Quality of Life and Quality of Care for Patients With Gout

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Significant pain, activity limitation, and disability in patients with acute and chronic gouty arthritis lower health-related quality of life. Although many effective therapies are available for gouty arthritis, medication errors are common. One goal of therapy is to reduce the frequency of gout flares by lowering serum uric acid. Further, evidence suggests that the quality of care provided to patients with gout may also impact health-related quality of life. This article reviews evidence concerning quality of care and quality of life for patients with gout.

Introduction

Gouty arthritis is characterized by acute, intermittent, inflammatory arthritis that evolves over many years to chronic inflammatory polyarthritis. In severe cases, tophaceous urate deposits and inflammatory arthritis may lead to deformity, disability, and radiographic destruction. An estimated 5 million Americans have gout, with an estimated $27 million spent each year on new acute cases [1,2]. In 2002, gout accounted for 1.4 million US outpatient visits [3]. These data indicate that gout is a significant public health problem in the United States and perhaps worldwide. Although efficacious treatment options are available to treat gout, failure to provide appropriate care is quite evident.

Practical ways to qualitatively examine the effectiveness of gout treatments include the use of evidence-based quality indicators (QIs); the examination of objective outcomes, such as the normalization of serum urate, delay, and reversal of radiographic joint damage; or the assessment of patient-reported outcomes, such as gout-specific, health-related quality of life (HRQoL), pain, and function. Very large samples are needed to determine improvement in outcomes, however, making this approach difficult for most health care systems in terms of costs and feasibility. Another limitation of this approach is that these outcome data are often infrequently collected as part of regular clinical care. Therefore, quality of care is assessed by examining errors in medication use or by assessing compliance with QIs.

Gouty arthritis morbidity mostly involves acute arthritis flares, chronic polyarthritis, tophaceous masses, and joint destruction. Thus, arthritis impacts the HRQoL of patients with gout. Patients with gouty arthritis also have significant medical comorbidity load, which can also impact HRQoL. This article focuses on recent advances in quality of care and quality of life (QoL) for patients with gout.

Quality of Care for Gout

The Agency for Health Care Research and Quality defines quality of care as "The degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" [4]. The following section examines data regarding errors in medication prescription and laboratory monitoring, as well as noncompliance with evidence-based QIs for gout [4].

Errors in medication prescription and laboratory monitoring

The pharmacologic treatment of gouty arthritis can be broadly divided into two categories: urate-lowering agents (eg, the xanthine oxidase inhibitor, allopurinol, followed by uricosurics, such as probenecid, sulfinpyrazone, and benzbromarone [not available in the Untied States]) and anti-inflammatory medications (eg, nonsteroidal anti-inflammatory drugs [NSAIDs], corticosteroids, and colchicine) used for acute flares and prophylaxis against flares during initiation of urate-lowering agents. Long-term therapy with urate-lowering agents (usually lifelong) is indicated in patients with gouty arthritis with ≥ 2 attacks/year, radiographic destruction, or tophaceous gout [5,6]. Treatment intends to reduce the frequency of acute flares by achieving a target serum uric acid level of ≤ 6 mg/dL, a cut-off supported by published evidence.

A recent systematic review examining the optimal target for serum uric acid level included 23 studies, four

of which were randomized controlled trials [7]. Evidence from these studies showed an association between higher serum uric acid level and higher risk of gout. A lower level of serum uric acid was associated with decreased frequency of gout flares, decreased requirement of NSAIDs during flares, and resolution of tophi. Thus, achieving a target serum uric acid ≤ 6 mg/dL improves outcomes in gout and therefore is an important cornerstone of treatment.

Several studies have described errors in medication use and monitoring in emergency room (ER), inpatient, and outpatient settings. Chin et al. [8] prospectively studied inappropriate ER drug use in 981 patients in Chicago, finding that the most common discharge diagnosis for which potentially inappropriate drugs were added included musculoskeletal disorders, back pain, gout, and allergy/urticaria.

Smith et al. [9] performed an audit of 93 patients who were prescribed allopurinol at the time of hospital discharge in Australia. In this study of 49 men and 44 women, the average age was 77 years (minimum age, 65 years). In 47% of patients, the allopurinol dose was higher than recommended for the creatinine clearance, whereas in 40% of patients it was lower, indicating that allopurinol doses were not adjusted to creatinine clearances.

