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BRIEF REPORT

The Problem of Pain in Rheumatology: Clinical Profiles Associated With Concomitant Diagnoses With Chronic Overlapping Pain Conditions

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Objective. The chronification of pain is heterogeneous in rheumatology. Chronic overlapping pain conditions (COPCs) such as fibromyalgia, endometriosis, migraine, and back pain may co-occur with one another and in rheumatic diseases. We describe the sociodemographic and clinical profiles associated with concomitant COPCs among patients with rheumatic diseases.

Methods. We retrospectively identified patients visiting rheumatology clinics at a single institution from 2010 to 2020 for five common rheumatic conditions: psoriatic arthritis (PsA), rheumatoid arthritis (RA), Sjögren syndrome (SjS), systemic lupus erythematosus (SLE), and systemic sclerosis (SSc). We compared sociodemographic, clinical, and lifestyle factors by rheumatic condition and by COPC status. We also report sex-stratified diagnosis of COPCs. The primary outcome was diagnostic validation of one or more COPCs.

Results. We identified 5992 rheumatology patients: 846 with PsA, 2605 with RA, 956 with SjS, 975 with SLE, and 610 with SSc. Approximately 36–62% of patients had a concomitant COPC diagnosis. Patients with SjS had the highest prevalence (62%). Diagnosis of one or more COPCs was highest among Black patients and lowest among Asian patients. Patients using public insurance had a higher prevalence of one or more COPCs compared with those with private insurance. Patients with one or more COPCs had more depression and anxiety and more frequent emergency department visits, surgeries, and hospitalizations.

Conclusion. Our findings suggest that COPCs are strikingly common among patients with rheumatic disease and are associated with lower quality of life and greater health care needs. Future research may elucidate drivers of chronic pain and how to best address the unique analgesic needs of this multimorbid population.

INTRODUCTION

Autoimmune rheumatic diseases, such as systemic lupus erythematosus (SLE), rheumatoid arthritis (RA), and systemic sclerosis (SSc), confer multiple challenges on those living with these conditions. Apart from intermittent disease flares and irreversible organ-specific damage, patients often suffer from pain, which may take myriad forms, including arthritis, headache, abdominal pain, pleuritis, Raynaud phenomenon, and comorbid fibromyalgia (FM). Individuals with rheumatic diseases often suffer iatrogenic complications from suboptimal pain management, including higher rates of opioid misuse, hospitalizations, and opioid-related mortality compared with the general population (1–4). Pain must be dually addressed in concert with treating the underlying inflammation that characterizes rheumatic diseases (5).

Although the mechanisms of chronification of pain in autoimmunity are not entirely understood, autoantibodies may act as conduits in modulating the function of nociceptive neurons, thus inducing persistent pain (6). Recently, pain researchers identified

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several chronic pain conditions that appear to co-occur in the same individuals. These conditions share a common mechanism and are more prevalent in females, much like several chronic autoimmune rheumatic diseases (7–9). These conditions are known as chronic overlapping pain conditions (COPCs) and include temporomandibular disorder (TMD), FM, irritable bowel syndrome (IBS), vulvodynia, myalgic encephalomyelitis/chronic fatigue syndrome (CFS), urologic chronic pelvic pain syndrome (UCPPS), endometriosis, chronic tension-type headache (CTTH), migraine, and chronic low back pain (CLBP). The presence of these COPCs is associated with worse physical, psychological, and social functioning and higher health care use (9). The concomitant presence of COPCs in rheumatic diseases leads to higher disease activity scores compared with patients without COPCs (10), often complicating the choice of immunosuppressive therapies. Knowledge of the burden of COPCs in rheumatic diseases may lead to more effective management of chronic pain, lead to improvements in patients' quality of life and functioning, and potentially reduce morbidity and mortality.

Thus, the aim of this study, the first of a series, was to cross-sectionally estimate the burden of nonrheumatic COPCs among patients with five of the most common autoimmune rheumatic diseases (psoriatic arthritis [PsA], RA, Sjögren syndrome [SjS], SLE, and SSc). We also describe the sociodemographic characteristics and clinical profiles associated with concomitant diagnoses with COPCs in patients with these rheumatic diseases.

