

Effects of Nurse-led Patient Education for Gout Patients

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통풍환자에 대한 간호사 주도 환자교육의 효과

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Abstract Objectives: This study was performed to analyze the effect of nurse-led education on results for patients with gout. **Methods:** The face-to-face education was conducted by a specialist nurse. Patient satisfaction and drug adherence, serum uric acid was assessed. **Results:** Patient satisfaction was significantly higher in the nurse-led education group than in the usual care group. The serum uric acid level on the second visit was lower after patient education. In addition, the mean drug adherence in the nurse-led group was significantly higher than in the usual care group on the second and third visits. **Conclusion:** The nurse-led education about gout improves patient satisfaction, drug adherence, and serum uric acid level in patients with gout.

Key Words : Gout, Patient-satisfaction, Nurse-led education, Patient education coordinator, Drug adherence

요약 통풍은 관절염뿐만 아니라 심혈관질환 등을 유발하는 만성염증질환이다. 하지만 대부분의 환자들이 단순히 관절질환으로 인식하고 있어 치료에 장애로 작용한다. 이 연구를 통해 간호사 주도의 통풍환자 대상 교육이 환자의 통풍에 대한 인식 개선 및 질병 경과에 미치는 영향을 확인하고자 하였다. 교육전문 간호사가 상급종합병원 류마티스내과 외래에 내원한 환자를 대상으로 통풍에 대한 일대일 교육을 시행하였고 환자의 만족도 및 복약순응도, 혈중 요산치의 변화 정도를 측정하였다. 교육을 받은 환자군의 진료만족도는 대조군에 비해 유의하게 높았으며 두 번째와 세 번째 외래 방문 시에 측정된 복약순응도와 혈중 요산치는 대조군에 비해 교육군에서 유의하게 개선이 되었다. 결론적으로 간호사 주도 환자교육은 진료만족도 개선 및 질환 경과의 호전에도 도움이 되는 것으로 확인되었다.

키워드 : 통풍, 진료만족도, 간호사 주도 환자교육, 교육전문 간호사, 복약순응도

1. INTRODUCTION

Gout is the most common metabolic and inflammatory arthritis and is caused by persistent hyperuricemia. A number of studies suggest that gout is associated with various comorbidities including cardiovascular diseases (CVDs) [1-12]. Urate lowering therapy (ULT) has been reported to

improve the outcomes of various comorbidities [13, 14]. Therefore, adherence to prescribed medication is important to the management of gout by maintaining the optimal therapeutic target (<6.0mg/dL) of serum uric acid [15]. However, numerous studies have reported very low rates (less than 50%) of adherence to ULT among patients with gout [15-20]. Drug adherence during the first year of

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gout (36.8%) was reported to be the lowest among the following chronic diseases: hypertension (72.3%), hypothyroidism (68.4%), diabetes mellitus (65.4%), seizure disorders (60.8%), hypercholesterolemia (54.6%), and osteoporosis(51.2%) [15,21].

There are several barriers to adherence to therapies by gout patients. First, treatment-related factors including posology, tolerability, and potency affect adherence [15]. In terms of posology, patients prefer a once-daily dose of ULT over multiple daily doses. In a European cohort study, the two most commonly used urate lowering agents in the world, allopurinol and febuxostat demonstrated appropriate adherence in gout patients (allopurinol 82%, febuxostat 92%) [22]. Second, patient-related factors such as awareness, motivation, and behavior are associated with adherence. Lack of adequate information about gout and treatment strategies may cause poor adherence to ULT [15]. Third, the physician-patient relationship, accessibility to experts, and cost-reimbursement issues are important healthcare system-related factors that can greatly affect adherence to treatment. Patients prescribed ULT by a rheumatologist or nephrologist, showed better adherence than those to whom ULT was prescribed by other physicians [15].

To improve the drug adherence to gout therapies, the British Society for Rheumatology (BSR) Guideline for the Management of Gout strongly emphasized the importance of gout patient education over any other intervention [23]. Most of the aforementioned factors can be improved through better patient education. Doherty *et al.* reported the findings of a randomised controlled trial of nurse-led education and engagement compared with usual care, led by general practitioners (GPs) [24]. In the nurse-led group, 95% of patients compared with 30% in the usual-care group achieved the targeted level of serum uric acid (less than 360 $\mu\text{mol/L}$) after 2 years. The

frequency of gout flares and the number of tophi were also significantly lower among patients in the nurse-led group than those in the usual-care group.

