

Regional Osteoporosis Screening, Referral, and Monitoring Program in Community Pharmacies: Findings from Project ImPACT: Osteoporosis

Jean-Venable "Kelly" Goode, Kim Swiger, and Benjamin M. Bluml

ABSTRACT

Objective: (1) To identify patients at risk for osteoporosis through community pharmacy-based bone mineral density (BMD) screening, to refer at-risk patients to primary care and/or specialty practice physicians, and to follow-up with at-risk patients; (2) to treat and manage osteopenic and osteoporotic patients referred to the pharmacy for medication therapy management services; and (3) to test a payment methodology for pharmacists who deliver community health management services to a population at risk for or diagnosed with osteoporosis.

Design: Single-cohort observational study.

Setting: Ukrop's Super Markets, Inc. Grocery and Pharmacy, a 29-store chain with 22 pharmacy locations in Richmond, Virginia.

Participants: Consumers with one or more known risk factors for osteoporosis in Ukrop's customer service area.

Intervention: During the initial phase (health promotion and disease prevention) of the project, pharmacy-based osteoporosis screening with referral and follow-up was provided to consumers who responded to Ukrop's screening promotions. The second phase—provision of collaborative community health management services focused on osteoporosis monitoring and management—is ongoing and includes patients who are at risk for or diagnosed with osteoporosis and are covered by a regional payer.

Main Outcome Measures: Results of screenings; responses of patients and physicians to notifications; and long-term results during collaborative care.

Results: The pharmacists screened 532 patients and were able to contact 305 of these patients for follow-up interviews 3 to 6 months later. The stratification for risk of fracture was 37%, high risk; 33%, moderate risk; and 30%, low risk. A total of 78% of patients indicated that they had no prior knowledge of their risk for future fracture. In the moderate- and high-risk categories, 37% of patients scheduled and completed a physician visit, 19% had a diagnostic scan, and 24% of those patients were initiated on osteoporosis therapy subsequent to the screening. Participating pharmacies received payment for both the osteoporosis screening and the collaborative health management services.

Conclusion: Pharmacists can play a useful role in the identification, education, and referral of patients at risk for osteoporosis through pharmacy-based BMD screening. Patients are willing to pay for pharmacy-based osteoporosis screening services. Third-party payers are willing to compensate pharmacists for collaborative community health management services.

Keywords: Project ImPACT: Osteoporosis, osteoporosis screening, bone mineral density testing, patient referral, collaborative practice, community health management services, medication therapy management.

J Am Pharm Assoc. 2004;44:152–160.

Received December 16, 2004, and in revised form February 4, 2004. Accepted for publication February 5, 2004.

Jean-Venable "Kelly" Goode, PharmD, is Associate Professor, School of Pharmacy, Medical College of Virginia, Virginia Commonwealth University, Richmond. Kim Swiger is Category Manager, Pharmacy, Ukrop's Super Markets, Inc., Richmond, Va. Benjamin M. Bluml is Vice President for Research, American Pharmacists Association Foundation, Washington, D.C.

Correspondence: Jean-Venable "Kelly" Goode, PharmD, Associate Professor, Medical College of Virginia School of Pharmacy, Virginia Commonwealth University, 410 North 12th Street, P.O. Box 980533, Richmond, VA 23298-0533. Fax: 804-828-8359. E-mail: jrgoode@vcu.edu

See related article on page 161.

Disclosure: Beyond Mr. Bluml's employment by the APhA Foundation and Ms. Swiger's employment by Ukrop's, the authors declare no conflicts of interests or financial interests in any product or service mentioned in the article, including grants, employment, gifts, stock holdings, or honoraria.

Funded through an unrestricted educational grant from Merck & Co., Inc. to the American Pharmacists Association Foundation.

Osteoporosis, a disease characterized by compromised bone mass quality and increasing bone fragility, presents a major health care challenge.^{1,2} It is the most common of the bone diseases, affecting more than 10 million Americans. An additional 34 million Americans are at increased risk for osteoporosis because of low bone mass. Approximately 1.5 million osteoporotic fractures occur in this country annually, accounting for an estimated \$13.8 billion in direct medical expenditures. The number of fractures and associated costs could more than triple by 2040.³ Project ImPACT: Osteoporosis was designed and implemented to address this serious public health concern.

