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Coping with Prescription Medication Costs: a Cross-sectional Look at Strategies Used and Associations with the Physical and Psychosocial Health of Individuals with Arthritis

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Abstract

Background—Prescription medication costs increase financial burden, often leading individuals to engage in intentional nonadherence. Little is known about what specific medication cost-coping strategies individuals with arthritis employ.

Purpose—The purposes of this study are (1) to identify characteristics of individuals with arthritis who self-report prescription medication cost-coping strategies and (2) to examine the association between medication cost-coping strategies and health status.

Methods—Seven hundred twenty-nine people self-reporting arthritis and prescription medication use completed a telephone survey. Adjusted regression models examined medication cost-coping strategies and five health status outcomes.

Results—Participants reported engaging in cost-coping strategies due to medication costs. Those borrowing money had worse psychosocial health and greater disability; those with increasing credit card debt reported worse physical functioning, self-rated health, and greater helplessness. Medication underuse was associated with worse psychosocial health, greater disability, and depressive symptoms.

Conclusion—Individuals with arthritis use multiple strategies to cope with medication costs, and these strategies are associated with adverse physical and psychosocial health status.

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Keywords

Medication cost; Medication underuse; Coping strategies; Health status outcomes; Arthritis

Introduction

Current prevalence estimates suggest that nearly 50 million American adults self-report some form of doctor-diagnosed arthritis, and these numbers are projected to only increase in the future [1]. Arthritis is not only responsible for lower self-reported quality of life, increased activity limitation, and greater disability in the USA [1–4], arthritis also contributes to increasingly high direct and indirect medical-related costs [5, 6]. At a national level, total aggregate medical expenditures (i.e., inpatient, ambulatory, prescription medications, home health, emergency room visits) for individuals with arthritis and other rheumatic conditions (e.g., osteoarthritis, rheumatoid arthritis, lupus, fibromyalgia) totaled 353 billion US dollars in 2005—up from 252 billion US dollars in 1997 [7], and it is estimated that earning losses attributable to arthritis and other rheumatic conditions were 47 billion US dollars in 2003 [5].

At an individual level, high financial costs of medical care, including prescription medication costs, may present an additional challenge for adults with arthritis. A national probability sample of older (70+) US community-dwelling adults found that those with arthritis, rheumatism, or joint replacement used more health care services, had greater health care costs, and higher total out-of-pocket costs, which was due in part to those with arthritis more often paying for prescription drugs not completely covered by health insurance, when compared to those not reporting arthritis, rheumatism, or joint replacement [8]. Though general population estimates vary, it has been suggested that between 20 and 30 % of adults in the USA take medications for any form of arthritis (e.g., osteoarthritis, rheumatoid arthritis, lupus, fibromyalgia) [9, 10]. A greater number of individuals aged 65+ are taking one or more medications (i.e., prescription medications, over the counter drugs, vitamins, or herbal supplements) to manage their health [11], and out-of-pocket expenses for prescription medicines have considerably increased in this age group [12]. Given that arthritis is often comorbid with other conditions that require prescription medications for disease management (e.g., diabetes and cardiovascular disease), it stands to reason that the number of prescription medications being filled has increased, as is the mean prescription medication expenditures per person among adults with arthritis, and among adults with arthritis and 1 + comorbid conditions [7].

Individuals with arthritis and other chronic conditions (e.g., heart disease, diabetes) and/or who are older may be at greater risk for medication underuse either because they are either underinsured, despite having medical insurance coverage (e.g., Medicare), or without prescription medication insurance coverage entirely [9, 13]. With many Americans experiencing rising out-of-pocket health care costs [14], individuals must make decisions about the relative importance of their medical care in relation to their general survival, as well as decide if and how they will modify their lifestyles or spending habits in order to afford the medical care and prescription medications required for good health. A great deal of popular media focuses attention on the growing concern of high-cost prescription drugs with articles that go beyond national statistics and trends to highlight the personal stories of individuals who struggle to afford needed medical care [15–17]. Indeed, to cope with the financial burdens associated with prescription medication costs, individuals may intentionally become nonadherent by choosing not to take medication as prescribed [18, 19]. Individuals may also self-modulate and take less medication than prescribed (i.e., medication underuse), or make choices about how they use their available money and credit to purchase goods and services so that they can afford their prescription medications (i.e., medication cost-coping strategies) [20].

