Prescription Pattern of NSAIDs and the Prevalence of NSAID-induced Gastrointestinal Risk Factors of Orthopaedic Patients in Clinical Practice in Korea

Sung-Hun Lee¹, Chang-Dong Han², Ick-Hwan Yang³, and Chul-Won Ha⁴

¹Department of Orthopaedic Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul; ²Department of Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Korea

Received: 24 August 2010
Accepted: 24 February 2011

Address for Correspondence:
Chul-Won Ha, MD
Department of Orthopaedic Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, 81 Inwon-ro, Gangnam-gu, Seoul 135-710, Korea
Tel: +82-2-3410-0275, Fax: +82-2-3410-0061
Email: hcwh@skku.edu

This study was supported by Korean Knee Society Scientific Committee Cooperation studies program and a grant from Pfizer Pharmaceuticals Korea Limited in 2008.

INTRODUCTION

Nonsteroidal anti-inflammatory drugs (NSAIDs) are one of the most commonly used medications in the world. NSAID-induced adverse reactions involve upper gastrointestinal (GI) tract complications, which can be life-threatening. GI complications occur in 1%-5% of patients taking NSAIDs for more than one year and result in high costs and mortality (1-6). Rates of GI complications may vary substantially depending on each patient’s clinical characteristics. Identification of the NSAID-related GI risk factors is therefore crucial in determining the proper treatment for each patient. Many studies already reported that the development of serious GI complications are highly correlated with certain factors, including health status of disability (7, 8), increasing age (2), concommitant use of systemic steroids (9) or anticoagulants (10), history of a GI ulcer of bleed (11), diagnosis of rheumatoid arthritis (4), certain patterns of prior NSAID use (12), history of cardiovascular disease (13), smoking status (7, 14), and NSAID-related GI symptoms (8, 10, 15).

Prior to market release of the first cyclooxygenase-2 enzyme (COX-2) selective inhibitor (celecoxib), northern California health maintenance organization (HMO) developed a treatment guideline for the use of NSAIDs based on the Standardized Calculator of Risk for Events (SCORE) program developed at Stanford University, Division of Immunology and Rheumatology (2, 8). The SCORE tool stratifies patients by risk of developing serious GI complications using patient characteristics that have assigned points. After May 1999, different NSAIDs were recommended for patients depending on the total number of points assigned by the SCORE tool.

It is desirable that physicians consider each patient’s clinical factors before prescribing NSAIDs. Some studies already demonstrated the relationship between the clinical factors and the use of the NSAIDs (16). However, few domestic studies have been undertaken on physician’s prescription patterns of NSAIDs and the GI risks factors of the patients taking them.

In this study, we evaluated the current prescription pattern of NSAIDs and the prevalence of NSAID-induced GI risk factors of orthopaedic patients in real clinical practice in Korea.
MATERIALS AND METHODS

This was a cross-sectional observational study of Korean patients taking NSAIDs for the treatment of orthopaedic problems. Study members included 3,140 all adults (20 yr-old or older) who visited orthopaedic department of 131 hospitals (9 general hospitals, 122 private clinics) in the period between January and August 2008.

A self-administered questionnaire was prepared to assess the risk factors of GI complications. The questionnaire was given to the patients at the outpatient office who agreed to complete the questionnaire and was filled directly by the patients. The questions on the risk factors of GI complications consisted of age, current health status, smoking habit (over 10 cigarettes/day or less), drinking habit (100 g/day), diagnosis of rheumatoid arthritis, history of Helicobactor pylori infection, concomitant use of corticosteroids (number of months in a year), long-term NSAIDs therapy (≥ 3 months), aspirin use, anticoagulant use, selective serotonin reuptake inhibitor (SSRI) use, previous hospitalization event due to GI problems (an ulcer or a bleed), history of GI symptoms and diagnosis of co-morbid disease (cardiovascular, kidney, liver, diabetes, hypertension).