Osteoporosis, which affects women more often than men (80% of affected patients are women), is preventable and treatable, but early identification of at-risk patients is very important. The National Osteoporosis Foundation (NOF) recommends that all women be counseled on the risk factors for osteoporosis, including cigarette smoking, low body weight, and low calcium intake.¹ NOF and the American Association of Clinical Endocrinologists (AACE) recommend bone mineral density (BMD) testing for all women aged 65 years and older regardless of risk factors, all postmenopausal women who present with fractures, postmenopausal women under the age of 65 who have one or more additional risk factors other than menopause or fracture, and women who are considering therapy for osteoporosis.^{1,4} Additionally, AACE recommends testing for perimenopausal women with risk factors for frac-

tures.⁴ The National Institutes of Health, however, recommends an individualized approach to screening, even while recognizing that preliminary evidence indicates that the risk for fracture increases with age and with a larger number of additional risk factors.²

Project ImPACT: Osteoporosis is a regional health services demonstration project based on the previously successful national Project ImPACT: Hyperlipidemia. *ImPACT* is an acronym for Improve Persistence and Compliance with Therapy.⁵ In this article we describe the initial patient screening, follow-up, and results of referrals in Project ImPACT: Osteoporosis. We also provide the structure and process model for the ongoing monitoring and management services used in the second phase of the project, which pharmacists can use as a blueprint to design and implement their own osteoporosis screening and monitoring program.

Objectives

The objectives during the initial phase of Project ImPACT: Osteoporosis were focused on health promotion and disease prevention: to identify patients at risk for osteoporosis in the community through pharmacy-based BMD screening, to refer at-risk patients to primary care and/or specialty practice physicians, and to follow-up with at-risk patients. The second phase, still ongoing, focuses on the monitoring and management of osteopenic and osteoporotic patients referred by physicians into the project. Additionally, Project ImPACT: Osteoporosis is testing a third-party payment methodology for pharmacists to use in delivering collaborative community health management services to a population at risk for or diagnosed with osteoporosis.

Methods

Project ImPACT: Osteoporosis is being conducted in a regional supermarket chain pharmacy in Virginia. A regional chain was selected because of the project's goal to effectively address this health issue within a geographic region. The supermarket chain, comprising 22 pharmacies, has been involved in a variety of innovative patient care services; therefore, osteoporosis screening was a natural addition to other wellness services. In preparation for the project, pharmacists attended an Osteoporosis Certificate Training Program. Pharmacists also received education on operation of the Sahara Hologic Ultrasound Bone Densitometer. The Sahara Hologic was chosen after careful consideration of the precision and accuracy, portability, ease of use, price, reliability, technical support, and service options. Table 1 describes available bone densitometry devices.

Project ImPACT: Osteoporosis is a single-cohort observational study implemented in two phases. The first phase focuses on screening, patient education, and referral at key sites. The second phase includes rollout of both screening and collaborative community health management services for patients at risk for or with osteoporosis throughout the chain supermarkets' customer service area.

AT A GLANCE

Synopsis: Bone mineral density (BMD) screenings, referrals, and follow-up provided through pharmacies in a 22-store grocery chain attracted 532 consumers who were willing to pay \$25 each for the service. Based on telephone interviews with 305 of the patients conducted 3 to 6 months later, substantial portions of patients whose BMD results and risk-factor profile indicated moderate or high risk of osteoporosis had contacted their physicians and when appropriate been placed on medications for prevention or treatment of osteoporosis. In addition, sizable fractions of patients had improved their dietary or supplementary intakes of calcium and vitamin D and increased the amount of weight-bearing exercise they were getting.

Analysis: *Building on the success of its earlier program that addressed the needs of people with hyperlipidemia, the APhA Foundation breaks new ground with Project ImPACT: Osteoporosis by moving into the payment for pharmaceutical care services arena. Not only were patients willing to pay out of pocket for pharmacists' services, but the Foundation and its partner, Ukrop's Super Markets in Richmond, Va., have succeeded in convincing a regional payer to support pharmacy-based collaborative community health management services.*