At tertiary centers, the average outpatient consultation time is less than five minutes in Korea [25]. Thus, it is difficult for physicians to inform and properly educate patients to enhance adherence of outpatients.

In this study, we examined the impact of nurse-led patient education for improving outpatient care satisfaction and therapy compliance of gout patients.

2. METHODS

2.1 Study design and participants

This study is a parallel arm, non-blinded randomised controlled trial in single tertiary center. Adult gout patients (age ≥ 18 years) were enrolled who needed or were undergoing ULT. Patients were randomly assigned 1:1 to either the nurse-led education group or the usual care group. A randomization schedule was created using Microsoft Excel 2010. The nurse-led education group received face-to-face education from a specially trained nurse on their first visit. Patient satisfaction was investigated using the visual analogue scale (VAS; 0 to 100 mm) and a patient satisfaction questionnaire (PSQ) in both groups [26, 27]. The Korean version of PSQ has already been applied in other study [26]. The PSQ consisted of 45 questionnaires with a total of six items (including general satisfaction, giving of information, empathy with the patient, technical quality and competence, and attitude toward the patient, access and continuity). In addition, the over all saturation could be calculated using the score of each item [27]. Another questionnaire to evaluate patient knowledge about gout was used in both groups (as shown Table 1). This knowledge questionnaire has

been used in a previous multi-center survey [28]. On the second patient visit (two or three months after the first visit) and third visit (three months after the second visit), a questionnaire regarding patient knowledge about gout, drug adherence, and serum uric acid were investigated in both groups.

This study protocol was reviewed and approved by the Institutional Review Board of Chungnam National University Hospital (IRB No. 2016-09-019-005) and performed according to the Declaration of Helsinki. All subjects provided their informed written consent before participation.

Table 1. Questionnaire to evaluate patient knowledge about gout

Questionnaire regarding patient knowledge about gout
1. I know the cause of gout.
2. I know how to treat a gout attack.
3. I know the differences between treatment of a gout attack and maintenance therapy (urate lowering therapy) of gout.
4. I know it is important to take the medicine daily in order to lower the level of uric acid regardless of the pain.
5. I know about the treatment drugs allopurinol and febuxostat.
6. I know the factors that accelerate the development of gout.
7. I received an explanation about gout from a doctor or a nurse.
8. I read the booklet about information on gout.
9. I know the effect on gout of drinking alcohol.

Count the number of 'yes' answers

2.2 Interventions

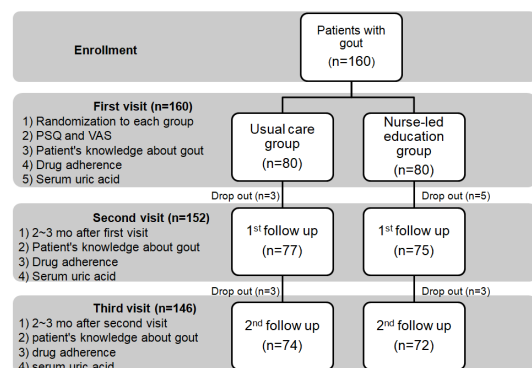
The nurse who provide patient education is a regular nurse and has been worked at a tertiary center for more than 10 years. In addition, the nurse has been engaged in patient education for more than three years and has completed the training course of rheumatology specialist nurse. Furthermore, the nurse trained by two rheumatologists and a nutritionist. The training was about the key points for the management gout, including such as causes and consequences of gout and hyperuricemia, lifestyle and diet, use of alcohol, obesity, and ULT goals that reflect recent guidelines [23]. The nurse-led patient education was conducted in a separate space from the clinic

for about 20 to 30 minutes through individual interviews on the first visit. In addition, patients were given a booklet with more complete information about gout (nature, causes, diagnosis, treatment options, lifestyle, and diet). The contents of the booklet were made based on the Arthritis Research UK booklet and modified to reflect the situation in Korea. As recommended in most treatment guidelines, allopurinol and febuxostat were prescribed as first-line treatment. For prophylaxis against gout flares, colchicine was used concurrently for more than 6 months. The usual care group also received patient education on their third visit.