MATERIALS AND METHODS

Study sample. The Institutional Review Board approved this study at the Stanford School of Medicine (IRB# 53750). We retrospectively queried electronic health records (EHRs) to identify patients ages 18 years and older visiting any outpatient rheumatology clinic (including a joint immunology-dermatology clinic) at a single academic medical center in Northern California between 2010 and 2020. Further, we identified patients with two or more diagnoses at least 3 months apart with the following rheumatic diseases based on International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes (Supplementary Table 1): PsA, RA, SjS, SLE, and SSc.

Measures. The primary outcome was diagnosis with at least one COPC (ie, FM, IBS, UCPPS, vulvodynia, migraine, CTTH, TMD, CLBP, CFS, or endometriosis) based on ICD codes listed in Supplementary Table 1 (8). To reduce misclassification and scenarios in which two or more of the same codes are entered at the same visit, we conducted sensitivity analyses using a stricter definition requiring two or more diagnoses at least 30 days apart for each COPC. We characterized sociodemographic and lifestyle variables, including age at first recorded diagnosis with a rheumatic disease, sex, insurance status, marital status, average body mass index (BMI), and current smoking status. We extracted data for outpatient clinics (including pain clinic), hospitalizations and surgeries, and emergency department (ED) occurring during the 11-year span of observation. We also included ICD codes for common mental health diagnoses, including depression, anxiety, mood disorders, alcohol use disorders, substance use disorders, and psychosis (Supplementary Table 1).

Data analysis. We examined the baseline distribution of patients with each of the five rheumatic conditions (PsA, RA, SjS, SLE, and SSc) by sociodemographic and lifestyle variables and health services use. We also described the sex-stratified diagnosis of COPCs in patients with rheumatic diseases. Stratifying by COPC diagnosis, we conducted bivariate comparisons of sociodemographic and lifestyle features and health use.

RESULTS

Diagnoses of COPCs among patients with rheumatic diseases by sex. During the study period, 846 patients with PsA, 2605 patients with RA, 956 patients with SjS, 975 patients with SLE, and 610 patients with SSc were seen in the rheumatology clinics (Supplementary Table 2). As expected, we found that the diagnosis of each COPC was higher among females (Table 1). Concomitant diagnosis of FM varied by sex and rheumatic disease, with 3% documented in male patients with SLE but 15% in female patients with PsA. Overall, the diagnosis of FM ranged from approximately twice as high in females compared with males among patients with SSc and SjS to roughly eight times as high in RA. The diagnosis of IBS ranged between 7% in SLE and 16% in SSc. IBS was also more common in females, and the male-to-female ratio ranged between 1.4 in SSc and approximately 5 in SjS. The diagnosis of UCPPS did not appear to vary by sex and hovered around 1% to 2% across rheumatic diseases. Between 11% and 20% of patients with rheumatic diseases also have migraine diagnoses and the diagnosis was higher among women. More than a fifth of females with PsA, SjS, and SLE also had concomitant migraine diagnoses compared with 6% to 7% of males. The diagnosis of CTTH ranged between 2% and 3%. There were no apparent differences in the diagnosis of CTTH by sex. CLBP was the most common COPC and ranged between 13% in SSc and 40% in RA and SjS. Although the diagnosis of CLBP was much higher among female patients with SSc, there appeared to be no differences by sex in RA. However, the diagnosis of CLBP was higher in males with PsA (35% vs. 25% in females). The diagnosis of CFS ranged from 4% in SSc to 12% in SLE and SjS. The male-to-female ratio hovered between 1.5 and 2. The diagnosis of endometriosis ranged between 2% and 4% of females. The diagnosis of vulvodynia and TMDs ranged between 0.2% and 1%.