Mikuls et al. [10] used the MEDMARX database (an internet-accessible error-reporting program designed for use by US hospitals and health care systems) to examine medication errors in the use of gout-related medications. They studied errors in the use of allopurinol, colchicine, probenecid, and sulfinpyrazone from 1999 to 2003. Of 582,397 medication errors, 891 (0.15%) errors were related to gout-specific medications. The most frequent medication errors occurred with allopurinol (n = 524) followed by colchicine (n = 315). The most common errors in colchicine and allopurinol use included illegible or incomplete orders, followed by excessive dosing, often in patients with renal failure. Compared with other treatment errors, physicians were more commonly implicated in medication errors related to gout (23%–39%) than other conditions (7%), whereas nurses were less often responsible for these errors (23%–27% for gout vs 50% for other conditions; $P < 0.0001$).

In contrast to other studies, Ly et al. [11] found a moderately good compliance of gout care with the New Zealand Rheumatology Association (NZRA) guidelines. This retrospective chart review in 100 patients who met American College of Rheumatology preliminary criteria for gout included two cohorts, 50 patients who received colchicine for acute gouty arthritis (mean age, 58 y) and 50 patients with renal impairment who were on long-term prophylactic colchicine (mean age, 66 y; creatinine ≥ 2 mg/dL or creatinine clearance ≤ 50 mL/min). For treatment of acute gouty arthritis, colchicine was prescribed in 96% (48 of 50) of patients at a total dosage of ≤ 2.5 mg/d. Appropriate complete blood count and creatine kinase laboratory testing was performed after six months in 38 (76%) of 50 patients receiving long-term colchicine, in accordance with NZRA guidelines. Laboratory monitoring identified one patient who developed colchicine-induced myopathy.

In a retrospective study, Dalbeth et al. [12] examined whether the allopurinol dosing in patients attending a rheumatology clinic was adjusted to creatinine clearance. Of 227 patients, 22 (10%) patients received a lower-than-recommended dosage of allopurinol, 161 (71%) received the recommended dosage, and 44 (14%) received dosages higher than recommended. Serum uric acid levels were lower in those receiving higher-than-recommended dosages of allopurinol (38% reached the target uric acid level) compared with lower-dosage and recommended-dosage groups (19% and 15%, respectively, reached the target uric acid level). Differences were also significant between the higher- and recommended-dosage groups ($P < 0.01$).

Singh et al. [13] studied a cohort of 643 veterans with gout who received a new allopurinol prescription. Quality medication use and monitoring were assessed, using published evidence ranging from randomized controlled trials to pharmacokinetic data. Of 643 patients with gout, 297 (46%) patients were prescribed allopurinol continuously; the rest had one or more discontinuations lasting 30 days or longer during follow-up. Only 20% of patients with gout reached the target uric acid level of ≤ 6 mg/dL, 20% of patients had a uric acid check and did not reach the target uric acid level, and 61% of patients had no serum uric acid check. Colchicine or NSAID prophylaxis was started before or on the day of new allopurinol prescription only in 169 (48%) of 643 patients with gout.

Sarawate et al. [14••] analyzed data from a managed care plan in which the average age of patients with gout was 57 years, 76% were men, and the average Deyo-Charlson Index score was 0.9. In 3651 patients with newly diagnosed gout who received allopurinol, 87% of patients discontinued therapy (defined as more than 1.5 times duration between refills compared with the last refill duration). Patients had bimodal distribution for allopurinol use (ie, most had medication-possession ratios [MPRs] of < 10% or > 90%). In those with newly diagnosed gout taking allopurinol, 83% of patients had no claim for serum uric acid testing within 6 months of allopurinol initiation. Fifty-three percent of patients with gout and renal impairment (creatinine > 2 mg/dL or a diagnostic code for renal impairment) received allopurinol dosage ≥ 300 mg/d (higher than the recommended dose).

Roddy et al. [15] studied the adherence to European League Against Rheumatism guidelines for the management of chronic gout using two general practice populations in the United Kingdom. Of 4249 patients completing the questionnaire, 488 reported gout or acute attacks and 164 confirmed to have gout on clinical examination by an expert. Overall, 44 (30%) of 164 patients were taking allopurinol. Of 10 patients with tophaceous gout, two (20%) patients were taking allopurinol and four (40%) patients had taken allopurinol in the past. Thirty-one (70%) current allopurinol users were taking a dosage of 300 mg/d, whereas two (25%) of eight patients took prophylactic colchicine and/or an NSAID during initial allopurinol prescription.