2.3. Data Collection and Outcomes

We recorded demographic information for each patient, such as age, gender, body mass index (BMI), gout duration, serum uric acid (sUA) value at baseline, current ULT dosage (daily dosage), and comorbidities.

The primary outcome was based on patient satisfaction, which was investigated using the visual analogue scale (VAS: 0 to 100 mm) and a patient satisfaction questionnaire (PSQ). Secondary outcomes were based on the concentration of serum uric acid, drug adherence (assessed by pill count), and a questionnaire regarding patient knowledge about gout [28,29].



(VAS: visual analogue scale (0-100 mm), PSQ: patient satisfaction questionnaire)

Fig. 1. Flow of patient randomization, and follow-up

2.4. Statistical Analysis

The sample size was determined by previous studies [26,27]. Also, we performed a pilot study with 116 gout patients (58 patients in each group). There were significant statistical differences between the nurse-led group and control group. We used a Student t-test for cases of normal distribution and the Mann-Whitney test for cases where the distribution was not normal. Non-continuous variables were analyzed using chi-square tests. The effects of nurse-led education were validated using an independent t-test. The secondary outcomes (mean differences in outcomes between the two groups at each visit) were estimated with Analysis Of Variance (ANOVA). P-values <0.05 were considered statistically significant. The data were analyzed using SPSS version 20.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

3. RESULTS

3.1 Baseline Characteristics

Of 160 participants who started the study, 152 patients completed the survey on the second visit and 146 patients completed the survey on the third visit (Fig. 1). The baseline characteristics of 146 patients who completed the final survey are presented in Table 2. The mean age was 57.0 ± 13.4 years. Most patients (95.2 %) were male and the mean disease duration was 5.63 ± 6.07 years. Of the 146 patients, 90 (61.6 %) had at least one comorbidity. Among the comorbidities, hypertension (40.4 %) was the most frequent, followed by Renal parenchymal disease (22.6 %), heart disease (18.5 %), diabetes mellitus (13.0 %), and urinary stone (7.5 %). There was no statistical difference in the demographic characteristics between the two groups.

Table 2. Baseline characteristics

Variables	Usual care (n=74)	Nurse-led education (n=72)	p-value
	Mean±SD or N(%)		
Age(years)	58.4±13.1	55.7±13.7	.224
Sex	M:97.3 %	M:95.8%	.674
	F: 2.7 %	F: 4.1%	
BMI (kg/m ²)	26.7±3.2	26.4±3.3	.609
Disease duration (years)	5.3±5.8	6.0±6.4	.443
Comorbidities			
Heart disease*	15 (20.3 %)	12 (16.7 %)	.670
Hypertension	32 (43.2 %)	27 (37.5 %)	.504
Diabetes	10 (13.5 %)	9 (12.5 %)	.818
Kidney disease	16 (21.6 %)	17 (23.6 %)	.845
Urinary stone	6 (8.1 %)	5 (6.9 %)	.598
Baseline serum uric acid (mg/dL)	6.0±1.5	6.4±1.8	.622
Allopurinol (mg)	7 (9.5 %) (192.3±60.7)	9 (12.5 %) (161.1±92.3)	.448
Febuxostat (mg)	67 (90.5 %) (50.2±17.5)	63 (87.5 %) (55.6±19.6)	.100

Values are presented as number (%), or mean±standard deviation (SD). BMI: body mass index. *Includes angina, myocardial infarction, arrhythmia, and congestive heart failure.

3.2 Comparison of patient satisfaction between the nurse-led education and usual care group

First, we compared the patient satisfaction with treatment as measured by the VAS for the two (usual care and nurse-led education) groups. The patient satisfaction with treatment measured by the VAS for the nurse-led education group was significantly higher than that of the usual care group (83.8 ± 21.2 mm for nurse-led education group vs. 72.6 ± 21.4 mm for usual care group, $p = 0.002$) (Table 3). Next, PSQ was used to compare the treatment satisfaction of patients in both groups. Of the six items on the PSQ, the scores of four items (general satisfaction, giving of information, empathy with the patient, access and continuity) were significantly higher in the nurse-led education group than in the usual care group. There was no statistically significant

difference between the two groups for the other two items (technical quality and competence, attitude towards the patient). Accordingly, the overall satisfaction was statistically significantly higher in the nurse-led education group than in the usual care group (3.83 ± 0.52 for nurse-led education group vs. 3.64 ± 0.36 for usual care group, $p = 0.003$) (as shown Table 3).