Table 1. Sex-stratified concomitant diagnoses of chronic overlapping pain conditions among patients with rheumatic diseases managed at an academic medical center, 2010-2020

	FM	IBS	UCPPS	Vulvodynia	Migraine	CTTH	TMD	CLBP	CFS	Endometriosis
PsA										
Total (N = 846)	79 (9.3)	64 (7.6)	15 (1.6)	<10	119 (14.1)	15 (1.8)	<10	254 (30.0)	38 (4.5)	19 (2.3)
Female (n = 466)	69 (14.8)	46 (9.9)	<10	<10	96 (20.6)	12 (2.6)	<10	93 (24.5)	29 (6.2)	19 (4.1)
Male (n = 380)	10 (2.6)	18 (4.7)	<10	<10	23 (6.1)	<10	<10	161 (34.6)	<10	0
RA										
Total (N = 2605)	279 (10.7)	201 (7.7)	36 (1.4)	10 (0.4)	335 (12.9)	64 (2.5)	<10	1028 (39.5)	231 (8.9)	55 (2.1)
Female (n = 2033)	269 (13.2)	172 (8.5)	29 (1.4)	10 (0.5)	295 (14.5)	57 (2.8)	<10	816 (40.1)	201 (9.9)	54 (2.7)
Male (n = 572)	10 (1.75)	29 (5.1)	<10	0	40 (7.0)	<10	<10	212 (37.1)	30 (5.2)	<10
SjS										
Total (N = 956)	139 (14.5)	119 (12.5)	15 (1.6)	<10	187 (19.6)	28 (2.9)	<10	380 (39.8)	113 (11.8)	36 (3.8)
Female (n = 886)	134 (15.1)	117 (13.2)	14 (1.6)	<10	182 (20.5)	23 (2.6)	<10	356 (40.2)	107 (12.1)	36 (4.1)
Male (n = 70)	<10	<10	<10	0	<10	<10	<10	24 (34.3)	<10	0
SLE										
Total (N = 975)	117 (12.0)	63 (6.5)	10 (1.0)	<10	192 (19.7)	30 (3.1)	2 (0.2)	265 (27.2)	112 (11.5)	22 (2.3)
Female (n = 882)	117 (13.3)	62 (7.0)	10 (1.1)	<10	185 (21.0)	27 (3.1)	2 (0.2)	245 (27.8)	104 (11.8)	22 (2.5)
Male (n = 93)	0	<10	0	0	<10	<10	0	20 (21.5)	<10	0
SSc										
Total (N = 610)	41 (6.7)	100 (16.4)	<10	<10	65 (10.7)	12 (2.0)	<10	80 (13.1)	23 (3.8)	11 (1.8)
Female (n = 543)	39 (7.2)	92 (16.9)	<10	<10	60 (11.1)	12 (2.2)	<10	78 (14.4)	22 (4.1)	11 (2.0)
Male (n = 67)	<10	<10	0	0	<10	0	0	<10	<10	0

Note: Prevalence is defined as the proportion of patients with rheumatic disease who have at least one diagnosis code with each chronic overlapping pain condition. For example, 69 out of 466 (or 14.8%) of females with PsA were diagnosed with FM.
Abbreviations: CFS, chronic fatigue syndrome; CLBP, chronic low back pain; CTTH, chronic tension-type headache; FM, fibromyalgia; IBS, irritable bowel syndrome; PsA, psoriatic arthritis; RA, rheumatoid arthritis; SjS, Sjögren syndrome; SLE, systemic lupus erythematosus; SSc, systemic sclerosis; TMD, temporomandibular disorder; UCPPS, urologic chronic pelvic pain syndrome.

Table 2. Concomitant diagnoses of chronic overlapping pain conditions by demographic factors among patients with rheumatic diseases at an academic medical center, 2010-2020