Pal et al. [16] studied 429 patients diagnosed with gout or who were receiving gout medications from 12 general practices in the Untied Kingdom. The mean age of patients with gout was 64.5 years, with a male–female ratio of 4:1. Six percent of patients were administered NSAIDs more than 2 years after initiation of allopurinol. In most patients, allopurinol was started before acute gout had resolved. Most patients (61%) had no laboratory test while on medication treatment. A referral to the rheumatology department was made in 9% of patients. Counseling on reducing alcohol intake was given to only 42% patients.

In an internet-based study, Neogi et al. [17] examined inappropriate therapy in acute gouty attack and its predictors. Based on a review of rheumatologist records, 232 patients had gout. The mean age was 53 years, 81% were male, and median disease duration was 4 years. Definite inappropriate therapy was defined as initiation of allopurinol during an acute attack, and possible inappropriate therapy, the use of analgesics, alternative remedies, or no medications during acute attack (appropriate therapy defined as use of NSAIDs, colchicine, or corticosteroids). Of the 232 patients, 26% received either definite or possible inappropriate therapy.

Poor compliance with quality-of-care indicators for gout

Quality of care is frequently measured using various QIs, which are process measures of health care quality based on readily available data. A key feature of QIs is that they have a well-defined numerator and denominator, which can be easily extracted from the health care data. These are rendered in an IF/THEN/BECAUSE format, for example: "IF a patient with tophaceous gout is given an initial prescription for a urate-lowering medication (xanthine oxidase inhibitor, probenecid, or sulfinpyrazone) and lacks both 1) significant renal impairment (a serum creatinine level ≥ 2 mg/dL or measured/estimated creatinine clearance ≤ 50 mL/min) and 2) peptic ulcer disease, THEN a prophylactic anti-inflammatory agent (colchicine or NSAID) should be given concomitantly BECAUSE prophylactic anti-inflammatory therapy reduces the risk of rebound gout attacks, which frequently follow the initiation of urate-lowering therapy."

Mikuls et al. [18] examined the UK General Practitioner Research Database from 1990 to 1999 and identified 63,105 patients with a code for hyperuricemia or gout. Three QIs were examined regarding allopurinol use. Of 145 physicians, noncompliance varied 25% to 57%, with 25% of physicians noncompliant in lowering the initial allopurinol dosage in patients with renal failure, 25% noncompliant in adjusting allopurinol dosage when using azathioprine or 5-mercaptopurine, and 57% of physicians noncompliant in treating asymptomatic hyperuricemia with allopurinol.

Singh et al. [19] assessed three QIs in 663 eligible veterans (99% men) with gout, an average age of 68 years, and a Charlson Comorbitiy Index score of 2.5. Physician nonadherence with QIs varied from 24% for serum uric acid check within 6 months of initiating a new allopurinol prescription to 78% for dosing of allopurinol less than 300 mg/d in the presence of creatinine clearance less than 50 mL/min or creatinine greater than 2 mg/dL. Of all patients receiving colchicine for more than 6 months, 35% of patients had received a complete blood count and creatine kinase check within 6 months. Overall adherence to all applicable QIs was low, with only 144 (22%) of 663 patients meeting the standard.

These studies highlight that inappropriate treatment of gout is common in various settings. These rates of compliance with QIs for gout is similar or lower than those reported for chronic disease care QIs in two US national samples, 56% [20] and 59% [21]. This suggests that gout treatment is an area that needs improvement.

Predictors of poor quality care in patients with gout

Sarawate et al. [14••] examined predictors of high MPR and of receiving a serum urate test after initiation of a new allopurinol prescription. Patients with previously diagnosed gout were three times more likely than patients with newly diagnosed gout, whereas those with hypertension were 1.4 times more likely than those without hypertension to have an MPR ≥ 80% for allopurinol (Table 1). However, patients with gout flare before post-index serum urate testing were 50% less likely than those without flare to have an MPR ≥ 80%. Factors associated with post-index serum urate testing were renal impairment (OR, 3.2); number of medications (OR, 1.53 per medication); baseline serum uric acid level (OR, 1.14 per 1 mg/dL uric acid level); and colchicine use (OR, 0.55).