Cost-related medication nonadherence has been researched in the chronic disease (e.g., cardiovascular, diabetes) [21, 22] and aging literature [9]. In addition, several studies have examined cost-related prescription medication underuse in the general population [16] and in subgroup analyses of various chronic conditions, including arthritis [9, 10, 23, 24]. These studies suggest that cost-related medication nonadherence is a growing public health problem, especially given that it has been associated with greater number of hospitalizations, worse self-reported health, and poorer physical and mental health outcomes [9, 24–28]. In addition, a recent systematic review has demonstrated that medication nonadherence among individuals with various rheumatic conditions is a problem worthy of continued attention [29]. While prior research examining compliance with medications among individuals with rheumatic conditions has identified cost and out-of-pocket expenses as a key factor in treatment adherence [30, 31], it appears that no study has yet explored what specific medication cost-coping strategies are employed by individuals with arthritis. Given this gap in the literature, our paper aims to (1) identify the characteristics of individuals with arthritis who self-report prescription medication cost-coping strategies and (2) examine the association between coping strategies and medication underuse with physical and psychosocial health status among a cohort of participants with arthritis.

Participants and Methods

Study Design

The current study, Individual and Community Social Determinants of Arthritis Outcomes Study (Social Determinants), stems from the North Carolina Family Medicine Research Network cohort [32]. Briefly, in 2004 and 2005, of the 4,442 cohort members assessed for eligibility, 4,165 members were deemed eligible (those ≥18 years of age, who agreed to be contacted for future studies, had a current address and telephone number, and spoke English fluently) and invited by mailed letter to participate in the Social Determinants study. Of the 2,479 individuals who consented and participated in the baseline telephone survey (Social Determinants T1), 2,420 individuals agreed to be contacted again and were subsequently mailed invitations to participate in a follow-up telephone survey (Social Determinants T2). In 2006, a total of 1,541 participants consented to participation and were queried about demographics, chronic conditions, health attitudes and beliefs, and prescription medication costs (Fig. 1); the telephone survey lasted approximately 45 min. All study materials and methods were approved by the University of North Carolina at Chapel Hill Biomedical Institutional Review Board.

This paper cross-sectionally examines the 729 participants self-reporting arthritis, as well as self-reporting currently taking doctor-prescribed medicines for their health in the follow-up Social Determinants T2 survey. Arthritis status was established according to the 2002 arthritis module of the Behavioral Risk Factor Surveillance System (BRFSS) and includes any type of doctor-diagnosed arthritis, such as osteoarthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia [33]. Of the 729 individuals self-reporting arthritis, the majority (54 %) report two or more forms of arthritis, with the most common being osteoarthritis (n=390), bursitis/tendonitis (n=345), rheumatoid arthritis (n=168), carpel tunnel syndrome (n=160), gout (n=109), fibromyalgia (n=90), and other forms (n=90). These respondents were similar in race (77 % white vs. 76 %), gender (75 % female vs. 71 %), and education (55 % some college or more vs. 50 %) when compared to the initial cohort in 2001, though were older (25 % aged 65+ vs. 18 %). When compared to two American samples of individuals with arthritis that were drawn from nationally representative datasets [34, 35], the current sample had a greater percentage of non-Hispanic black participants, and was more likely to be female, older, more highly educated, have greater body mass index (BMI) and greater number of comorbid conditions (data not shown). However, these variations may reflect the difference of sampling frames, as individuals who visit family practices in North Carolina may be different (i.e., sicker) than individuals participating in nationally representative interview surveys.

Outcome Measures

Health Assessment Questionnaire—The Health Assessment Questionnaire (HAQ) measures self-reported disability in daily function by assessing 20 activities of daily living organized around eight domains: dressing and grooming, arising, eating, walking, hygiene, reach, grip, and outside activities. Level of difficulty for each is assessed on a scale from 0 (no difficulty) to 3 (unable to do). Domain scores were summed (range 0–24) and divided by 8 to provide a continuous, averaged index value from 0 to 3 [36]. In this study, the HAQ had high internal consistency (Cronbach's α=0.94). A higher HAQ score indicates greater disability, and previous research has demonstrated average scores of 0.49 in a general population-based study, 0.80 among osteoarthritis patients, and 1.2 in rheumatoid arthritis patients [37–39].

Physical and Mental Health Functioning—The Medical Outcomes Study's 12-item Short Form Survey Instrument (SF-12v2) two summary scores, the SF-12v2 Physical Component (PCS), and the SF-12v2 Mental Component (MCS) were used to assess physical and mental health functioning. The SF-12v2 is strongly correlated with the SF-36 and is reliable in general populations [40]. In this study, it had high internal consistency (Cronbach's α=0.90). PCS and MCS summary scores were designed to range from 0 to 100, with a general US population mean score equal to 50 (standard deviation of 10) [41, 42]. PCS score of 38.3 and MCS score of 48.9 have previously been noted in a sample of southern US community-dwelling adults with self-report arthritis [43]. Generally, higher PCS and MCS summary scores indicate better health.

Self-rated Health—The Centers for Disease Control (CDC) Health-Related Quality of Life measure of global self-rated health was used to examine participant self-report of overall health [44]. One question asked “in general, would you say that your health is excellent, very good, good, fair, or poor”. Response options were collapsed into two categories for analyses in this study: excellent/very good/good (referent) and fair/poor. The CDC health-related quality of life measure has shown good construct validity, concurrent validity, and predictive validity, and has been validated against other objective health-related quality of life instruments [45, 46].