	PsA	RA	SjS	SLE	SSc
Sex					
Female	251/466 (53.9)	1161/2033 (57.1)	556/886 (62.8)	467/882 (53.0)	204/543 (37.6)
Male	125/380 (32.9)	268/572 (46.9)	36/70 (51.4)	32/93 (34.4)	14/67 (20.9)
Race					
Asian, PI	41/109 (37.6)	162/369 (43.9)	99/203 (48.8)	86/242 (35.5)	25/96 (26.0)
Black	<10	43/65 (66.2)	11/18 (61.1)	33/51 (64.7)	11/21 (52.4)
Other	48/141 (34.0)	204/400 (51.0)	77/135 (57.0)	98/184 (53.3)	40/128 (31.3)
White	282/590 (47.8)	1020/1771 (57.6)	405/600 (67.5)	282/498 (56.6)	142/365 (38.9)
Ethnicity					
Hispanic/Latino	34/80 (42.5)	161/270 (59.6)	61/99 (61.6)	91/194 (46.9)	37/92 (40.2)
Non-Hispanic	318/703 (45.2)	1175/2145 (54.8)	498/795 (62.6)	383/730 (52.5)	178/501 (35.5)
Unknown	24/63 (38.1)	93/190 (49.0)	33/62 (53.2)	25/51 (49.0)	3/17 (17.7)
Insurance					
Other	28/72 (38.9)	117/218 (53.7)	50/80 (62.5)	37/81 (45.7)	13/47 (27.7)
Private	192/467 (41.1)	555/1121 (49.5)	276/473 (58.4)	255/549 (46.5)	78/268 (29.1)
Public	156/307 (50.8)	757/1266 (59.8)	266/403 (66.0)	207/345 (60.0)	127/295 (43.1)
Marital status					
Divorced/separated	26/42 (61.9)	104/178 (58.4)	46/68 (67.7)	35/46 (76.1)	24/50 (48.0)
Married/life partner	236/549 (43.0)	936/1721 (54.4)	414/663 (62.4)	282/497 (56.7)	139/392 (35.5)
Other	<10	<10	<10	<10	<10
Single	93/217 (42.9)	209/413 (50.6)	94/158 (59.5)	152/378 (40.2)	41/129 (31.8)
Widowed	15/27 (55.6)	171/274 (62.4)	37/64 (57.8)	27/43 (62.8)	12/30 (40.0)
Smoking					
Current smoker	17/41 (41.5)	37/74 (50.0)	12/16 (75.0)	15/21 (71.4)	<10
Former smoker	99/201 (49.3)	407/678 (60.0)	144/222 (64.9)	104/166 (62.7)	70/171 (40.9)
Never smoker	258/592 (43.6)	970/1823 (53.2)	432/709 (60.9)	378/765 (49.4)	146/420 (34.8)
Unknown	<10	15/30 (50.0)	<10	<10	0/8 (0)

Note: Prevalence is defined as the proportion of patients with rheumatic disease who have ≥1 diagnosis with any chronic overlapping pain condition. For example, 251 out of 466 female patients with PsA (53.9%) had diagnosis of at least one chronic overlapping pain condition.
Abbreviations: PI, Pacific Islander; PsA, psoriatic arthritis; RA, rheumatoid arthritis; SjS, Sjögren syndrome; SLE, systemic lupus erythematosus; SSc, systemic sclerosis.

Table 3. Concomitant diagnosis of chronic overlapping pain conditions by age, mental health diagnosis, and health use among patients with rheumatic diseases at an academic medical center, 2010-2020