Neogi et al. [17] examined the predictors of inappropriate therapy during an acute gout attack. The two significant predictors of inappropriate therapy were consultation with a physician during acute attack, associated with higher odds (95% CI) of 2.5 (1.3–4.7) and increasing number of gout attacks, associated with lower odds of 0.8 (95% CI, 0.7–0.9).

Singh et al. [19] examined the predictors of overall physician adherence with three QIs in their study of 643 veterans with gout. Older age and more inpatient visits per year were associated with lower adherence to QIs. Higher number of outpatient visits or visits to greater number of health care providers were associated with higher adherence.

Mikuls et al. [18] in their study of QIs in General Practice Research Database patients found that male sex, older age, chronic renal failure, and a greater number of concomitant medications were significantly associated with inappropriate treatment for symptomatic hyperuricemia.

Singh et al. [13] examined predictors of continuous allopurinol, use of colchicine or NSAID prophylaxis and of achieving target serum uric acid in veterans with gout receiving a new allopurinol prescription. Better care patterns were associated with higher number of outpatient visit days, more primary care or rheumatology visits, and lower comorbidity.

Thus, multiple factors predict patterns of poor physician compliance and gaps in quality care for patients with gout. Efforts aimed at improving quality of care may choose to focus first on high-risk patients (ie, older patients, those with higher comorbidity, renal failure, and receiving concomitant medications).

Causes of physician noncompliance with gout quality indicators

Gout is mostly managed by nonrheumatologists in the United States and worldwide. Survey studies of general practitioners have assessed reasons for lack of joint aspiration during acute gouty arthritis, initiation of urate-lowering treatment based on clinical suspicion rather than documentation of urate crystals in joint fluid for urate crystals, and nonadherence to published recommendations for gout care in Europe [22,23] and China [24]. To our knowledge, no published surveys of general practitioners, family practitioners, or internists examine the reasons for physician noncompliance with QIs and with appropriate medication use and monitoring in patients with gout.

In an informal discussion with internists after presentation of data regarding gaps in gout care during medical grand rounds, primary care physicians cited reasons for treatment and monitoring errors. These included lack of time in busy outpatient settings and need to manage multiple comorbidities other than gout (Singh, unpublished observation). More studies are needed to examine what reasons underlie physician noncompliance so that interventions can be designed to improve gout care. Beyond exploring reasons for physician noncompliance, studies are also needed to define patient and health care access factors that may contribute to suboptimal care.

Health-related Quality of Life

Roddy et al. [25•] used the World Health Organization Quality of Life–Short Version (WHO QoL-BREF) questionnaire to compare HRQoL of patients with gout to controls in a primary care population in the United Kingdom. Of 13,684 patients surveyed, 3082 (23%) responded, of whom 137 patients had gout confirmed on clinical examination and 2848 patients were controls. The mean age of patients with gout was 63 years, 49% had hypertension, 44% had cardio/cerebrovascular disease, and 50% had musculoskeletal comorbidity. Physical QoL was worse in patients with gout compared with patients without gout, but psychological, social, and environmental QoL were similar between patients with and without gout. In multivariable-adjusted analyses that adjusted for gender, age, musculoskeletal comorbidity, medical comorbidity, and gout status, gout was an independent predictor of physical QoL. In patients with gout, no differences in HRQoL were found by serum uric acid level or allopurinol use.

Singh et al. [26•] compared the HRQoL of 1500 veterans with gout (mean age, 68 y) to 38,000 veterans without gout (mean age, 61 y). In unadjusted analyses, gout patients had much poorer physical HRQoL, but not mental/emotional HRQoL on Short Form-36 for veterans (SF-36V), a validated outcome measure very similar to Short Form-36 (SF-36), version 2. Adjusted scores (for sociodemographic, health care access, and comorbidity) for physical and mental/emotional HRQoL were similar in patients with and without gout, except slightly lower adjusted bodily pain scores in patients with gout versus those without gout (47.1 vs 49.7; $P < 0.01$). In patients with gout, medical comorbidity predicted lower scores on both physical component summary (PCS) and mental component summary (MCS) scales, whereas arthritic comorbidity predicted a lower PCS, but not lower MCS score.

