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ORIGINAL ARTICLE

Improving Osteoarthritis Detection in the Community: Pharmacist Identification of New, Diagnostically Confirmed Osteoarthritis

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Objective. **Osteoarthritis (OA) is the most common arthritis and a leading cause of disability. Many persons with knee OA are not diagnosed and not referred for treatment. Therefore, identification of patients with knee pain who have undiagnosed OA needs to be improved. Our objective was to determine if pharmacists, using a simple screening questionnaire, can identify individuals with previously undiagnosed knee OA.**

Methods. **Patients with knee pain and no previous diagnosis of knee OA were recruited by community pharmacists who used a simple questionnaire (<10 minutes to complete) to determine likelihood of knee OA. Patients who were likely to have knee OA were referred for a standardized knee examination and radiograph.**

Results. **Of the 411 patients screened by pharmacists, 274 were eligible. Of these, 44 declined, 35 were ineligible (18 had a previous OA diagnosis,16 had other inflammatory conditions, and 1 was excluded for other reasons), and 1 died. The remaining 194 were mostly female (62%) with a mean age of 62 years and were mostly white (86%). Body mass index (BMI) was classified as normal (18.5–24.9 kg/m^2) in 29%, overweight (25.0–29.9 kg/m^2) in 45%, and obese (>30.0 kg/m^2) in 26%. Of those examined, 190 (98%) of 194 met the American College of Rheumatology clinical criteria for knee OA. The radiographic results revealed that most participants likely had mild OA.**

Conclusion. **Pharmacists administering a simple screening questionnaire can identify >80% of patients with knee pain who have undiagnosed knee OA. Based on radiographs and BMI, much of this OA is early and may be amenable to intervention.**

KEY WORDS. Knee osteoarthritis; Pharmacists; Screening.

INTRODUCTION

Osteoarthritis (OA) is the most common form of arthritis and the leading cause of disability in North America. In fact, half of all disability among older persons has been attributed to OA (1). In 2002, Health Canada noted that at an annual cost of more than $16 billion for medical care

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and lost wages, musculoskeletal disease (the majority of which is OA and back disease) was second only to cardiovascular disease (2). The prevalence of OA is increasing dramatically with the aging of the population (in the next 10–20 years, it is estimated that the prevalence will increase by 50%) (3), resulting in a large personal, health care, and societal burden.

Knee OA is a major cause of the loss of independence in older adults. Unfortunately, the majority of persons with knee OA do not seek medical care; if they do, they are often not correctly diagnosed or are inappropriately treated (4,5). For example, in a recent study of older community-dwelling adults, the mean overall pass rate for OA quality-of-care indicators was 57% (4). In addition, a study by Glazier et al (5) revealed that less than half of patients with hip or knee OA received a recommendation for exercise and weight loss (if required) and any pharmacotherapy. Although 25% of patients over age 55 years report knee pain of at least 4 weeks' duration in the last year, only 15% of these consult their family physician for this symptom (6). Thus, there is a need for innovative ways to identify patients with knee OA and bring them into the health care system.

Pharmacists, a group of health care professionals who have not traditionally been involved in the identification of OA, may have the necessary skills and patient contact that would complement traditional methods of identifying knee OA. Pharmacists are actively involved in the provision of drug information, therapy assessment, patient education, and chronic disease management, with demonstrated improvement in patient outcomes (7–12). Pharmacists are ideally placed to screen for knee OA because they are often consulted about the choice of over-the-counter analgesics including nonsteroidal antiinflammatory drugs and acetaminophen for the management of musculoskeletal pain (13). In addition, pharmacists may be consulted for advice about knee braces, which are commonly used to manage knee pain (14). Therefore, we investigated whether pharmacist identification of previously undiagnosed knee OA was feasible and accurate.

SUBJECTS AND METHODS

Sample. The sample was derived from participants who visited Save-On-Foods pharmacies in the metropolitan Edmonton and Vancouver areas. Potential participants approached the pharmacy counter after seeing display posters in analgesic medication sections, splint/knee brace sections, or checkout counters in the pharmacy, or advertisements in newspaper flyers explaining the study. Each patient provided informed consent to participate in the study. This study was approved by the University of British Columbia Clinical Ethics Research Board, the Vancouver Coastal Health Authority Research Services Office, and the University of Alberta Research Ethics Board.