Additionally, we employed GI SCORE for each patient. The GI SCORE takes into account six predictors (age, diagnosis of rheumatoid arthritis, current health status, proportion of time taking steroids, history of a previous GI side effects, and history of a previous GI hospitalization) which were already identified from the questionnaires (16). A certain number of points were allocated for the responses of each predictor and the GI SCORE was calculated for each patient. The risk levels were stratified into 4 groups. A score of 10 or less indicated that risk of a serious GI problem was low; 11-15 points indicated moderate risk; 16-20 points indicated high risk; and more than 20 points indicated very high risk.

The data on the prescription type of the NSAIDs were filled up by the physicians at the outpatient clinic office. The patterns of NSAIDs prescription were analyzed and the percentage of COX-2 inhibitor prescription was also assessed in each risk group.

Ethics statement

This study was approved by the institutional review board of Samsung Medical Center, Seoul (IRB No.: 2010-09-041-001). Informed consent was exempted by the board.

RESULTS

A total of 3,140 adult patients taking NSAIDs were eligible for this study. Women accounted for 69% of the patients and the average age for the group was 63.1 (20-98) yr. When dividing into two age subgroups, 1,690 (54%) patients were aged over 65 yr and females were 75% in the older aged group (≥ 65 yr). Arthritis was the most common cause of taking NSAIDs (67%), fol-

| Diagnosis                      | Total (% of total) | General hospital | Private clinic | Gender | Male (% of total) | Female (% of total) | Age (yr) | < 65 (% of total) | ≥ 65 (% of total) |
|--------------------------------|--------------------|------------------|---------------|--------|-------------------|---------------------|----------|------------------|-------------------|
| Arthritis                      | 67%                | 81               | 62            |        | 55                | 72                  |          | 56               | 76                |
| Knee arthritis                 | 31%                | 31               | 30            |        | 22                | 34                  |          | 25               | 35                |
| Spinal disease                 | 9%                 | 2                | 11            |        | 11                | 8                   |          | 9                | 9                 |
| Spinal stenosis                | 5%                 | 1                | 7             |        | 6                 | 5                   |          | 4                | 7                 |
| Herniated lumbar disc          | 2%                 | 1                | 3             |        | 3                 | 2                   |          | 4                | 1                 |
| Fracture                       | 5%                 | 3                | 6             |        | 9                 | 4                   |          | 7                | 4                 |
| Wrist/hand fracture            | 1%                 | 0                | 1             |        | 1                 | 0                   |          | 1                | 0                 |
| Foot/ankle fracture            | 1%                 | 1                | 1             |        | 2                 | 1                   |          | 1                | 1                 |
| Femur fracture                 | 1%                 | 1                | 0             |        | 1                 | 1                   |          | 0                | 1                 |
| Sprain                         | 4%                 | 0                | 6             |        | 7                 | 3                   |          | 8                | 1                 |
| Lumbar sprain                  | 2%                 | 0                | 2             |        | 2                 | 1                   |          | 3                | 1                 |
| Other inflammatory disease     | 4%                 | 1                | 6             |        | 6                 | 4                   |          | 6                | 3                 |
| Epicondylitis                  | 1%                 | 0                | 2             |        | 2                 | 1                   |          | 2                | 0                 |
| Other diseases                 | 12%                | 11               | 12            |        | 15                | 11                  |          | 15               | 9                 |
allowed by spinal disease (9%), fracture (5%), sprain (4%), other inflammatory disease (4%), and others (12%) (Table 1).

Among the GI risk factors identified in the questionnaire, long-term use of NSAIDs (≥ 3 months) was the most prevalent risk factor in the overall study population, followed by old age (≥ 65 yr) (54%), co-morbid disease (cardiovascular, renal, liver, diabetes, hypertension) (46%), higher NSAID doses (43%), previous GI events (36%) and aspirin use (15%) (Table 2).