Thus, these two studies had somewhat different findings with regard to the association of gout with physical HRQoL, after adjustment for medical comorbidity among other factors. The two studies differed in HRQoL assessments (SF-36V vs WHO QoL-BREF), type of medical comorbidities adjusted for, socio-demographics (98% men, mean age of 68 y vs 81% men, mean age of 64 y), setting (US population-based survey vs two general UK practices), assessment of comorbidity (International Classification of Diseases, 9th Revision codes vs self-report) and response rates (58% vs 23%). Longitudinal studies with well-defined cohorts of gout and controls are needed to examine the correlates of HRQoL in patients with gout. Recent development of a gout-specific QoL instrument may also help measure disease-specific versus generic HRQoL in patients with gout [27].

Khanna et al. [28] studied 80 patients with gout and a mean age of 60 years, 90% men from tertiary care and a Veterans Affairs medical center. The SF-36 PCS score was 38.9 and MCS score was 48.6, whereas the median Health Assessment Questionnaire–Disability Index was 0.3. Health utilities, as assessed by Short Form-6D and EuroQoL-5D, were 0.68 (95% CI, 0.29–1.0) and 0.73 (95% CI, 0.11–1.0), respectively.

Is there a link between suboptimal care and poorer HRQoL?

In a previously described study of 868 patients who were seen in the ER, the SF-36 was used to query the HRQoL of patients 3 months after the ER visit [8]. Prescription of potentially inappropriate drug provision in the ER was associated with a significantly worse score on SF-36 physical function and pain subscales at 3-month follow-up, 11 points and 13 points lower, respectively [8].

Conclusions

Gout reduces the physical HRQoL of patients. Several studies in multiple settings confirm the deficits in quality of care for gout, including failure to achieve target uric acid of 6 mg/dL. Many factors including patient age, comorbidity, type of provider seen, and health care utilization patterns, predict these inappropriate care patterns. A concerted effort is needed to improve the quality of care

Table 1. Summary of studies of predictors of quality of care in patients with gout

Study	Patients, *n*	Outcome	Potential predictors	Significant predictors	Odds/risk ratio (95% CI)	*P* value
Sarawate et al. [14••]	2318	Medication possession ratio ≥ 80% for allopurinol	Age; sex; pre-index comorbidities; newly or previously diagnosed gout; gout flare before post-index serum urate testing	Previously diagnosed gout	2.95 (2.45–3.55)	Not provided
				Hypertension	1.44 (1.20–1.73)	Not provided
				Gout flare before post-index serum urate test	0.50 (0.40– 0.63)	Not provided
Sarawate et al. [14••]	337	Getting serum urate test after initiation of allopurinol	Age; sex; pre-index comorbidities; all post-index concomitant medications; gout-specific drugs; and mean baseline serum urate level	Baseline renal impairment	3.20 (1.25–8.23)	Not provided
				Increasing number of medications (per medication increase)	1.53 (1.21–1.94)	Not provided
				Increasing baseline serum urate level (per mg/dL increase)	1.14 (1.02–1.29)	Not provided
				Colchicine use	0.55 (0.35– 0.89)	Not provided
Neogi et al. [17]	202	Definitely or possibly inappropriate drug therapy during acute gouty arthritis	Age; sex; race; highest education level attained; self-reported comorbidities; body mass index; duration of gout; consulting a physician for the attack; and the total number of recurrent attacks during the study	Increasing number of gout attacks (risk per one attack increase)	0.8 (0.7–0.9)	0.01
				Consultation with physician during acute attack	2.5 (1.3–4.7)	0.006
Mikuls et al. [18]	Not specified	Inappropriate treatment of asymptomatic hyperuricemia with allopurinol	Age; gender; comorbidity; concomitant medication use; follow-up duration	Age	1.01 (1.00–1.03)	Not provided
				Male sex	1.82 (1.10–2.99)	Not provided
				Chronic renal failure	4.89 (1.58–15.11)	Not provided
				Diuretic use	0.46 (0.27–0.77)	Not provided
				Total medications	1.25 (1.12–1.40)	Not provided

*Odds ratio (95% CI) compared with rheumatology: primary care, 0.16 (95% CI, 0.07–0.36); specialty medicine, 0.12 (95% CI, 0.02–0.58); surgery, 0.12 (95% CI, 0.01–1.22); other, 0.13 (95% CI, 0.03–0.53). Each of these has $P < 0.05$ except surgery versus rheumatology.