Table 3. Comparison of patient satisfaction of nurse-led education group and usual care group Values are presented as mean \pm standard deviation (SD)

	Usual care group	Nurse-led education group	p-value
Satisfaction (VAS, mm)	72.57 \pm 21.36	83.75 \pm 21.18	.002
PSQ			
General satisfaction	3.61 \pm 0.57	3.87 \pm 0.64	.013
Giving of information	3.11 \pm 0.50	3.38 \pm 0.43	.001
Empathy with the patient	3.43 \pm 0.49	3.71 \pm 0.59	.002
Technical quality and competence	4.23 \pm 0.35	4.36 \pm 0.53	0.08
Attitude towards the patient	3.60 \pm 0.51	3.69 \pm 0.56	.285
Access and continuity	3.81 \pm 0.44	3.99 \pm 0.51	.02
Overall satisfaction	3.64 \pm 0.36	3.83 \pm 0.52	.003

VAS: visual analogue scale (0-100 mm), PSQ: patient satisfaction questionnaire.

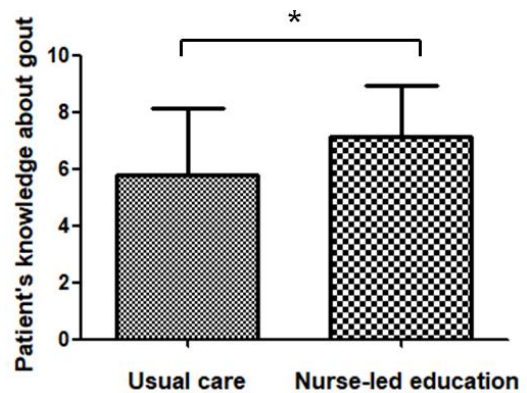
3.3 Effects of nurse-led education

3.3.1 Changes in the level of patient knowledge about gout

We evaluated the effects of nurse-led education using various parameters. First, we compared the difference in the level of patient knowledge about gout between the nurse-led education group and the usual care group using the questionnaire to evaluate patient knowledge about gout.

The nurse-led group had a significantly higher level of knowledge about gout than did those in the usual care group (7.12 ± 1.83 for nurse-led education group vs. 5.76 ± 2.35 for usual care group,

$p < 0.001$) (as shown Fig. 2).



(Data is expressed as mean \pm SD. Statistical significance was determined by t-test * $p < 0.001$.)

Fig. 2. Changes in the level of knowledge about gout in patients

Moreover, we analyzed the changes in the level of patient knowledge about gout over time. First of all, the level of knowledge about gout in patients before education was 5.70 ± 2.05 , but the level of knowledge measured after education was significantly higher (7.12 ± 1.83 , $p < 0.001$). There was no significant difference in the level of patient knowledge about gout in the surveys conducted after education (first visit) and at the second and third visits (7.12 ± 1.83 for first visit, 7.31 ± 1.46 for second visit, 7.27 ± 1.31 for third visit, $p > 0.05$).

3.3.2 Changes in drug adherence by patients

Next, we compared the changes in drug adherence between the nurse-led education group and the usual care group during the three visits. On the first visit, there was no statistical difference in drug adherence between the nurse-led education group and the usual care group (86.79 ± 10.61 for nurse-led education group vs. for usual care group, $p > 0.05$) (Table 4). The mean drug adherence in the nurse-led group was significantly higher than that in the usual care group on the second and third visits (as shown Table 4).

