also possible that we captured a different spectrum of disease severity leading to lower likelihood of requiring additional support at discharge and shorter length of stay on average.

Our study has a few limitations. First, most analyses considered all rheumatic diseases together, whereas other US studies often focus on a specific rheumatic disease. However, when possible, we also included analyses of individual conditions (including our multivariable analyses) and determined risk factor associations for different conditions. Second, instead of a population-based cohort of people with established diagnoses of specific rheumatic diseases followed over time to determine hospitalization rates, we relied on data that included only inpatient encounters. Following a population-based cohort was not possible because we lacked ambulatory data. Although some other studies, such as those in Olmsted County, Minnesota, have been able to establish cohorts, others (such as those using the National Inpatient Survey) have relied on a similar design to ours. Third, given the deidentified data available, we were unable to access individual medical record data to validate diagnoses. However, we used diagnostic codes and followed standard methods comparable to national studies. It is possible, though unlikely, that if access to rheumatologists is limited in Alaska compared with other areas of the United States, more cases of rheumatic disease are either misdiagnosed or undiagnosed. Fourth, we did not

investigate comorbidities in detail. However, we do plan to investigate hospitalizations for cardiovascular disease and infectious disease among people with rheumatic disease in our future research. Finally, it is likely that a large proportion of hospitalizations for osteoarthritis were for joint replacement. We plan to examine total knee and total hip arthroplasty rates and comparisons in future analyses as well.

In summary, hospitalizations associated with rheumatic disease are common in Alaska, as they are in other studies in the United States. These hospitalizations are more common in older people. Associations with gender and race vary by the specific rheumatic disease of interest. With the exception of gout, AN/AI people were more likely than White people to be hospitalized for the rheumatic diseases investigated. Future research will continue to examine specific causes of hospitalizations and joint replacement rates and health disparities in the population.

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All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Holck had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. Ferucci, Holck.
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