Table 1. Summary of studies of predictors of quality of care in patients with gout *(Continued)*

Study	Patients, *n*	Outcome	Potential predictors	Significant predictors	Odds/risk ratio (95% CI)	*P* value
Singh et al. [19]	643	Overall physician-adherence with 3 quality indicators: allopurinol dose < 300 mg in gout patients with renal insufficiency, uric acid check with 6 mo of starting a new allopurinol prescription, and complete blood count and creatine kinase check every 6 mo for gout patients receiving prolonged colchicine therapy	Race; age; inpatient stays per year; inpatient stays per year with gout as the primary diagnosis; primary care, rheumatology, and other outpatient visits per year; percent service connection and Charlson Comorbidity Index; and number of health care providers	Age	0.78 (0.64–0.96)	0.021
				Non-white race	1.41 (0.52–3.84)	0.035
				Inpatient stays/y with gout as primary diagnosis	0.71 (0.52–0.97)	0.015
				Primary care visits/y	1.28 (1.02–1.62)	0.037
				Number of health care providers	1.69 (1.32–2.15)	0.000
Singh et al. [13]	643	Allopurinol discontinuations	Age; race; inpatient admissions/y; inpatient admissions/y with gout as primary diagnosis; days/y with outpatient primary care visits; percent service connection; means test; and Charlson Comorbidity Index	Visits per year to rheumatology or primary care		
	643	Colchicine prophylaxis with new allopurinol prescriptions	Same variables as above	Days/y with any outpatient visits	2.08 (1.54–2.80)	< 0.0001
				Most frequent clinic	*Odds ratio (95% CI) compared with rheumatology	0.001
	643	Getting serum urate test within 6 mo after initiation of allopurinol	Same variables as above	Days/y with any outpatient visits	1.60 (1.15–2.22)	0.003
				Charlson Comorbidity Index	0.61 (0.44–0.83)	0.001

*Odds ratio (95% CI) compared with rheumatology: primary care, 0.16 (95% CI, 0.07–0.36); specialty medicine, 0.12 (95% CI, 0.02–0.58); surgery, 0.12 (95% CI, 0.01–1.22); other, 0.13 (95% CI, 0.03–0.53). Each of these has P < 0.05 except surgery versus rheumatology.

and quality of life in patients with gout. This approach may include physician education, patient education, and other interventions that may help prevent errors in the use of gout medications. Interventions targeting quality of care can potentially improve the standard of care and HRQoL for patients with gout.

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References and Recommended Reading

Papers of particular interest, published recently, have been highlighted as:

- • Of importance
- •• Of major importance

1. Kramer HM, Curhan G: **The association between gout and nephrolithiasis: the national health and nutrition examination survey iii, 1988–1994.** *Am J Kidney Dis* 2002, **40:**37–42.
2. Kim KY, Ralph Schumacher H, Hunsche E, et al.: **A literature review of the epidemiology and treatment of acute gout.** *Clin Ther* 2003, **25:**1593–1617.
3. Krishnan E, Griffith C, Kwoh K: **Burden of illness from gout in ambulatory care in the United States.** *Arthritis Rheum* 2005, **52:**S656.
4. Mikuls TR, MacLean CH, Olivieri J, et al.: **Quality of care indicators for gout management.** *Arthritis Rheum* 2004, **50:**937–943.
5. Emmerson BT: **The management of gout.** *N Engl J Med* 1996, **334:**445–451.
6. Terkeltaub RA: **Clinical practice. Gout.** *N Engl J Med* 2003, **349:**1647–1655.
7. Perez-Ruiz F, Lioté F: **Lowering serum uric acid levels: what is the optimal target for improving clinical outcomes in gout?** *Arthritis Rheum* 2007, **57:**1324–1328.
8. Chin MH, Wang LC, Jin L, et al.: **Appropriateness of medication selection for older persons in an urban academic emergency department.** *Acad Emerg Med* 1999, **6:**1232–1242.
9. Smith P, Karlson N, Nair BR: **Quality use of allopurinol in the elderly.** *J Qual Clin Pract* 2000, **20:**42–43.
10. Mikuls TR, Curtis JR, Allison JJ, et al.: **Medication errors with the use of allopurinol and colchicine: a retrospective study of a national, anonymous internet-accessible error reporting system.** *J Rheumatol* 2006, **33:**562–566.
11. Ly J, Gow P, Dalbeth N: **Colchicine prescribing and safety monitoring in patients with gout.** *N Z Med J* 2007, **120:**U2808.
12. Dalbeth N, Kumar S, Stamp L, Gow P: **Dose adjustment of allopurinol according to creatinine clearance does not provide adequate control of hyperuricemia in patients with gout.** *J Rheumatol* 2006, **33:**1646–1650.
13. Singh JA, Hodges JM, Asch SM: **Opportunities for improving medication use and monitoring in gout.** *Ann Rheum Dis* 2009 (in press).
14. •• Sarawate CA, Brewer KK, Yang W, et al.: **Gout medication treatment patterns and adherence to standards of care from a managed care perspective.** *Mayo Clin Proc* 2006, **81:**925–934.