When the study groups were stratified into four risk groups according to GI SCORE tool, 45% of the patients belonged to high risk or very high risk groups for GI complications, and female accounted for about 75% (Fig. 1). Female patients tended to be more risky compared to male patients (49% vs 37%), and older groups (≥ 65 yr) had greater GI risk compared to younger groups (< 65 yr) (72% vs 14%). The proportion of arthritis patients also had a tendency to be greater as the risk level was higher (31% [low risk] < 67% [moderate] < 71% [high] < 76% [very high]).

When the type of prescription was analyzed in overall study groups, celecoxib (COX-2 selective inhibitor) was the most commonly used NSAIDs, comprising 36% of the patients. Aceclofenac (22%), meloxicam (15%), zaltoprofen (7%), nabumetone (5%), loxoprofen (5%), and talniflumate (5%) were followed consecutively (Table 3).

| Table 3. The type of prescription in overall study groups (units in %) |
|---|
| **NSAIDs** | **Total (n=3,140)** | **Gender** | **Hospital type** | **Age** | **Risk level** |
| **NSAIDs** | **Male** | **Female** | **General hospital** | **Private clinic** | **< 65 yr** | **≥ 65 yr** | **Low** | **Moderate** | **High** | **Very high** |
| Celecoxib | 36 | 28 | 39 | 32 | 37 | 14 | 54 | 6 | 28 | 51 | 56 |
| Aceclofenac | 22 | 26 | 21 | 14 | 25 | 28 | 18 | 27 | 25 | 17 | 21 |
| Meloxicam | 15 | 12 | 16 | 15 | 14 | 18 | 11 | 16 | 16 | 13 | 10 |
| Zaltoprofen | 7 | 8 | 6 | 11 | 6 | 10 | 4 | 10 | 8 | 6 | 4 |
| Nabumetone | 5 | 6 | 5 | 8 | 4 | 7 | 4 | 10 | 5 | 4 | 3 |
| Loxoprofen | 5 | 6 | 4 | 1 | 6 | 6 | 3 | 7 | 4 | 3 | 7 |
| Tainiflumate | 5 | 8 | 4 | 0 | 7 | 9 | 2 | 14 | 6 | 3 | 1 |
| Chondroitin sodium sulfate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Clematis mandshurica | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 2 | 1 | 0 | 1 |
| Deltabuprofen | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diacerein | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diclofenac | 1 | 1 | 1 | 3 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| Etodolac | 2 | 1 | 2 | 6 | 1 | 3 | 1 | 3 | 3 | 1 | 0 |
| Glucosamine sulfate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Indomethacin | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Lornoxicam | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Morniflumate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Naproxen | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Nimesulid | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Piroxicam | 1 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| Proglumetacin maleate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Sulindac | 1 | 0 | 1 | 3 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Avocado soya unsaponifiable | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Ketoprofen | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Opioids | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ultracet | 11 | 11 | 12 | 14 | 11 | 11 | 12 | 7 | 11 | 12 | 19 |

Fig. 1. Composition of GI risk groups according to SCORE tool.
COX-2 selective inhibitor was prescribed in 56.2% of very high risk patients and 50.9% of high risk patients. Only 51% of patients at high or very high risk patients were receiving COX-2 selective inhibitors. Analysis of prescription pattern revealed that only 60% of patients with concomitant antiocoagulant use, 54% of the patients aged over 65 yr, 52% of patients with concurrent aspirin use were prescribed COX-2 selective inhibitor to decrease the risk of developing GI complications. Its prescription rate was even lower in patients with the other GI risk factors. Comparing two age groups with each GI risk factor, its prescription rate was greater in older aged groups (≥ 65 yr) overall (Table 4).