Table 1. Characteristics of Available Bone Densitometry Devices

Technology (common abbreviation)	Sites	Comments
Dual-energy X-ray absorptiometry (DXA)	Spine	Gold standard for diagnosis
	Hip	Precise
	Wrist	Expensive
	Total body	Skilled operator required
Single-energy X-ray absorptiometry (SXA)	Forearm	Precise
	Finger	Less expensive
	Sometimes heel	
Radiographic absorptiometry (RA)	Spine	Precise
		More expensive
		Skilled operator required
Quantitative computed tomography (QCT)	Spine	Spine measurement less precise
	Forearm	More expensive
		Skilled operator required
Quantitative ultrasound densitometry (QUS)	Heel	Generally not as precise
	Tibia	Useful screening tool
	Patella	Inexpensive

Phase I: Health Promotion and Disease Prevention

Screening Process

The health-promotion and disease-prevention activities consisted primarily of osteoporosis screening, education, and referral. The program was initiated in May 2001 during Women's Health Month. Additionally, osteoporosis screenings were offered at five sites on a weekly basis during Wellness Days. Wellness Days are days set aside for the pharmacist to conduct walk-in health screenings in the private consultation room. Stand-alone screening events required additional pharmacist time, while the screenings during Wellness Days were built into an already established workflow. Patients were targeted for screening based on having at least one risk factor other than being female; however, any patient could self-select into the screening program. Patients were required to fill out a consent form for screening. After the screening, patients received an information sheet highlighting the results and pharmacist recommendations. The osteoporosis screenings were offered for a fee, with all participants paying \$25 out of pocket for these services.

Marketing

Marketing was an important component of a successful screening. Several strategies were used to advertise the osteoporosis screenings, including information in the newspaper weekly circular and on Ukrop's Super Markets, Inc. Web site, signs and shelf talkers in the stores, printouts on the grocery store receipt, direct mail and live news segments on a local television station. For the public to understand the need for screening, increased public awareness and education on the issues surrounding osteoporosis had to be addressed simultaneously. Ukrop's accomplished this through educational articles in weekly circulars and on its Web

site, brochures, advertisements in *Medicine* and *Fifty Plus* magazines, and segments on a biweekly live talk show (*Ukrop's Live Healthy, Be Healthy*). During May (National Osteoporosis Awareness Month), Ukrop's partnered with a local television network to promote women's health and the osteoporosis screenings.

Physician Collaboration

Collaboration with the health care community was an important component in the screening process. The supermarket contacted key physician specialists in the area to inform them of the new program. One of the physicians invited the pharmacists from Ukrop's to his office for demonstration of how he diagnoses patients and begins treatment. The pharmacists used the Sahara densitometer to assess fracture risk on each other, and the physician then performed a dual X-ray absorptiometry (DXA) scan on each of the pharmacists. The experience was helpful for both the pharmacists and physician in developing a working relationship. Consequently, the pharmacists referred many of the high-risk patients to this specialist. Another specialist physician participated in a live television talk show. In addition, a letter explaining the Ukrop's pharmacists' role in screening, identification, and referral was mailed to all members of the Richmond Academy of Medicine, a local professional physician organization. A follow-up advertisement on the collaborative ongoing monitoring and management program was placed in the same organization's monthly newsletter.

Risk Stratification and Physician Referral

The peripheral ultrasound densitometry devices are primarily used for screening purposes. They are useful for assessing potential risk for future fracture, although these devices may or may not report T-scores and Z-scores according to the diagnostic criteria developed by the World Health Organization. T-scores reported from the

Sahara densitometer are based on reference data specifically for the device. Sahara densitometry T-scores less than 0 but greater than -1 indicate a moderate risk for future fracture, while T-scores of -1 or less were considered to represent a high risk for future fracture.

Patients were stratified, educated, and referred to their physician through a process based on risk of future fracture (Figure 1). All patients with a moderate or high risk for future fracture received either a written or verbal referral to their physician. At this point, the process was for the physician to make an assessment and potential diagnosis of osteopenia or osteoporosis. The physician would refer the patient back to the pharmacy for the collaborative community health management program if deemed necessary.

In addition, all patients received a follow-up phone call 3 to 6 months after the screening to assess the outcome of the referral, any changes in lifestyle, and interest in Ukrop's community health management program. Pharmacists questioned patients to see if they had visited a physician and/or had a DXA scan and whether they had received therapy for osteoporosis. Additionally, several questions were asked about lifestyle changes, including weight-bearing exercise, calcium supplementation, smoking cessation, caffeine and alcohol intake, and fall precautions.