This study from a large health maintenance organization described errors in medication management and laboratory monitoring related to patients with gout.

15. Roddy E, Zhang W, Doherty M: **Concordance of the management of chronic gout in a UK primary-care population with the EULAR gout recommendations.** *Ann Rheum Dis* 2007, **66:**1311–1315.
16. Pal B, Foxall M, Dysart T, et al.: **How is gout managed in primary care? A review of current practice and proposed guidelines.** *Clin Rheumatol* 2000, **19:**21–25.
17. Neogi T, Hunter DJ, Chaisson CE, et al.: **Frequency and predictors of inappropriate management of recurrent gout attacks in a longitudinal study.** *J Rheumatol* 2006, **33:**104–109.
18. Mikuls TR, Farrar JT, Bilker WB, et al.: **Suboptimal physician adherence to quality indicators for the management of gout and asymptomatic hyperuricaemia: results from the UK general practice research database (GPRD).** *Rheumatology (Oxford)* 2005, **44:**1038–1042.
19. Singh JA, Hodges JS, Toscano JP, Asch SM: **Quality of care for gout in the US needs improvement.** *Arthritis Rheum* 2007, **57:**822–829.
20. McGlynn EA, Asch SM, Adams J, et al.: **The quality of health care delivered to adults in the United States.** *N Engl J Med* 2003, **348:**2635–2645.
21. Asch SM, McGlynn EA, Hogan MM, et al.: **Comparison of quality of care for patients in the veterans health administration and patients in a national sample.** *Ann Intern Med* 2004, **141:**938–945.
22. Owens D, Whelan B, McCarthy G: **A survey of the management of gout in primary care.** *Ir Med J* 2008, **101:**147–149.
23. Roberts C, Adebajo AO, Long S: **Improving the quality of care of musculoskeletal conditions in primary care.** *Rheumatology (Oxford)* 2002, **41:**503–508.
24. Fang W, Zeng X, Li M, et al.: **The management of gout at an academic healthcare center in Beijing: A physician survey.** *J Rheumatol* 2006, **33:**2041–2049.
25. • Roddy E, Zhang W, Doherty M: **Is gout associated with reduced quality of life? A case-control study.** *Rheumatology (Oxford)* 2007, **46:**1441–1444.

This study was the first to compare the QoL in a large sample of gout patients compared with patients without gout in primary care clinic population in the United Kingdom.

26. • Singh JA, Strand V: **Gout is associated with more comorbidities, poorer health-related quality of life and higher healthcare utilisation in US veterans.** *Ann Rheum Dis* 2008, **67:**1310–1316.

This study compared QoL in a large sample of US patients with or without gout and described the effect of medical and arthritis comorbidity on HRQoL in patients with gout. Comparisons were also made to US norms.

27. Hirsch JD, Lee SJ, Terkeltaub R, et al.: **Evaluation of an instrument assessing influence of gout on health-related quality of life.** *J Rheumatol* 2008, **35:**2406–2414.
28. Khanna D, Ahmed M, Yontz D, et al.: **The disutility of chronic gout.** *Qual Life Res* 2008, **17:**815–822.