Depressive Symptoms—The Center for Epidemiologic Studies Depression (CES-D) Scale measures symptoms associated with depression in the general population [47] and is a 20-item, self-report scale yielding scores ranging from 0 to 60, with higher scores indicating greater levels of depressive symptoms. Scores of 16 or greater have been found to be a marker of depressive symptoms in the general population [47, 48], therefore depressive symptom scores were dichotomized at cut point of 16 [<16 (referent) and ≥16] in this study. This scale had high internal consistency in this study (Cronbach's α=0.92).

Helplessness—The Helplessness Subscale of the Rheumatology Attitudes Index (RAI) assessed personal beliefs and attitudes regarding a self-identified condition (physical or mental) that limited activities. This is a short, five-item group of statements asked in the Rheumatology Attitudes Index [49] that were originally adapted from the Arthritis Helplessness Index [50, 51]. Individuals respond to each statement using a five-point Likert scale that ranges from strongly disagree [1] to strongly agree [5]. Responses are summed and averaged to create a mean score that ranges from 1 to 5, with lower scores indicating greater perceived helplessness. This scale had moderate internal consistency in this study (Cronbach's α=0.74), which is consistent with previous research conducted in the development of this brief measure [52].

Predictor Measures—We asked participants to respond "yes" or "no" to whether or not during the last 12 months they had "spent less on food, heat or other basic needs so that you would have enough money for your medicines," "ever have to borrow money from a friend or relative outside of your household to pay for your prescription medications," "increased the amount of credit card debt you carried month-to month because of the cost of your prescription medications," or "taken fewer medications than prescribed by your doctor because of the cost." These questions have been used previously in studies examining patient strategies to cope with high-prescription medication costs, including restricting medication use [9, 21, 24, 53, 54]. Previous research has considered these four questions to represent three strategies: "cutting back on necessities," "increasing debt," and "medication restriction," with "increasing debt" representing a combined response of borrowing money from a friend or relative and increasing credit card debt. For this study, we considered these four questions to be representing four separate strategies, given the personal nature of humbling oneself to asking for monetary help from family or friends, vs. independently using available credit to purchase medications.

Covariates

In this study, covariates and potential confounders included participant sociodemographics (age, race, and gender) as well as health characteristics (BMI and number of comorbid conditions). Age was calculated from the date of telephone survey and self-reported date of birth, and used as a continuous measure. Race was self-reported and based on the 2000 US Census race and ethnicity categories and trichotomized into non-Hispanic White (referent), non-Hispanic Black, and other, where all else were labeled other. Educational attainment was assessed with seven categories and later dichotomized as High School (HS)/General Educational Development test or below and some college and above (referent). Household income was assessed by asking participants the following question: "Is your annual family income above or below US$45,000." This dichotomy is retained for this study, with greater than US$45,000 per year as the referent. Participants provided a description of their current occupation (or last occupation if not currently employed at time of survey) and coded according to occupation classification categories from the 2000 US Census. Occupation was further refined into two categories for this study: nonprofessional (e.g., farming, fishing, service, construction, production, and labor) and professional (e.g., management, technical, sales and office; referent). Home-ownership was assessed by asking participants: "Do you own your home?" (yes, no) with homeowner as the referent. BMI (in kilograms per square meters) was calculated from self-reported height and weight, and used as a continuous measure. Existing comorbid conditions were assessed by asking participants if a health professional ever told them they had any of 21 different chronic diseases (e.g., asthma, diabetes, high cholesterol). For this paper, the number of comorbid conditions is a sum of all self-reported conditions.

Data Analysis

After excluding for missing cases, all statistical analyses were conducted on 729 individuals with self-report arthritis. To examine our first aim, we conducted univariate analyses to generate descriptive statistics, as well as correlation and unadjusted bivariate analyses to examine the relationship between demographics, medication cost-coping strategies, and health status. Chi-square analyses were conducted with categorical variables, and *t* test and

ANOVA were conducted for continuous variables. We estimated multivariate logistic regression models to identify the independent effect of characteristics on using prescription medication cost-coping strategies. To examine our second aim, we conducted separate multivariate linear regressions (SF12v2 physical and mental functioning, HAQ disability, and helplessness) and multivariate logistic regressions (self-rated health and CES-D depressive symptoms) to examine the association between prescription medication cost-coping strategies and health status, models adjusted for age, gender, BMI, comorbid condition count, race, educational attainment, income, homeownership, and occupation. Though the data are cross-sectional, we also wanted to further examine the complex relationship between key demographic variables, medication cost-coping strategies, and health status. We examined whether medication cost-coping strategies mediated the association between health status and (1) income, (2) race, and (3) comorbid condition count by following established criteria [55, 56]. We used adjusted multivariate models to first establish existence of a significant direct effect (either linear or logistic depending on the health status variable). We used logistic regression models to establish significant associations between the mediators (medication cost-coping strategies) and the three key demographic variables, as well as linear/logistic regression models to establish significant associations between the mediators and health status. In each of the models, the mediators were treated as binary variables. Further tests of mediation (e.g., Sobel test) were not performed based on results of the mediation analyses. All analyses were conducted using the STATA 11.0 (StataCorp, College Station, TX).