Phase II: Ongoing Monitoring and Management Program

Ukrop's and the APhA Foundation made presentations to executives of major health plans in the Richmond market in an effort to obtain third-party compensation for the activities of Project ImPACT: Osteoporosis. The presentations focused on the accessibility of pharmacists, practice resources available, mutual benefits of aligning incentives, and Ukrop's proven ability to deliver regional services with an ongoing commitment to improving health care in the Richmond community.

Under the plan we proposed to executives (see Figure 2), patients would choose to enroll in an ongoing osteoporosis monitoring and management program under either a self-payment option or with third-party payment as a covered plan participant. Patients would enter the program following either self-referrals or referrals from local physicians. In the former case, the patient's physician would be contacted by the pharmacist to approve the care and would complete a patient-referral form, and the pharmacist would keep the physician involved from that point forward in the patient's care. All patients would be required to give written consent once they were informed of the pertinent background information on the project, what their participation would involve (including potential benefits, risks, inconveniences, discomforts), their right to confidentiality, and their right to withdraw at any time.

After signing the informed consent to participate and an authorization for medical information release, the patient would be assigned a project patient code under our proposal. At that time the patient would complete a one-page form with the necessary personal information, which would remain on file in the pharmacy's patient record. Each participating patient would also complete a

patient history form that would provide general health information, which the pharmacist would use to assess the patient's status fully. Pertinent baseline values for the patient would be recorded. Results and subsequent intervention activities would be logged using project encounter forms that would provide for ongoing monitoring. Additional forms would also be used for provider-team communication, patient communication and education, and service quality and satisfaction assessment.

Over the course of the proposed monitoring and management services, participating pharmacists would maintain ongoing communications with patients and their physicians. In addition to being actively involved in their therapy, treatment plans, and goal setting, patients would be regularly informed about their progress.

Results

Project ImPACT: Osteoporosis was structured in such a way as to provide pharmacists with an opportunity to contribute to two distinct public health agendas: health promotion and disease prevention in Phase I and monitoring and management of disease in Phase II. Phase I of the project is complete, and those results are presented here. Phase II of the project is still in process, and while interim results are described, the full results of the osteoporosis monitoring and management program will be presented in a future article.

Phase I: Health Promotion and Disease Prevention

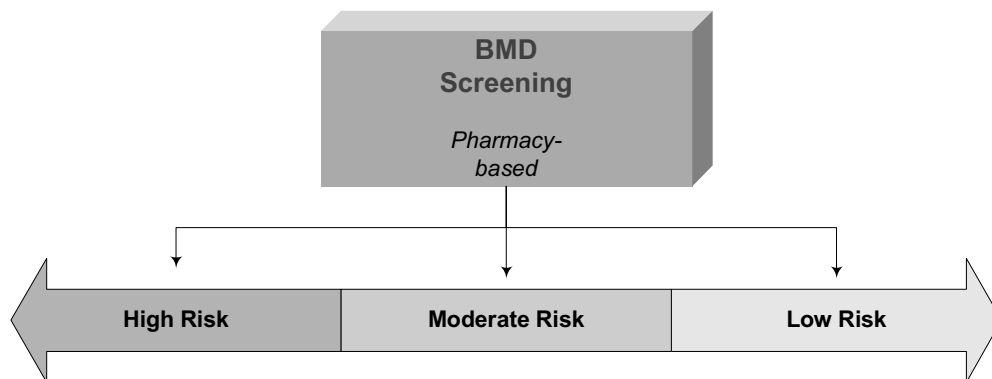
The health-promotion and disease-prevention effort resulted in a total of 532 patients being screened for osteoporosis between May 2001 and October 2002. Of those, 305 patients (57.3%) were reached for telephone follow-up; 4% of them had subsequently been diagnosed as having osteoporosis. Additionally, 22% of interviewed patients indicated that they had previously been screened for osteoporosis, whereas 78% had no prior knowledge of their risk for future fracture as depicted in Figure 3. Almost all the interviewed patients were Ukrop's Super Market customers (91%), but only 28% indicated that they were a Ukrop's Pharmacy customer (see Figure 4).