### DISCUSSION

Multiple case-control population and database studies have confirmed that use of NSAIDs increases the risk of significant GI complications (e.g., bleeding, hospitalization, surgery) from 3.5-fold to 7.8-fold overall (4, 17, 18). The adverse events are usually mild such as in dyspepsia and abdominal pain in most of the cases, but sometimes the events can be life-threatening in cases of bleeding and perforation. In the United States, it is estimated that approximately 107,000 patients are hospitalized annually for NSAID-related GI complications and at least 16,500 NSAID-related deaths occur each year among arthritis patients alone (15).

The symptoms of NSAID-induced GI complication vary and sometimes can be completely absent, that the understanding of the NSAID-induced GI risk factors has been emphasized (19). Several epidemiologic studies have identified the risk factors for developing GI complications, including health status of disability (7, 8), increasing age (2), concomitant use of systemic steroids (9) or antiocoagulants (10), history of a GI ulcer of bleed (11), diagnosis of rheumatoid arthritis (4), certain patterns of prior NSAID use (12), history of cardiovascular disease (13), smoking status (7, 14), and NSAID-related GI symptoms (8, 10, 15). While individual risk factors have been identified by a number of studies, the necessity of a multivariate risk factor model to permit estimation of risk in individual patient and initiation of appropriate therapeutic action has been suggested. Fries et al. first created a GI bleeding risk model based on Arthritis, Rheumatism, and Aging Medical Information System (ARAMIS) database in 1991 (2). A refined updated model, the SCORE tool, was presented in abstract form by Singh et al. in 1998. The SCORE tool is accepted as a reliable and accurate predictor of serious NSAID-related GI events in rheumatoid arthritis and osteoarthritis patients and currently used as a main risk model in related studies (16, 20-22).

One main purpose of this study was to understand and present the NSAID-induced GI risk factors and the actual pattern of NSAID prescription in real clinical practice in Korea. Therefore, the GI risk factors already identified in previous studies other than the SCORE tool have been also included in the questionnaire. This study revealed that long-term use of NSAIDs was the most prevalent risk factor in Korean orthopaedic patients, followed by old age (over 65 yr) (54%), co-morbid disease (cardiovascular, renal, liver, diabetes, hypertension) (46%), use of high dose NSAIDs (43%), previous GI events (36%) and aspirin use (15%) (Table 2). The Korean Knee Society (KKS) presented comparable results, yielding old age over 65 yr (56%), history of previous GI symptom (40%), presence of co-morbid disease (25%) were prevalent risk factors in the NSAID-induced GI risk management study in 2009 (22).

Our study also showed that about half (45% in this study) of the population taking NSAIDs for a number of reasons were classified into high/very high risk groups for GI complications, but only 51% of them were given COX-2 selective inhibitor for the prevention of GI events. Similarly, only 50% of old patients (over 65 yr) with previous GI symptom and only 60% of old aged patients previously hospitalized due to GI events were prescribed COX-2 selective inhibitor. Korea Food and Drug Administration has forbidden the combined use of non-selective NSAIDs with aspirin due to high bleeding tendency and decreased renal function. Nonetheless, the proportion of the combined use of non-selective NSAIDs among the patients taking aspirin was high up to 48% in our study. Physician’s neglect on patient’s GI factor in real practice, each physician’s preference for a specific NSAID, vigorous marketing of pharmaceutical companies, harsh curtailment of medical expenses by Health Insurance Review and Assessment Service (HIRAS) as well as unawareness of the patients could be accounted for the inappropriate NSAIDs prescription.