Results

Participant Characteristics

The 729 participants with arthritis that were currently taking doctor-prescribed medicines for their health were on average 61 years old, had a mean BMI of 30, and had 6 comorbid conditions. They tended to be female (75 %), non-Hispanic white (77 %), with an income below US $45,000 (56 %), educated (55 % some college or higher), and worked in occupations considered “professional” (59 %). Please see Table 1. Participants had mean scores of 37.9 and 51.5 for physical and mental health functioning, respectively, and generally reported modest disability (mean score 0.70). The majority of participants self-reported depressive symptoms scores of less than 16 (69 %) and good self-rated health (61 %).

When asked whether or not they had used a medication cost-coping strategy within the last 12 months, 22 % of participants reported spending less on basic necessities, 16 % reported borrowing money from family or friends, 12 % reported increasing credit card debt, and 20 % reported taking fewer medications than prescribed by their doctor (Table 1). While 65 % of participants reported not using any strategy, nearly 35 % reported pursuing at least one strategy (n=255): most participants reporting only one coping strategy (n=105), however some reported two (n=66) and three strategies (n=67), and several reported using all four strategies (n=19).

We conducted unadjusted bivariate analyses (not shown) and found that, in general, the following characteristics were significantly (p<0.05) more likely to be associated with engaging in medication cost-coping strategies: being female, younger age, higher BMI, having more comorbid conditions, non-Hispanic Black race, nonprofessional occupation, household incomes of less than US$45,000, and being a homeowner. The exceptions were associations of spending less on basic necessities with age (p=0.062), as well as restricting medication use with BMI (p=0.058), race (p=0.691), and occupation (p=0.089).

When we examined participant sociodemographic characteristics associated with medication cost-cutting strategies through multivariate logistic regression models controlling for covariates (Table 2), we found that individuals who were younger were at greater odds than older adults to engage in all cost-coping strategies. Individuals with a greater comorbid condition count were at greater odds of engaging in cutting necessities (OR 1.26, 95 % CI 1.17–1.36), borrowing money (OR 1.25, 95 % CI 1.15–1.36), increasing credit card debt (OR 1.27, 95 % CI 1.16–1.39), and restricting medication use (OR 1.27, 95 % CI 1.18–1.38). Participants earning less than US$45,000 had about five times greater odds than those with higher earnings to cut necessities (OR 4.76, 95 % CI 2.77–8.20) and borrow money (OR 5.14, 95 % CI 2.62–10.10), and they had nearly three times greater odds of restricting medication use (OR 2.95, 95 % CI 1.77–4.91). Non-Hispanic Blacks had two times greater odds of reporting cutting necessities than non-Hispanic Whites (OR 2.24, 95 % CI 1.37–3.64) and nearly three times greater odds of borrowing money (OR 2.87, 95 % CI 1.67–4.93). Of note, individuals that were homeowners had significantly greater odds than non-homeowners of reporting increasing credit card debt. Finally, individuals with a nonprofessional status occupation had two times greater odds of reporting borrowing money from family or friends (OR 2.05, 95 % CI 1.20–3.50).

We found through the unadjusted bivariate relationship between each medication cost-coping strategy and each health status outcome (data not shown) that participants engaging in each strategy were significantly at greater odds to have worse physical health (e.g., worse physical functioning, greater HAQ disability, and worse self-rated health), as well as worse psychological health (greater helplessness, worse mental health, and more depressive symptoms), all at $p<0.001$.

Given the demonstrated relationship between medication cost-coping strategies and health status, we examined the association between all four medication cost-coping strategies and each health status (Table 3). Individuals reporting increasing credit card debt scored nearly five points lower on PCS physical health even after adjusting for covariates ($B=-4.61$, $p\leq 0.001$). Those reporting borrowing money from family or friends, as well as reporting medication underuse scored more than a tenth of a point higher on HAQ disability ($B=0.13$, $p=0.049$ and $B=0.13$, $p=0.031$, respectively). Increased credit card debt as a medication cost-coping strategy was associated with 2.35 times greater odds of reporting worse self-rated health (95 % CI 1.29–4.27; $p=0.005$) and also associated with scoring more than a half-point higher on the RAI helplessness scale ($B=0.47$, $p\leq 0.001$). Participants who borrowed money from family or friends scored nearly four points lower on mental health status ($B=-3.82$, $p=0.003$) and scored more than four points lower on mental health status when reporting medication underuse ($B=-4.21$, $p\leq 0.001$). Finally, individuals reporting medication underuse had 2.03 times greater odds of reporting depressive symptoms than those who did not report medication underuse (95 % CI 1.25–3.30; $p=0.004$). In general, being older and having more comorbid conditions, higher BMI, and having lower educational attainment and income levels were statistically significant covariates in the majority of these models.