	PsA		RA		SjS		SLE		SSc	
	≥1 COPC (n = 376)	No COPC (n = 470)	≥1 COPC (n = 1429)	No COPC (n = 1176)	≥1 COPC (n = 592)	No COPC (n = 364)	≥1 COPC (n = 499)	No COPC (n = 476)	≥1 COPC (n = 218)	No COPC (n = 392)
Age, y, mean (SD)	53.9 (15.0)	50.1 (17.0)	59.1 (16.5)	55.3 (18.2)	56.2 (15.3)	54.8 (15.6)	44.8 (19.3)	36.4 (20.4)	55.4 (15.1)	53.7 (15.6)
BMI, kg/m^2, mean (SD)	29.1 (7.0)	28.5 (7.3)	28.0 (7.3)	26.0 (7.4)	26.5 (6.4)	24.4 (6.9)	25.9 (8.5)	20.4 (11.6)	24.1 (5.2)	24.2 (5.3)
Pain clinic visit, n (%)	84 (22.3)	29 (6.2)	251 (17.6)	47 (4.0)	128 (21.6)	14 (3.9)	117 (23.5)	16 (3.4)	63 (28.9)	29 (7.4)
Depression, n (%)	132 (35.1)	74 (15.7)	433 (30.2)	131 (11.1)	186 (31.4)	43 (11.8)	178 (35.7)	64 (13.5)	90 (41.3)	51 (13.0)
Anxiety, n (%)	140 (37.2)	79 (16.8)	453 (31.7)	142 (12.1)	206 (34.8)	50 (13.7)	186 (37.3)	78 (16.4)	80 (36.7)	51 (13.0)
Mood disorders, n (%)	30 (8.0)	15 (3.2)	106 (7.4)	29 (2.5)	44 (7.4)	15 (4.1)	48 (9.6)	14 (2.9)	17 (7.8)	<10
Alcohol use disorders, n (%)	16 (4.3)	15 (3.2)	56 (3.9)	23 (2.0)	18 (3.0)	<10	10 (2.0)	<10	16 (7.3)	<10
Substance use disorders, n (%)	48 (12.8)	31 (6.6)	160 (11.2)	63 (5.4)	43 (7.3)	11 (3.0)	62 (12.4)	26 (5.5)	26 (11.9)	12 (3.1)
Psychosis, n (%)	<10	<10	24 (1.7)	<10	<10	0	12 (2.4)	<10	<10	<10
No. of ED visits, mean (SD)	1.9 (4.0)	0.5 (1.5)	1.6 (4.6)	0.5 (1.6)	1.2 (2.7)	0.4 (1.4)	2.5 (6.5	0.8 (2.1	2.7 (5.5)	0.7 (2.6)
No. of surgeries, mean (SD)	3.2 (4.5)	1.2 (2.4)	3.7 (5.6)	1.7 (3.1)	3.8 (5.3)	2.0 (3.6)	3.7 (5.2)	2.2 (3.1)	5.9 (6.0)	2.8 (3.6)
No. of hospitalizations, mean (SD)	3.7 (6.0)	1.7 (3.9)	3.3 (5.7)	1.7 (3.9)	2.9 (4.6)	1.5 (3.0)	3.4 (5.1)	1.5 (2.9)	7.1 (6.4)	2.8 (4.1)

Abbreviations: BMI, body mass index; COPC, chronic overlapping pain condition; ED, emergency department; PsA, psoriatic arthritis; RA, rheumatoid arthritis; SjS, Sjögren syndrome; SLE, systemic lupus erythematosus; SSc, systemic sclerosis.

Diagnosis of COPCs by demographic factors among patients with rheumatic diseases. The burden of COPCs varied by sociodemographic factors and by rheumatic disease (Table 2). Black patients with rheumatic diseases had the highest prevalence of one or more COPCs, ranging from 52% in SSc to 66% in RA, whereas Asian patients had the lowest prevalence of one or more COPCs, ranging from 26% in SSc to 49% in SjS. Hispanic patients had a higher prevalence of one or more COPCs in RA and SjS and a lower prevalence of COPCs in other rheumatic diseases. Patients using public insurance had the highest prevalence of one or more COPCs compared with those with private insurance. For example, 66% of publicly insured patients with SjS had one or more COPC diagnoses compared with 58% of privately insured patients. Divorced/separated patients had the highest prevalence of one or more COPC diagnoses across rheumatic diseases. Patients who were former smokers also had the highest prevalence of one or more COPC diagnoses.

Diagnosis of COPCs by age, mental health diagnosis, and health use among patients with rheumatic diseases. Patients with one or more COPCs were older at the first visit captured in our cohort with rheumatic diseases and had higher current BMI compared with those without COPCs (Table 3). Receipt of care from a specialty pain clinic was higher among those with one or more COPCs. Specifically, receipt of specialty pain clinic care ranged between 18% in RA and 29% in SSc. Regarding mental health conditions, the prevalence of depression and anxiety diagnoses were higher among patients with one or more COPCs. Among those with one or more COPCs, the prevalence of depression ranged from 30% in RA to 41% in SSc. The prevalence ratio between those with one or more COPCs compared with those without COPCs for depression ranged 2 to 4. These findings were consistent for anxiety and mood disorders. We also found a much higher prevalence of diagnosed alcohol use disorder, substance use disorders, and psychosis among those one or more COPC diagnoses. For example, patients with one or more COPCs in SSc were four times as likely to have a concomitant diagnosis of substance use disorder than those without COPCs (12% vs. 3%, respectively). Overall, patients with one or more COPCs also had higher BMI, and more frequent ED visits, surgeries, and hospitalizations. For example, the average number of ED visits among those with one or more COPCs was two to three times the average of those without COPCs. The average number of surgeries and hospitalizations was twice as high in those with one or more COPCs.