Although COX-2 selective inhibitor significantly decreases...
GI complications compared to non-selective NSAIDs, its uncondi-
tional prescription is inappropriate because cost-effectiveness
of COX-2 selective inhibitor is likely to be lower in population
at lower risk for GI complications (16). The northern Cali-
fornia HMO guideline recommended different NSAIDs for patients
depending on the total number of points assigned by the SCORE
tool (16). A COX-2 selective inhibitor was recommended for pa-
tients with a score of 21 or greater; a moderate-risk NSAID such
as nabumetone, etodolac, or salasalate for patients with inter-
mediate scores (16-20 points); and a traditional NSAID such as ibu-
profen, sulindac or naproxen for patients with the lowest scores
(1-15 points). This treatment guideline was designed to max-
imize the cost-effectiveness of NSAID utilization by prescribing
less expensive non-selective NSAIDs for the patients at low GI
risk and reserving expensive COX-2 selective inhibitor for the
patients at higher risk. With an effort such as mailing the guide-
line to the physicians enrolled in the HMO and education pro-
trogram through drug education pharmacists, a 5.5-fold difference
in the use of COX-2 selective NSAIDs was obtained between the
patients in the highest-risk decile and the patients in the lowest
risk decile (16). Correspondingly, the risk stratification model
used in developing the SCORE tool showed that the risk of hos-
pitalization or death due to NSAID-related GI complication de-
creased by approximately 4-fold between arthritis patients in
higher and lower risk strata (2, 16). Our study resulted in similar
pattern of NSAID utilization, showing more frequent use of COX-
2 selective inhibitor in higher risk groups (6% [low] < 28% [mod-
erate] < 51% [high] < 56% [very high]) and more common use of
non-selective NSAIDs in less risk groups. However, it is evident
that little effort has been made to decrease GI complication for
Korean patients taking NSAIDs as mentioned before. In an ob-
servational study by Korea Knee Society, only 41% of overall pa-
tients taking NSAIDs and 43% of patients at high risk groups were
prescribed GI protective medication, indicating that physicians
make little efforts to consider patient’s individual GI risk factors
in real practice. Comparable results were reported that the pre-
scription rates of GI protector in patients with current GI symp-
tom and in patients without it were not significantly different
(44% vs 39%) (22), meaning that physicians prescribe GI protec-
tor rather in the customary manner without considering patient’s
factor. Physician’s voluntary efforts to put more attention on in-
dividual factor, patient’s self-awareness on the adverse effects
caused by NSAIDs as well as government-led promotion pro-
grams such as mailing guideline booklets and periodic educa-
tion program could aid in decreasing GI complications induced
by NSAIDs medication.

Cote et al. (23) reported that after the intervention (combi-
nation of education and computer alert), the use of gastroprotec-
tor in high risk patients increased from 45% with no interven-
tion to 52% with physician education alone, to 46% with the com-
puter alert alone, and to 67% with the combination of physician
education and computer alert (P < 0.005). Recently, a revised
SCORE tool (electronic SCORE) was designed with an effort to
easily access patient criteria and estimate a patient’s risk using
computer-stored medical and demographic information (21).
Application of electronic SCORE to hospital Order-Communi-
sation system (OCS) could be another method to easily predict
individual’s risk for NSAID-induced GI complication.

This study has a few limitations. First, there were no research-
es on the pattern and type of gastroprotector use. As mentioned
previously, Korean Knee Society reported the overall prescrip-
tion rate of gastroprotector was as low as 41% and physicians
used gastroprotector in customary manner rather than consid-
ering patient’s individual factor including current GI symptom
(22). Young medical specialists (with certification year less than
10) prescribed gastroprotectors more actively, assuming that
doctors recently educated were rather well aware of the severity
of adverse effects caused by NSAIDs. The most commonly used
gastroprotector was cytoprotectant followed by H2 receptor an-
tagont, gastropokinetic and proton pump inhibitor (22). The
low prescription rate of proton pump inhibitor seemed to be
related to low rate of reimbursement by National Health Insur-
ance (NHI). Secondly, this study was a cross-sectional observa-
tional study designed to obtain an initial data for the current pat-
tern of NSAIDs utilization and confirm the prevalence of GI risk
factors of Korean patients taking NSAIDs. Therefore, we did not
put much effort to develop new GI risk factor. More interesting
data could be obtained if we had progressed more research on
the topic such as new GI risk factor typical to Korean population,
degree of patient’s awareness on adverse effects by NSAIDs, phy-
sician’s criterion or principle in choosing the type of NSAIDs or
gastroprotectors. This study is still meaningful in that it offered
valuable data on the current prescription pattern of NSAIDs in
real clinical practice in Korea at the very first, and gave us a mo-
moment to share insights on the solution to minimize NSAID-in-
duced GI complications effectively. Strategic efforts such as phy-
sician’s voluntary attention to estimate individual patient’s risk
factor, patient’s self-awareness on the adverse effects caused by
NSAIDs, government-led campaign activities such as mailing
guideline booklets, medical association-led periodic education
programs for physicians and patients, and development and
application of Korean electronic SCORE system to hospital Or-
der Communication System (OCS) could aid in decreasing GI
complications induced by NSAIDs medication.