Finally, we conducted mediation analyses to further test the complex relationship between each medication cost-coping strategy and health status, income, race, and comorbid condition count. First, while we established statistically significant direct effects in adjusted models for income and health status, as well as comorbid condition count and health status, none existed for race. Therefore, mediation analyses were not carried out for race. The tests of mediation, based on established criteria, revealed that none of the medication cost-coping strategies singularly acted as mediators between income and health status or between comorbid condition count and health status. In all the tests of mediation, the indirect effect remained significant and the indirect effect beta coefficient values were comparable to the direct effect models. For example, while low-income individuals were more likely to engage in spending less on necessities, and those individuals spending less on necessities had lower physical functioning score, spending less on necessities did not more fully explain the relationship between income and physical functioning.

Discussion

Our study is one of the first to examine medication cost-coping strategy use and cost-related medication nonadherence among individuals with self-report arthritis. We found that, within this community-based sample, there is a high rate of individuals with arthritis employing strategies to cope with prescription medication cost, and 20 % of the total sample reported restricting medication use. These rates are on par with other rates previously identified in studies among individuals with chronic conditions (e.g., diabetes), low income, and older adults [20, 21, 57–59].

Our findings reveal that, with the exception of age and homeownership, those typically considered at greater risk for poorer health had engaged in cost-related coping strategies in the past 12 months. Non-Hispanic Blacks and those with a greater number of comorbid conditions, low household income, and nonprofessional occupations routinely engaged in either cutting back on basic necessities, borrowing money from family or friends, increasing credit card debt, and/or restricting medication use. Older adults were less likely than their younger counterparts to engage in these strategies; however, this relationship has been previously observed and documented in the literature [20, 21]. This study supports previous research suggesting that women were more likely than men to cut back on necessities and restrict medication use [20, 21]. Finally, of interest is the finding that homeowners were more apt to increase credit card debt as a response to medication costs. This covariate has not been previously examined in the literature, but reveals that homeowners may be more vulnerable to medication cost issues than non-homeowners. We hypothesize that these participants might either have additional costs associated with homeownership or not qualify for public or private medication assistance programs because of their homeownership status, and resort to using available credit to manage their medical costs. Also for consideration is the possibility that homeowner status may be a proxy for overall available wealth and financial resources. This status may also have a positive bearing on individual credit or credit scores, leaving homeowners with the option of choosing to increase credit card debt more often than non-homeowners.

It is important to consider our results in the context of what might be considered a minimally important difference in health status, such as physical functioning or disability. Prior research suggests that a universal value of effect size equal to 0.5 is the minimally important difference that a patient would report [60], however this value is likely to differ given the instruments and various scale anchors used [61]. For example, a previously reported physical function (SF-36 PCS) minimally important difference corresponds to an effect size of 0.49 [62], whereas a change in disability (HAQ) of about 0.20 has been reported as clinically important [39, 63], corresponding to an effect size of 0.27. Expert opinion varies widely on what constitutes a meaningful difference and its assessment. Our group has previously calculated quasi-effect size for health status [64] to better interpret results. We similarly calculated quasi-effect size for physical functioning, disability, helplessness, and mental health by standardizing the parameter estimates by corresponding standard deviations in this study. We interpret the parameter estimates as changes in health status resulting from a treatment of medication cost-coping strategy use relative to the referent group (strategy not used). For example, the PCS parameter estimate for increasing credit card debt is −4.61, meaning that people employing this strategy would have an average PCS that is 4.61 units less than those not employing the strategy. Using the sample standard deviation of PCS (12.8) from Table 1, a quasi-effect size would be 4.61/12.8=0.36. The quasi-effect size for disability (HAQ) is 0.20 for strategies “borrowing money” and “medication underuse,” and a quasi-effect size of 0.53 for helplessness among those who increased credit card debt. Finally, the quasi-effect size was 0.34 and 0.38 for mental health status for those employing the strategies “borrowing money” and “medication underuse.” Our findings represent moderate effects judged against other estimates of minimally important difference, suggesting that use of various medication cost-coping strategies, including medication underuse, may result in poorer health status for individuals with arthritis.