Inclusion and exclusion criteria. The eligibility of each potential patient was determined from their answers on the pharmacist-administered screening questionnaire. Individuals were included if they had pain, aching, or discomfort in or around the knee during the previous year lasting >28 separate or consecutive days; were ≥50 years of age; were currently not taking and had no history of taking disease-modifying antirheumatic drugs or gout medications; had no prior knee arthroplasty; had no knee surgery within the past 4 months; had no history of acute injury to the knee in the past 6 months; and had no previous physician diagnosis of OA, rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, fibromyalgia, or gout. In addition to these criteria, participants who were unable to speak and/or read English and those unwilling to be assessed at the regional arthritis center were excluded from participation in the study.

Pharmacist training. Pharmacists received training regarding OA and the components of the study through an educational session in Edmonton or Vancouver. The training session consisted of a lecture on OA pathology, epidemiology, and management followed by a session on the study objectives and procedures. Pharmacists were instructed on how to administer the screening questionnaire to participants with a focus on clarifying the differences between OA, osteoporosis, and inflammatory arthritis.

Study procedures. The study procedures are shown in Figure 1. After individuals identified themselves to the pharmacist, the pharmacist administered the screening questionnaire (Appendix A, available at the *Arthritis Care & Research* Web site at http://www.interscience.wiley.com/jpages/0004-3591:1/suppmat/index.html). The pharmacist then faxed the results of this questionnaire to the study coordinator, who then contacted eligible individuals within 2 working days to schedule an appointment for a physical examination and a knee radiograph at the regional arthritis center.

At the appointment at the regional arthritis center, participants completed a set of questionnaires that included demographics, the complete Western Ontario and McMaster Universities Osteoarthritis Index (15), and the Short Form 36 Health Survey (SF-36), a generic health-related quality of life/functional status instrument with construct validity in OA (16). Participants also underwent a physical examination of their knees, and weight-bearing anteroposterior radiographs of their knees were obtained.

Based upon the physical examination and the clinical history, patients were classified as having or not having knee OA based on the American College of Rheumatology (ACR) clinical criteria (17). If classified as having knee OA, participants were issued a letter explaining the likely diagnosis with instructions to contact their family practitioner. In addition, a report of the radiograph results was sent to their family practitioner. Finally, the Arthritis Society of Canada (British Columbia and Yukon branch, and Alberta and Northwest Territories branch) offered the complete Arthritis Self-Management course including the Arthritis Helpbook to these participants to help them manage their OA.

Physical examination. As stated, a standardized knee examination was performed at the initial appointment

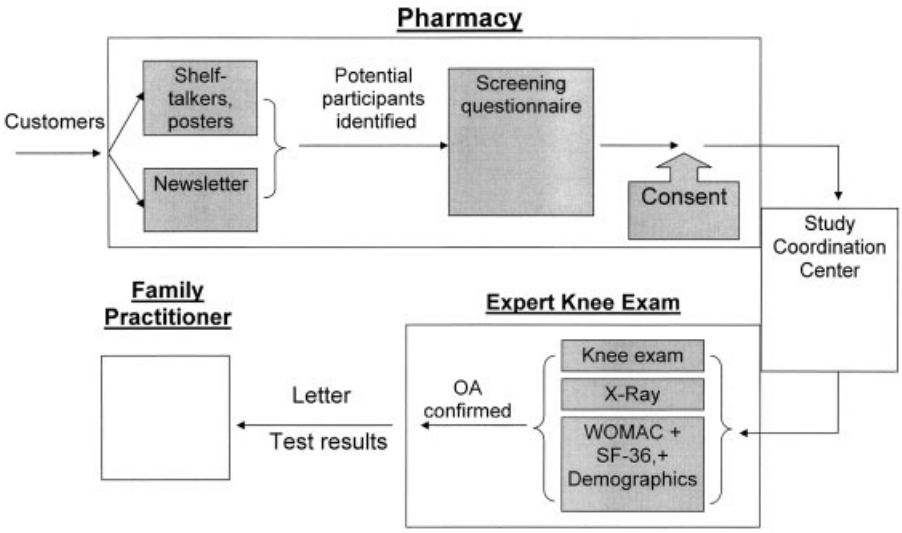

Figure 1. Schematic representation of study procedures. OA = osteoarthritis; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; SF-36 = Short Form 36 Health Survey.

(18). For the first 25 participants, both a rheumatologist (JC) and a physiotherapist (PE) experienced in the assessment of knee OA performed examinations on the same participant independently, and agreement on knee OA diagnosis was examined. After the first 25 patients, agreement was determined to be sufficient to allow the physiotherapist to perform all further knee examinations.