Ninety-three percent of patients were women, and their mean age was 55.8 years (range, 18-86 years; see Figure 5). Ethnicity was as follows: 89% Caucasian, 3% Asian, 2% African American, 1% Hispanic, and 5% other or not specified. In the population of 305 patients who were contacted by telephone, 70% were at either high or moderate risk for future fracture (see Figure 6).

Risk factors for osteoporosis other than gender were present in these percentages of the 305 patients: 33% frequently drank alcohol; 90% were of Caucasian or Asian descent; 6% currently smoked or had smoked in the past; 36% did not take calcium supplements or consume three or more dairy products per day; 46% had menopause, amenorrhea, or low testosterone levels; 30% had a small frame or thin body build; 33% had a sedentary lifestyle;

Figure 1. Project ImPACT: Osteoporosis Screening Process

Project ImPACT: Osteoporosis BMD Screening Process



Sahara T-Score	≤ -1	-1 to 0	≥ 0
-----------------------	-----------	-------------	----------

Patient Education	<ul style="list-style-type: none"> Provide treatment background information including therapy options 	<ul style="list-style-type: none"> Provide wellness/prevention information Provide treatment background including therapy options 	<ul style="list-style-type: none"> Provide wellness/prevention materials and information
Recommendations	<ul style="list-style-type: none"> Suggest that the patient see their physician or a specialist within the next 90 days 	<ul style="list-style-type: none"> Provide patient with written information regarding their best "next steps" 	<ul style="list-style-type: none"> Suggest that the patient return for BMD in 2 years
Actions	<ul style="list-style-type: none"> Obtain patient's consent for follow-up Provide patient with a written physician referral Inform patient about pharmacy-based Osteoporosis services 	<ul style="list-style-type: none"> Obtain patient's consent for follow-up Provide patient with verbal referral to a physician Inform patient about pharmacy-based Osteoporosis services 	<ul style="list-style-type: none"> Obtain patient's consent to follow-up
Follow Up	<ul style="list-style-type: none"> Contact patient in 90 days to ensure/encourage physician evaluation and treatment 	<ul style="list-style-type: none"> Contact patient in 6 months to ensure/encourage physician evaluation 	<ul style="list-style-type: none"> Contact patient in 2 years for another BMD measure