Medication underuse or nonadherence of nonsteroidal anti-inflammatory drugs (NSAIDs), analgesics, disease-modifying antirheumatic drugs (DMARDs), and biologics can result in ineffective management of symptoms (e.g., pain, fatigue), inflammation and swelling, progression of joint damage, and hospitalization [19, 65–67]. It is possible that without adherence to a proper medical regime, mobility and function have been compromised—influencing both physical functioning and eventually quality of life in our study population. Failure to comply with dosage on prescription medications for comorbid conditions (e.g., heart disease, depression) may have contributed to poorer physical and psychosocial health status among those with arthritis.

Medication cost-coping strategies that involved cutting back on necessities or needing additional financial resources to afford prescriptions were also associated with worse physical and psychosocial health. It is possible that engaging in these behaviors (e.g., purchasing fewer groceries, skipping a bill payment 1 month or asking for financial help) may increase the level of stress and anxiety stemming from not having sufficient resources for even basic necessities or health needs, and in turn negatively influence individual health. It should be noted, however, that earlier research has demonstrated that individuals who are sicker or take more medications often engage in medication cost-coping strategies [68]. While our analyses in this study did not reveal medication cost-coping strategies acting as mediators in the relationship between income and health status or in the relationship between comorbid condition count and health status, this type of potentially reciprocal relationship deserves additional consideration. This study is cross-sectional and cannot establish a causal link between cost-coping strategies and health status. Future studies might consider examining the longitudinal impact of medication cost-coping strategies on disease burden and general health among individuals with different forms of arthritis because of the varying disease-associated prescription medication costs (e.g., lower cost of NSAIDs for osteoarthritis vs. higher cost of DMARDs for rheumatoid arthritis). If certain groups engage in medication cost-coping strategies over a prolonged period of time, medication cost-coping strategies and nonadherence may contribute to the relationship between characteristics that put individuals at greater risk for poorer health (e.g., low income) and poorer health outcomes (e.g., physical and mental health functioning). Future research might also focus on the role of stress and anxiety as potential mediators in the relationship between engaging in medication cost-coping strategies and health outcomes.

Our study has several limitations that should be noted in light of our findings. First, there is potential for reporting bias to act in complex ways in this study. Participants may have been generally reluctant to report that they have difficulties affording their prescription medications. For example, individuals reluctant to report using cost-coping strategies may have caused the strength of the associations to be reduced, suggesting that the use of cost-coping strategies is more widespread than reported. On the other hand, reporting bias may have also varied according to demographic groups such as race, gender, and health status. For example, if a particular demographic felt more at liberty to report using cost-coping strategies or a particular cost-coping strategy than another, the observed relationships may have been greater due to reporting bias. The unquantified level, direction, and complexity of reporting bias should be considered when interpreting these data.

Second, this study does not have information on other important variables, such as health insurance status or out-of-pocket health care costs. While nearly 40 % of participants were 65 or older, and therefore eligible for Medicare, we did not infer insurance status for this subsection of the sample. However, it is possible that Medicare eligibility may offer a partial explanation for the observed age differences in strategy use: that is to say older individuals did not engage in medication cost-coping strategies because they had some form of health insurance. Individuals with greater out-of pocket health care costs may be more likely to engage in cost-coping strategies than those with lower out-of pocket costs. Unfortunately we are not able to examine the role of out-of pocket prescription medication costs, either through adjustment or sample stratification, and we must reiterate that our findings are largely descriptive given these limitations. However, studies have shown that individuals who are uninsured or underinsured have greater cost-related poor adherence [9, 69], and it could be through this mechanism that we observed the association between cost-related medication nonadherence and poorer physical and psychosocial health.

Additionally, this study did not ask participants how many medications they were taking, about medication dosing complexity, or whether the medications individuals were using were disease specific (e.g., heart disease, arthritis) or for general health (e.g., multivitamin) or if they were using complementary and alternative medicine to manage their arthritis symptoms (e.g., liniments, fish oil). We also did not ask participants about their perceived beliefs regarding the importance of arthritis-related medication adherence vs. medication adherence for other chronic conditions. While previous research found no increase in disease-specific complications among individuals with arthritis [24], it has established that individuals do cut back on symptom-relieving medications (e.g., nonsteroidal anti-inflammatory drugs) rather than medications for life-threatening conditions such as diabetes or heart disease [10, 70]. Future research might qualitatively examine which medications arthritis patients specifically cut back on when costs prohibit medication adherence, as well as further investigate beliefs and attitudes towards medication efficacy. Finally, although prior research has suggested the importance of trusting patient–provider interactions regarding medication costs and ways to limit medication underuse due to cost [71], we did not have data to explore these additional associations among individuals with arthritis.