In conclusion, although about half of Korean orthopaedic
patients receiving NSAIDs are at high or very high risk for
NSAID-induced GI complications, physicians’ prescription pat-
tern for NSAIDs appears to be inconsiderate. Physician’s con-
siderate prescription of NSAIDs with well-understanding of each
patient’s GI risk factors is strongly encouraged in order to maxi-
mize cost effectiveness as well as to prevent serious GI compli-
cations in Korea. Other strategic efforts such as patient’s self-
awareness, government-led educational campaigns, medical association-led educational programs, and application of Korean electronic SCORE system to hospital OCS should also be accompanied in a way to promote physician’s attention.

ACKNOWLEDGMENTS

The author sincerely appreciate Seong-il Bin, M.D., Choong-Hyeok Choi, M.D., Hee-Chun Kim, M.D., Dong Chul Lee, M.D., Myung-Chul Lee, M.D., Byoung-Hyun Min, M.D., Seo Seung Suk, M.D., Soo-Jae Yim, M.D. and other orthopaedic surgeons in private clinics for their contribution to data collection in this study.

REFERENCES

1. Schlansky B, Hwang JH. Prevention of nonsteroidal anti-inflammatory drug-induced gastropathy. J Gastroenterol 2008; 44 Suppl 19: 44-52.
2. Fries JF, Williams CA, Bloch DA, Michel BA. Nonsteroidal anti-inflammatory drug-associated gastropathy: incidence and risk factor models. Am J Med 1991; 91: 213-22.
3. Johnson RE, Hornbrook MC, Hooker RS, Woodson GT, Shneidman R. Analysis of the costs of NSAID-associated gastropathy. Experience in a US health maintenance organisation. PharmacoEconomics 1997; 12: 76-88.
4. Singh G, Rosen Ramey D. NSAID induced gastrointestinal complications: the ARAMIS perspective—1997. Arthritis, Rheumatism, and Aging Medical Information System, J Rheumatol Suppl 1998; 51: 8-16.
5. White TJ, Arakelian A, Rho JP. Counting the costs of drug-related adverse events. PharmacoEconomics 1999; 15: 445-58.
6. Tramèr MR, Moore RA, Reynolds DJ, McQuay HJ. Quantitative estimation of rare adverse events which follow a biological progression: a new model applied to chronic NSAID use. Pain 2000; 85: 169-82.
7. Singh G, Triadafilopoulos G. Epidemiology of NSAID induced gastrointestinal complications. J Rheumatol Suppl 1999; 56: 18-24.
8. Fries JF. NSAID GI toxicity: epidemiology. J Musculoskel Med 1991; 8: 21-8.
9. Piper JM, Ray WA, Daugherty JR, Griffin MR. Corticosteroid use and peptic ulcer disease: role of nonsteroidal anti-inflammatory drugs. Ann Intern Med 1991; 114: 735-40.
10. Shorr RI, Ray WA, Daugherty JR, Griffin MR. Concurrent use of nonsteroidal anti-inflammatory drugs and oral anticoagulants places elderly persons at high risk for hemorrhagic peptic ulcer disease. Arch Intern Med 1993; 153: 1665-70.
11. Gabriel SE, Jaakkimainen L, Bombardier C. Risk for serious gastrointestinal complications related to use of nonsteroidal anti-inflammatory drugs. A meta-analysis. Ann Intern Med 1991; 115: 787-96.
12. Gutthann SP, García Rodríguez LA, Raiford DS. Individual nonsteroidal antiinflammatory drugs and other risk factors for upper gastrointestinal bleeding and perforation. Epidemiology 1997; 8: 18-24.