3.3.3 Changes in the level of serum uric acid in patients

In addition, we measured the serum uric acid of patients in the two groups on each visit to confirm changes in the response to education. On the first visit, there was no statistical difference in the level of serum uric acid between the nurse-led education group and the usual care group (6.13 ± 1.61 mg/dL for nurse-led education group vs. 6.33 ± 1.81 mg/dL for usual care group, $p > 0.05$) (Table 5). The mean concentration of serum uric acid in the nurse-led group was significantly lower than those in the usual care group on the second and third visits (Table 5). In the nurse-led education group, the mean decrease in the uric acid concentration between the first and second visits (0.66) was greater than the decrease between the second and third visits (0.24), and this difference was statistically significant ($p < 0.05$).

4. DISCUSSION

Through this study, it was found that nurse-led patient education during outpatient treatment of gout increases the overall satisfaction of patients. For all items of the PSQ, the scores of the nurse-led education group were higher than those of the usual care group. For four items in particular (general satisfaction, giving of information, empathy with the patient, access and continuity), the differences shown were statistically significant. In addition, the patient drug adherence increased after education, which significantly reduced the serum uric acid concentration compared to those in the usual care group.

The disease course and prognosis of gout patients have improved significantly with the development of various drugs and the establishment of appropriate treatment goals. However, in numerous studies, common misconceptions about gout remain barriers to optimal treatment [24,29,30]. Therefore, in recent years, patient education

has been emphasized so that patients can improve their overall quality of life by understanding and managing their own disease conditions [31].

Recently, nurses in the rheumatology department have been trained to undertake more important and extensive roles: patient education, assessment of disease activity, monitoring patients on disease-modifying antirheumatic drugs (DMARDs), and counseling for drug adjustments. Numerous studies have demonstrated that nurse-led care provides more effective patient education with higher satisfaction [32-34]. It was proved that patient satisfaction with the care offered in various chronic diseases improves drug adherence, disease course, and the health-related quality of life [32,35]. In the study of Koksvik *et al.*, when nurses conducted education of patients with inflammatory arthritis at 3, 9, and 21 months, and evaluated the performance at 9 and 21 months, the nurse education group presented better results compared to the doctor education group. In particular, for all items (even giving information), the score improvement of the nurse education group was higher than for the doctor education group [32]. Based on this, European League Against Rheumatism (EULAR) issued a recommendation emphasizing the role of nurses in treating chronic inflammatory arthritis [36].

Although the number of patients is small and the study period is short compared to the study by Doherty *et al.*, our study has several unique points [24]. First, our study only enrolled patients receiving treatment from rheumatologists in tertiary centers, which are more specialized in gout treatment than general practitioners (GPs) are. Because GPs mainly treat patients with acute gout, they often hesitate to prescribe uric acid lowering agents or do not increase them sufficiently. It is for this reason, that the study by Doherty *et al.* may have shown a significant difference in uric acid concentrations between the nurse-led care group and the usual

care group. Second, the primary outcome of our study was patient satisfaction. Patient satisfaction is an important parameter of the quality of care in clinics [32,37]. It has been reported that an increase in satisfaction with treatment, results in improvement of drug adherence, functional status, and health-related behaviors in a variety of chronic diseases [32,35]. In addition, patient satisfaction was found to be an important parameter that could be modified by nurse-led care in a rheumatology clinic in a previous study [26]. Last, in order to confirm the effect of education on reduction of the uric acid concentration, we analyzed the change in the level of knowledge about gout and drug adherence as a secondary outcome. Serum uric acid is affected by combined drugs, meals, and alcohol consumption. Therefore, to confirm the effectiveness of nurse-led education, the levels of knowledge about gout and drug adherence were analyzed together.

This study has some limitations. Compared to the study by Doherty *et al.*, a relatively small number of patients participated in our study and the study period was short. However, as mentioned above, the primary and secondary outcomes in our study are different from those in the study of Doherty *et al.* In addition, the statistical power of the sample size was sufficient (relative to those of previous studies) for evaluation of the patients' medical satisfaction [26, 32]. Age, education, and socioeconomic levels could affect patient satisfaction in response to nurse-led education, and could also affect adherence to ULT, but these variables were not considered in this study.

5. CONCLUSION

In conclusion, nurse-led patient education about gout increases patient satisfaction with treatment in a rheumatology clinic of a tertiary medical center. Moreover, the drug adherence for ULT and serum uric acid level were improved in patients with gout by nurse-led education.

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