This study supports the existing literature and also provides a foundation for future studies to examine the complex relationship between financial burden, complexity of medication adherence, individual characteristics (e.g., race, age, health conditions), interactions with health care providers around medication adherence and cost, and the health care system among individuals with arthritis [13, 72]. It should be highlighted again that this study asked North Carolinians about medication cost-coping strategies in 2006, and therefore may not be generalizable to other populations. However, given the current global economic climate, these issues may be of particular relevance in other geographic areas, and use of these strategies may be even more extreme and widespread then reported in our 2006 study. Our findings also reinforce that primary care providers, as well as rheumatologists, need to be attuned to the costs of medication they prescribe and consider identifying whether medication costs (e.g., out-of-pocket costs) present a financial burden or additional stress to their patients [53, 73]. Knowledge of how individuals with arthritis choose to cope with medication costs can present opportunities for interventions ranging from networking patients with pharmaceutical benefits programs, to conducting an audit of all current prescriptions, to reinforcement of the importance of medication adherence. In addition, physical activity programming and health promotion campaigns (e.g., the Arthritis Foundation’s “Moving is the Best Medicine”) are aimed at decreasing incidence rates, as well as reducing symptoms and disability resulting from prevalent arthritis. These types of interventions can act as tertiary prevention and may reduce the number of individuals who experience poor overall health and/or arthritis-related outcomes due to engaging in medication cost coping.

In conclusion, this descriptive study demonstrates that medication cost-coping strategies are independently and significantly associated with both physical and psychosocial health status among individuals with arthritis. Individuals who engage in medication cost-coping strategies did in fact have poorer health, independent of known risk factors for poor health in this population (e.g., age, gender, comorbid conditions, low income). Researchers, practitioners, public health practitioners, and policy makers should strive for continued collaboration in efforts to reduce the overall burden of chronic disease and arthritis, particularly those related to high costs of prescription medications.

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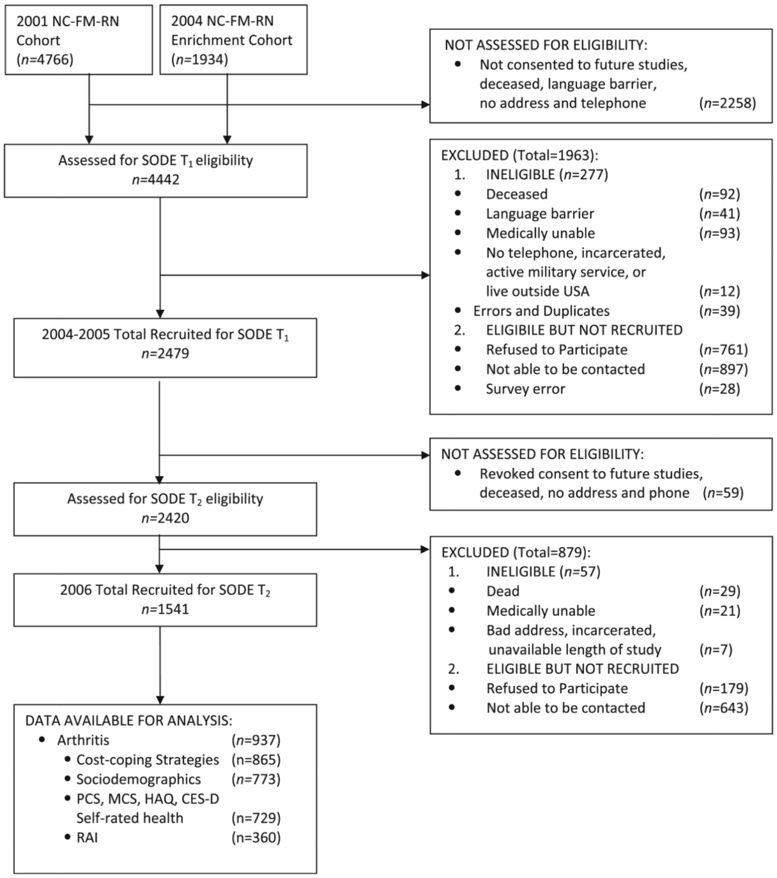

Fig. 1.

Participant recruitment and participation

Table 1

Participant sociodemographic characteristics and outcomes

Sociodemographic characteristics	
Age, mean±SD (years); range	60.6±12.5; 23.5–94.6
Body mass index (kg/m^2), mean±SD; range	30.2±7.1; 15.6–64.6
Comorbid condition count, mean±SD; range	6±3; 0–16
Gender	
Women	75
Race	
Non-Hispanic White	77
Non-Hispanic Black	17
Other	6
Income	
<US$45,000 income	56
Education	
Some college or higher	55
Homeowner	
Yes	82
Occupation	
Professional	58
Health status	
Physical functioning, mean±SD; range	
SF12v2 PCS (0–100)	37.9±12.8; 5.7–65.6
Mental health, mean±SD; range	
SF12v2 MCS (0–100)	51.5±11.1; 9.0–75.2
Disability, mean±SD; range	
HAQ (0–3)	0.70±0.64; 0–3
Helplessness, mean±SD; range	
RAI (1–5)	3.03±0.89; 1–5
Depressive symptoms	
CES-D score <16	69
CES-D score ≥16	31
Self-rated health	
Fair/poor	39
Good/very good/excellent	61
Prior 12-month medication cost-coping strategies	
Spend less on food, heat or other basic needs so as to have enough money for medicines	22
Borrow money from a friend or relative outside of your household to pay for prescription medications	16
Increase the amount of credit card debt carried month-to-month because of prescription medication cost	12
Prior 12-month cost-related medication underuse	
Taken fewer medications than prescribed by doctor because of the cost	20