Radiographs. A weight-bearing, anteroposterior radiograph of both knees was performed. An experienced rheumatologist (JC) interpreted the radiographs and classified them according to the Kellgren/Lawrence (K/L) grading system using a standard atlas (19). In addition, from a subset of randomly selected radiographs (n = 41), a second rheumatologist (JME) examined and classified the results to determine interrater reliability.

Validation of self-report of no prior OA diagnosis. To validate participants' report of no prior knee OA diagnosis, we contacted the primary care practitioners for participants recruited from Vancouver. Specifically, health records (including radiographic reports) were reviewed for evidence of documentation of knee OA, knee pain, or a knee radiograph that had occurred prior to the administration of the pharmacist screening questionnaire. In addition, the practitioner completed a questionnaire that specifically asked whether the patient had received a diagnosis of knee OA, reported knee pain, or had a knee radiograph prior to the study entry date.

Statistical analysis. Baseline characteristics of the sample were summarized using descriptive statistics. The accuracy of the pharmacist screening was determined by characterizing the proportion of patients who were classified by the pharmacist as likely having knee OA who subsequently met the ACR clinical criteria (17) and were diagnosed with knee OA by the examiner. Interrater reliability between the rheumatologists' evaluation of the knee radiographs was assessed using the intraclass correlation coefficient (ICC) where the judges were fixed and each provided one rating as calculated from a two-way analysis of variance (20).

RESULTS

Pharmacists administered the screening questionnaire to 411 potential participants. Of these, 274 participants were referred to the study coordinator to be further assessed for entry into the study (Figure 2). The reasons for potential participants' visit to the pharmacy are summarized in Table 1, with filling prescriptions for themselves being the most common (62%).

As illustrated in Figure 2, of the 411 participants who approached the pharmacist for screening, 274 were deemed to likely have knee OA and were eligible for further clinical screening at the regional arthritis center. Of the 137 patients who were excluded by the pharmacist, the most common reasons for exclusion were previous physician diagnosis of OA of any joint (n = 56); history of a hot, painful joint or big toe (n = 20); history of gout (n = 14); history of acute knee injury within the previous 6 months (n = 9); and prior total knee arthroplasty (n = 8).

Of the 274 deemed to meet the inclusion/exclusion criteria, 80 participants were not assessed because they no longer wished to participate (n = 44), had a previous diagnosis of OA (n = 18) or inflammatory arthritis (n = 16) that was not identified by the pharmacist, met other exclusion criteria (n = 1), or were deceased by the time of contact (n = 1), leaving 194 to be further assessed by physical examination and radiographs. The baseline characteristics of the 194 participants are summarized in Table 2. On average, these participants were 62 years old, white (86%), and overweight or obese (71%), with significant impairment in their SF-36 mental and physical component scores.

For the physical examination and diagnosis of knee OA,

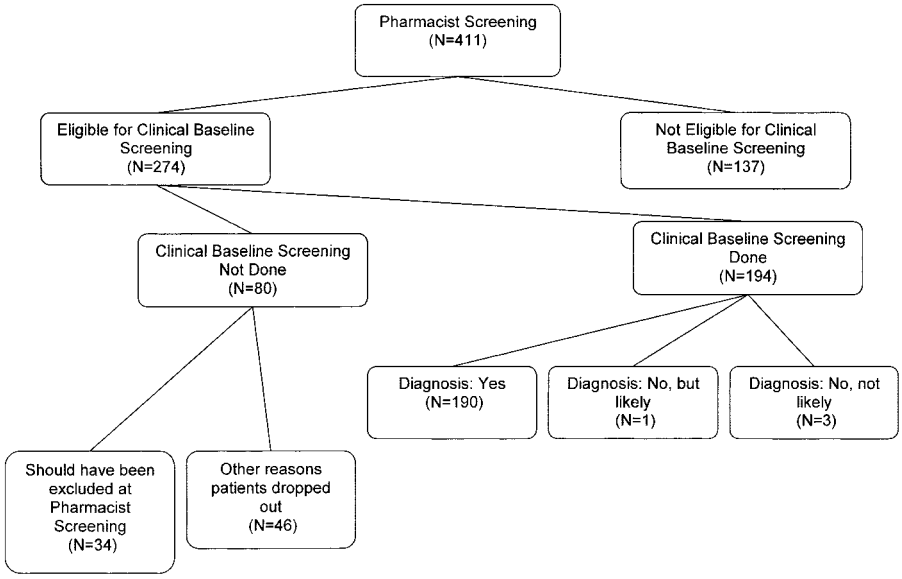

Figure 2. Study outcomes.

the physiotherapist and the rheumatologist both assigned a diagnosis of knee OA in 24 of the 25 patients that they examined independently (96%). In the 1 patient where the examiners disagreed, the rheumatologist assigned a diagnosis of knee OA that fit the ACR criteria, whereas the physiotherapist determined that a diagnosis of OA was not likely. Based on these findings, diagnostic agreement between the investigators was deemed to be sufficiently high.