Sensitivity analysis. As expected, when we used stricter case definitions (≥2 diagnoses at least 30 days apart for each COPC), the prevalence of COPCs was lower than in the initial analysis. The overall prevalence of CLBP reduced to 18% from 30% in PsA and reduced to 15% from 27% in SLE (Supplementary Table 3). The prevalence of COPCs remained higher among female patients, Black patients, publicly insured, and divorced/separated patients (Supplementary Tables 4 and 5). The prevalence of mental health diagnoses was also reduced, but the patterns in differences by COPC status were similar: higher prevalence of mental health diagnoses among those with one or more COPCs. Overall, we found higher health care use metrics in the sensitivity analyses. On average, we found higher number of ED visits, surgeries, and hospitalization, suggesting that the sensitivity analyses appear to have identified those in poorest health.

DISCUSSION

We estimated the burden of COPCs in common rheumatic diseases. Here, we highlight salient findings and identify areas for future work. First, we found that more than half of patients with RA, SjS, and SLE had a concomitant diagnosis of a COPC. Patients with SjS had the highest prevalence of COPCs (62%). About 44% of patients with PsA and 36% of patients with SSc also had a COPC diagnosis. We found no studies in the general population; thus, we were unable to compare our findings with other studies. However, there is one study of COPCs within the cancer disease state: a preprint. Marriott and Smith found that the prevalence of one or more COPCs in newly diagnosed patients with cancer was 19%, and also that CLBP had the highest prevalence, followed by migraine (11). We can, however, make comparisons with studies involving individual COPCs. In the general population of the United States, the most prevalent COPCs are IBS (approximately 44 million adults; 18%), TMD (35 million adults; 14%), and CLBP (20 million; 8%) (12). In our study, CLBP had the highest prevalence (13%-40%), followed by migraine (11%-20%) and FM (7%-15%). The Marriott and Smith preprint also found that CLBP had the highest prevalence, followed by migraine (11). This finding was consistent across rheumatic diseases, by sex, and in stricter case definitions. Our findings are also consistent with the levels of concomitant diagnosis of CLBP, migraine, and FM in autoimmune rheumatic diseases found in other studies (13–16). In SjS, we also found a significant burden for endometriosis and vulvodynia compared with other rheumatic conditions. A recent study reported that concomitant autoimmunity may be a risk factor for severe/late-stage endometriosis (17). More studies are needed to outline the interplay between pain progression and autoimmunity, as well as associations and potential causal relationships. The manner in which COPCs were identified in this study was different from previously published studies. In some other studies, the diagnosis is dependent on self-report or body map. Herein, we identified COPCs based on ICD diagnoses.

Second, we found stark health disparities in the burden of COPCs among patients with rheumatic diseases. In particular, the correlates of COPCs in this sample included female sex, older age, higher BMI, public insurance, and divorce/widowhood.

These findings align with our current understanding of the epidemiological profile of patients with the most pain interference (ie, pain that interferes with work, life, and social activities) and their referral to pain clinics (18). Based on the 2016 National Health Interview Survey, although one in five adults in the United States general population reported having chronic pain (pain on most days or every day in the past 6 months), less than half reported that this pain interfered with their work/life activities, i.e., high-impact chronic pain (18). The study found that individuals with high-impact chronic pain were more likely to be women, Black, and have public insurance, similar to the sociodemographic profiles of patients dually diagnosed with COPCs in our study. These findings suggest a need for earlier identification and intervention in this vulnerable population—in particular, a need to understand drivers of chronic pain in different subpopulations and how to best address the unique needs of this population who have multimorbidity with episodic and chronic pain.