Values are the percentage unless otherwise indicated

CES-D center for epidemiologic studies depression, *HAQ* health assessment questionnaire, *RAI* rheumatology attitudes index, *SD* standard deviation, *SF12v2 MCS* short form survey instrument physical component mental component, *SF12v2 PCS* short form survey instrument physical component

Table 2

Participant sociodemographic characteristics associated with medication cost-coping strategies, *N*=729

	Cut necessities			Borrowed money			Increased debt			Restricted medication use		
	OR	**95 % CI**	***p* value**	**OR**	**95 % CI**	***p* value**	**OR**	**95 % CI**	***p* value**	**OR**	**95 % CI**	***p* value**
Age	0.96	0.95–0.98	≤0.001	0.94	0.92–0.96	≤0.001	0.96	0.94–0.98	≤0.001	0.94	0.92–0.95	≤0.001
BMI	0.99	0.96–1.02	0.515	1.00	0.83–2.98	0.162	0.99	0.96–1.03	0.620	0.98	0.96–1.01	0.254
Comorbid condition count	1.26	1.17–1.36	≤0.001	1.25	1.15–1.36	≤0.001	1.27	1.16–1.39	≤0.001	1.27	1.18–1.38	≤0.001
Income												
≥US$45,000	Ref											
<US$45,000	4.76	2.77–8.20	≤0.001	5.14	2.62–10.10	≤0.001	1.36	0.76–2.46	0.302	2.95	1.77–4.91	≤0.001
Race												
Non-Hispanic White	Ref											
Non-Hispanic Black	2.24	1.37–3.64	≤0.001	2.87	1.67–4.93	≤0.001	1.24	0.65–2.37	0.510	0.86	0.50–1.50	0.604
Other	1.37	0.64–2.95	0.419	1.97	0.86–4.52	0.110	0.90	0.35–2.31	0.819	0.74	0.33–1.69	0.478
Gender												
Male	Ref											
Female	1.17	0.70–1.97	0.542	1.57	0.83–2.98	0.162	1.37	0.72–2.60	0.336	1.39	0.82–2.37	0.225
Education												
Some college or more	Ref											
HS education or less	1.12	0.72–1.76	0.605	0.81	0.48–1.37	0.432	1.06	0.62–1.82	0.822	0.84	0.54–1.32	0.453
Homeowner												
Yes	Ref											
No	1.06	0.66–1.69	0.822	1.10	0.64–1.87	0.718	0.39	0.19–0.81	0.011	0.89	0.54–1.47	0.642
Occupation												
Professional	Ref											
Nonprofessional	1.07	0.68–1.68	0.783	2.05	1.20–3.50	0.009	1.10	0.63–1.94	0.733	1.00	0.63–1.60	0.996

Each logistic model adjusted for all variables listed in table

BMI body mass index

Table 3

Strategies to cope with medication costs, socioeconomic status variables, and health status, beta (SE), and OR [95 % CI], *N*=729

	Physical health			**Psychological health**		
	Physical functioning *B* (SE)	**Disability *B* (SE)**	**Self-rated health OR (95 % CI)**	**Helplessness[a] *B* (SE)**	**Mental health *B* (SE)**	**Depressive symptoms OR (95 % CI)**
Spent less on necessities	−1.54 (1.23)	0.08 (0.06)	0.99 (0.59, 1.62)	0.11 (0.12)	0.47 (1.15)	1.39 (0.86, 2.26)
Borrowed money	1.01 (1.37)	0.13 (0.07)*	0.93 (0.53, 1.65)	0.08 (0.13)	−3.82 (1.29)**	0.95 (0.55, 1.64)
Increased credit card debt	−4.61 (1.41)***	0.06 (0.07)	2.35 (1.29, 4.27)**	0.47 (0.13)***	−0.01 (1.33)	0.81 (0.45, 1.45)
Medication underuse	0.03 (1.21)	0.13 (0.06)*	1.61 (0.97, 2.66)	−0.11 (0.11)	−4.21 (1.14)***	2.03 (1.25, 3.30)**

Models adjust for age, gender, body mass index, comorbid condition count, race, education, income, homeownership, and occupation

* $p<0.05$;

** $p<0.01$;

*** $p\leq0.001$

[a] $N=360$