Accuracy of the pharmacist-administered screening questionnaire. Using the ACR clinical criteria for knee OA (17) as the standard, the accuracy of the pharmacist-administered screening questionnaire in identifying patients with subsequent, diagnostically confirmed knee OA was 83% (190 of 228). A total of 35 patients who did not satisfy the inclusion/exclusion criteria yet were referred by the study pharmacists were classified as failures. These patients were subsequently identified on further questioning by the study coordinator and excluded from further participation.

Radiographic results. The results of the radiographic examinations are summarized in Table 3. Most of the patients had a K/L classification of either no OA or doubtful OA on radiograph (57%). The 2 rheumatologists had

Table 1. Reasons for participants' visit to the pharmacy on day of study inclusion

Reason	No. (%)
To pick up prescription medications for self	
For indication other than pain	243 (56)
For knee pain	14 (3)
For pain other than in or around the knee	14 (3)
To buy over-the-counter medications	
For indication other than pain	24 (6)
For knee pain	19 (4)
For pain other than in or around the knee	11 (3)
Prefer not to answer or not answered	13 (3)
Other*	97 (22)

* Other reasons included to buy groceries (n = 31), specifically to participate in the study (n = 24), accompanying another person (n = 10), have blood pressure and/or cholesterol checked (n = 10), contacted by pharmacy to come in (n = 7), and to pick up prescription for another person (n = 6).

Table 2. Baseline characteristics of participants who passed the pharmacists' screen (n = 194)*

Variable	Value
Female sex, no. (%)	121 (62.4)
Age, mean ± SD years	62 ± 8.5
Height, mean ± SD cm	168 ± 9.5
Weight, mean ± SD kg	79 ± 19
Body mass index, no. (%)	
Underweight (<18.5 kg/m^2)	1 (1)
Normal (18.5–24.9 kg/m^2)	56 (29)
Overweight (25.0–29.9 kg/m^2)	86 (45)
Obese (>30.0 kg/m^2)	50 (26)
WOMAC score, median (IQR)†	
Pain subscale (0–20)	6 (6)
Stiffness subscale (0–68)	15 (17.4)
Function subscale (0–8)	3 (2)
Normalized	9 (7)
SF-36 score, mean ± SD‡	
Physical component	39.9 ± 8.3
Mental component	37.5 ± 8.8

* WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; IQR = interquartile range; SF-36 = Short Form 36 Health Survey.
† WOMAC Likert Scales version 3.0: higher scores on each dimension indicate a greater burden in each category.
‡ Physical and mental component scores are constructed using the standard scoring algorithm and weights from all 8 scales within the SF-36 (physical functioning, role limitations, social functioning, emotional well-being, pain, energy/fatigue, and general health perceptions). To compare these scores with the US general population, they are normalized with the population mean ± SD score of 50 ± 10.

Table 3. Radiographic results stratified by clinical diagnosis*

Clinical diagnosis	K/L grade†	No. (%)
Yes according to ACR criteria (n = 190)	No OA	82 (43)
	Doubtful OA	26 (14)
	Small osteophytes and minimal joint space narrowing	52 (27)
	Moderate osteophytes and joint space narrowing	26 (14)
	Large osteophytes and severe joint space narrowing	4 (2)
No according to ACR criteria, but likely (n = 1)	No OA	1 (100)
Not likely (n = 3)	No OA	3 (100)

* K/L = Kellgren/Lawrence; ACR = American College of Rheumatology; OA = osteoarthritis.
† K/L grade refers to the system that uses a 0–4 global score to grade the radiographs of osteoarthritic joints. A score of 2 (small osteophytes and minimal joint space narrowing) or greater has traditionally been considered to represent a definitive radiographic diagnosis of OA.

high agreement using the K/L classification for the maximum grade across both knees, with an ICC of 0.83 (95% confidence interval [95% CI] 0.71–0.91), and the most severe compartment on the left and right knee, with an ICC of 0.85 (95% CI 0.71–0.92) and 0.81 (95% CI 0.65–0.90), respectively.