Third, we found that patients with rheumatic disease with concomitant COPCs had more than twice the prevalence of mental health and substance/alcohol use disorders compared with patients without COPCs. In addition, patients with COPCs also had a higher number of ED visits and hospitalizations. Specifically, it appears that individuals with COPCs had complex and/or more debilitating clinical and mental health profiles and treatment needs. These findings are consistent with previous studies suggesting that individuals with multimorbidity are more vulnerable, have lower quality of life, and use health care resources more frequently than patients without multimorbidity (19,20). However, we found that only 18% to 29% of these patients received specialty pain clinic care. Many multidisciplinary pain clinics are structured to address the whole-person treatment needs of patients, including psychosocial education and active pain self-management skills. In addition, rheumatologists should be well-versed on how to better treatment-stratify patients, perhaps using a stepped-care model (21). This model would initially include a way to characterize the patient's needs by differentiating disease activity from COPCs, followed by the prescription of more effective nonpharmacological therapies and discerning when to refer patients to multidisciplinary pain clinics. For example, a less complex patient might be prescribed simple nonpharmacologic approaches by the rheumatologist or other specialists. Only when the severity and impact of the condition warrants referral to a multidisciplinary pain clinic would that action be taken. Future research may focus on elucidating the needs of patients with rheumatic diseases, optimal timing of intervention, current availability of specialty pain care that includes whole-person treatment options, and new avenues to transcend current barriers that perpetuate pain care disparities broadly.

Our study has several limitations. Using ICD codes to identify patients may lead to some misclassification; however, we required multiple visits within a specific time to reduce potential false positives. The complexity challenges of using ICD codes and other structured data for identifying cases are myriad, and one way to overcome these biases is to include unstructured data (or clinic notes) in developing computational phenotyping algorithms (22,23). We found that the prevalence of individual COPCs in our study is lower than other recently published studies. For example, a recent meta-analysis estimated that the pooled prevalence of FM was 18% to 24% in RA and 18% in PsA (10) compared with the 9% to 11% prevalence of FM in these conditions found in our study. We are unable to explain why the prevalence of FM was lower in our study. However, 7 out of 27 studies in the meta-analysis had a prevalence that was approximately the same as we found in our study (10). In addition, Schrepf et al found that the true positive rate for using ICD-10 code for FM was 95%, giving us confidence in the use of this code (8). In addition, we found that the prevalence of migraines, CTTH, and CLBP in our study were comparable to those found in other studies (24,25).

In addition, ICD coding for SjS may have included both those with primary and secondary SjS rather than only those with the primary form of this condition. Furthermore, patients may have received care outside of the single center studied, which could underestimate health care use if care was received elsewhere. We also did not require specific specialties (eg, neurology, gastroenterology, psychiatry, etc) to record the codes for COPCs, psychiatric conditions, and substance use because we wanted to capture the true burden of these conditions regardless of where the diagnoses were made. This may lead to an overestimation of the burden of these conditions. We acknowledge that some PsA diagnostic criteria require a diagnosis of sacroiliitis or spondylitis (26), which may lead to overestimation of prevalence of CLBP and could artificially inflate the numbers. The cross-sectional nature of some of the data elements, such as insurance status and cigarette smoking, means that we cannot infer temporality. The current study does not include patient-reported data, and future research should include these data to better capture the current patient experience, behaviors, and treatment needs and wants.

Our study has several strengths. We leveraged EHRs from rheumatology clinics across five common rheumatologic conditions. Our findings suggest that COPCs are strikingly common among patients with rheumatic disease and are associated with lower quality of life and greater health care needs. Future research may elucidate drivers of chronic pain and how to best address the unique analgesic needs of this multimorbid population.

AUTHOR CONTRIBUTIONS

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

Study conception and design. Falasinnu, Chaichian, Darnall, Mackey.

Acquisition of data. Falasinnu.
Analysis and interpretation of data. Falasinnu, Nguyen, Jiang, Rector, Simard.

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