13. Silverstein FE, Graham DY, Senior JR, Davies HW, Struthers BJ, Bitman RM, Geis GS. Misoprostol reduces serious gastrointestinal complications in patients with rheumatoid arthritis receiving nonsteroidal antiinflammatory drugs. A randomized, double-blind, placebo-controlled trial. Ann Intern Med 1995; 123: 241-9.
14. McIntosh JH, Fung CS, Berry G, Piper DW. Smoking, nonsteroidal anti-inflammatory drugs, and acetaminophen in gastric ulcer: A study of associations and of the effects of previous diagnosis on exposure patterns. Am J Epidemiol 1988; 128: 761-70.
15. Singh G. Recent considerations in nonsteroidal anti-inflammatory drug gastropathy. Am J Med 1998; 105: 315-85.
16. Bull SA, Conell C, Campen DH. Relationship of clinical factors to the use of COX-2 selective NSAIDs within an arthritis population in a large HMO. J Manag Care Pharm 2002; 8: 252-8.
17. García Rodríguez LA, Barreales Tolosa L. Risk of upper gastrointestinal complications among users of traditional NSAIDs and COXIBs in the general population. Gastroenterology 2007; 132: 498-506.
18. Koncz TA, Lister SP, Makinson GT. Gastroprotection in patients prescribed non-selective NSAIDs, and the risk of related hospitalization. Curr Med Res Opin 2008; 24: 3405-12.
19. Taha AS, Dahlil S, Sturrock RD, Lee FD, Russell RI. Predicting NSAID related ulcers—assessment of clinical and pathological risk factors and importance of differences in NSAID. Gut 1994; 35: 891-5.
20. Fries JF, Bruce B. Rates of serious gastrointestinal events from low dose use of acetylsalicylic acid, acetaminophen, and ibuprofen in patients with osteoarthritis and rheumatoid arthritis. J Rheumatol 2003; 30: 2226-33.
21. Cheetham TC, Levy G, Spence M. Predicting the risk of gastrointestinal bleeding due to nonsteroidal antiinflammatory drugs: NSAID electronic assessment of risk. J Rheumatol 2003; 30: 2241-4.
22. MO online. NSAID-induced GI management study. Korea: Medical observer; c2000-2011. Available at http://www.moonline.co.kr/News/news_view.aspx?Cid=H1707&Cno=38293 [accessed on 14 Mar 2011].
23. Coté GA, Rice JP, Bulsiewicz W, Norwell JP, Christensen K, Bobb A, Postelnick M, Howden CW. Use of physician education and computer alert to improve targeted use of gastroprotection among NSAID users. Am J Gastroenterol 2008; 103: 1097-103.
AUTHOR SUMMARY

Prescription Pattern of NSAIDs and the Prevalence of NSAID-induced Gastrointestinal Risk Factors of Orthopaedic Patients in Clinical Practice in Korea
Sung-Hun Lee, Chang-Dong Han, Ick-Hwan Yang, and Chul-Won Ha

This cross-sectional observation study was aimed to explore the current prescription pattern of non-steroidal anti-inflammatory drugs (NSAIDs) and the prevalence of NSAID-induced GI risk factors in orthopedic patients (3140 orthopedic outpatients at 131 hospitals in Korea). Questionnaires and medical recordings showed that 45% of the patients belong to high risk or very high risk groups for GI complications. However, only 51% of risked patients were prescribed for COX-2 selective NSAID. Physician’s considerate prescription of NSAIDs with well-understanding of each patient’s GI risk factors is strongly requested in Korea.