Validity of patient report of no prior OA diagnosis. Of the 144 patients contacted, 85 (59%) agreed to allow the investigators access to their primary care medical charts. Reasons for not participating were withdrawal from the study (n = 36) and failure to return the consent form (n = 23). Six medical offices did not return our surveys. Of the 79 responses that were received from the primary care physician offices, 65 (82%) stated that the participant did not have a prior diagnosis of knee OA, 63 (80%) stated that the participant did not have a knee radiograph within 24 months prior to the study, and 56 (71%) stated that there was not any mention of knee pain documented in the health record.

DISCUSSION

The results suggest that community pharmacists can accurately identify community-dwelling individuals with chronic knee pain who likely have OA. Most of these patients were not previously known to have OA, were overweight or obese, and had mild disease. Considering the rising prevalence of OA and the associated personal and societal costs, these findings have important implications for efficient referral to prevention and intervention programs.

The main strength of integrating community pharmacists as members of the health care team is that they are highly accessible and are often the first point of contact with the health care system for patients. Because patients visit their pharmacist 5–8 times more frequently than their physician, pharmacists provide an excellent entree to a variety of health care providers who can provide chronic disease management (21). Pharmacists are already partnering with physicians and patients to improve health outcomes in a variety of chronic diseases such as hypertension (22), hypercholesterolemia (7), diabetes (8,10), and OA (23).

The identification and diagnosis of community-dwelling individuals with knee pain and OA has been shown to be less than optimal (6). In what they deemed the "consultation staircase," Peat et al (6) documented that in a sample of 10,000 patients >55 years of age, 2,500 had knee pain but only 400 went on to consult with a doctor and receive a diagnosis of OA. Because it has been shown that most individuals with knee pain in this age group have OA (24), a care gap exists in integrating these patients into the health care system. Without proper identification and diagnosis, treatments that can alleviate symptoms and improve quality of life (such as comprehensive exercise and weight-loss programs) cannot be implemented. There is evidence to suggest that these interventions reduce pain and physical disability and improve function and mobility-related self-efficacy (25–28). Also, as new disease-modifying OA drugs are developed and become available, treatment will need to be initiated early, necessitating timely recognition of the disease process (29).

There are a few limitations with this study. First, although comprehensive data were collected from participants who were initially included by the pharmacists but then subsequently excluded (false positives), nothing is known about how many of those that were excluded by the pharmacists actually had knee OA (false negatives). As such, no calculation of sensitivity, specificity, positive predictive value, or negative predictive value is possible. Second, we relied on patient self-report to exclude a previous OA diagnosis by their primary care physician, which may have been inaccurate; however, we believe that the impact of this factor is small as documented by our followup with family practitioner offices and their review of patient charts. Finally, we utilized an experienced physiotherapist to perform the physical examinations and determine the diagnosis of knee OA based on clinical findings. Again, we think that the risk of inaccuracies due to this factor is small considering the experience of the physiotherapist in examining and treating patients with OA, the extensive training the physiotherapist received in performing the standardized knee examination, and the high degree of agreement between the physiotherapist and the rheumatologist in the 25 patients they both examined.

This study was the first step in planning a chronic disease management strategy for persons with likely knee OA. Now that it has been demonstrated that pharmacists can identify these individuals, the next logical step is to design and implement an intervention that could improve their health outcomes and quality of life. A recent study by Hay

et al (23) examined the effectiveness of community physiotherapy and enhanced pharmacy review for knee pain as compared with a control (an advice leaflet). These investigators found that evidence-based care delivered by primary care physiotherapists and pharmacists resulted in short-term improvements in pain and function outcomes. Future research should test whether an intervention using community pharmacists to identify patients, perform a comprehensive pharmacotherapy review, and refer patients to other health care providers (primary care practitioners and physiotherapists) could improve patients' health outcomes and quality of life.

A previously untapped clinical resource, community pharmacists can identify, with reasonable accuracy, community-dwelling individuals older than 50 years with likely knee OA, the vast majority of whom are undiagnosed. This finding has important implications for possible intervention programs in the future.

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AUTHOR CONTRIBUTIONS

Dr. Marra had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study design. Marra, Cibere, Tsuyuki, Soon, Esdaile, Gastonguay, Kok.

Acquisition of data. Marra, Cibere, Tsuyuki, Soon, Esdaile, Gastonguay, Oteng, Embley, Enenajor, Kok.

Analysis and interpretation of data. Marra, Tsuyuki, Soon, Esdaile.

Manuscript preparation. Marra, Tsuyuki, Soon, Esdaile, Enenajor, Kok.

Statistical analysis. Marra, Colley.

ROLE OF THE STUDY SPONSOR

Merck Frosst Canada had no role in the study design, analysis, or interpretation of the data. Merck Frosst Canada was not involved in the writing of the manuscript and did not approve the final version for publication.

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