Figure 2. Project ImPACT: Osteoporosis Process of Care

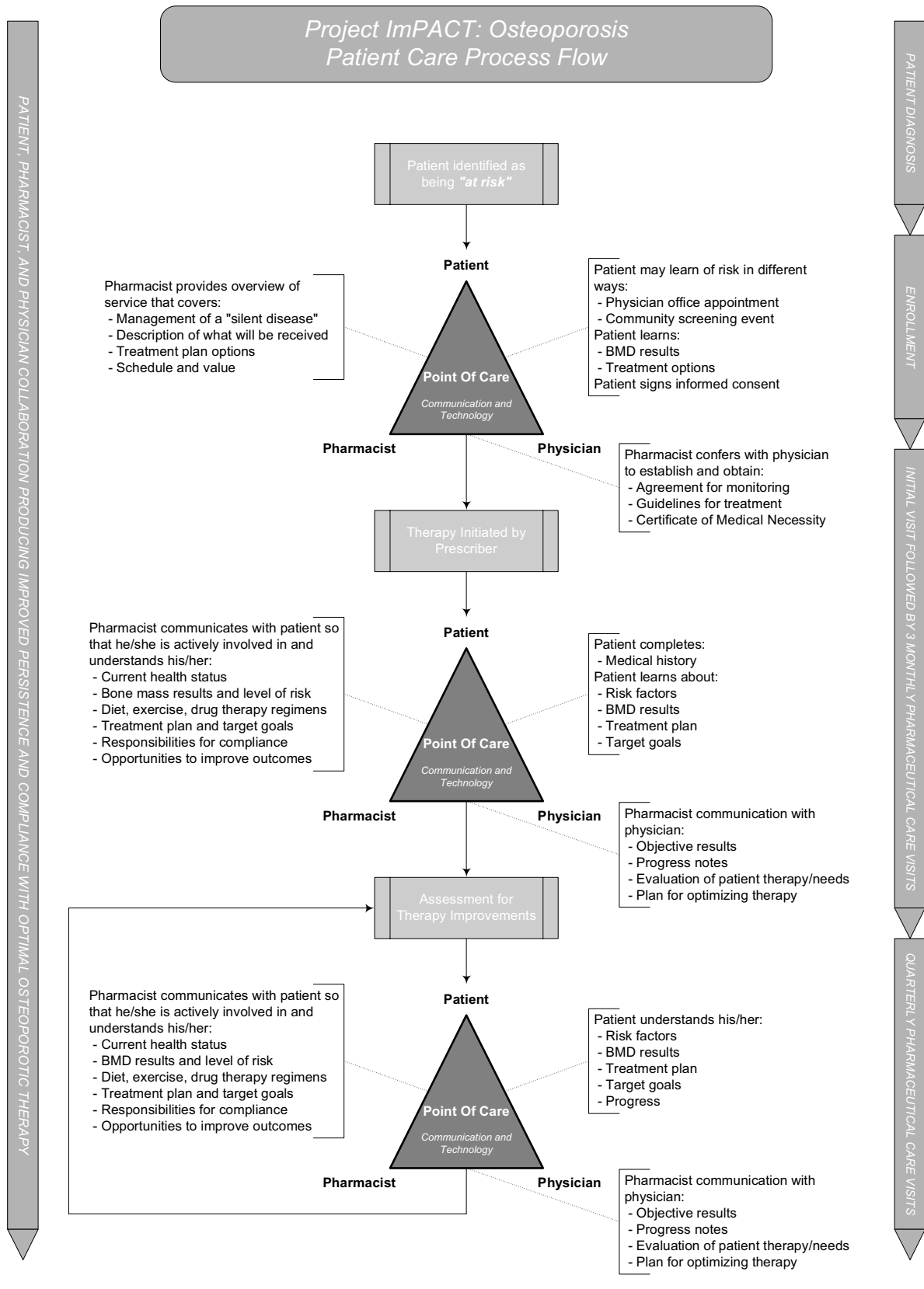


Figure 3. Patient Knowledge of Risk for Future Fracture in Project ImPACT: Osteoporosis

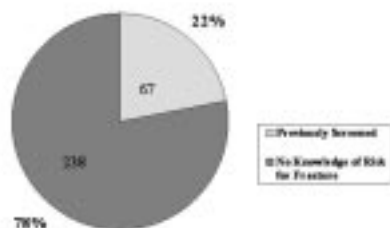


Figure 5. Age Distribution Profile of Participants in Project ImPACT: Osteoporosis

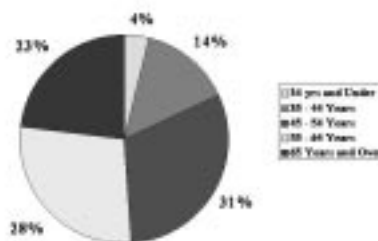


Figure 4. Pharmacy Versus Nonpharmacy Customers Screened in Project ImPACT: Osteoporosis

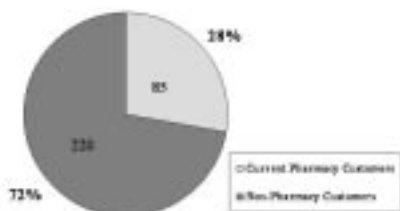
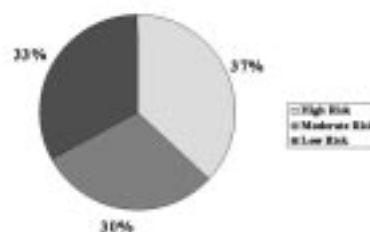


Figure 6. Future Fracture Risk Stratification Profile for Screened Population in Project ImPACT: Osteoporosis



11% had a history of bone fracture as an adult; and a surprising 42% of patients were using corticosteroids. A total of 37 patients indicated that they had other diseases.

A total of 29% of patients scheduled a physician office visit subsequent to the screening; this included 42% of interviewed patients who were at high risk of developing osteoporosis based on screening results, 30% of those at moderate risk, and 11% whose screening results indicated low risk. DXA scans were administered to 16% of interviewed patients after the screening, and this included 23% of those with high-risk screening results, 15% of patients at moderate risk, and 9% of those with low risk.

Some 58 patients (19% of those screened) were initiated on medications used for preventing and treating osteoporosis as a result of the physician-referral process. Additionally, 30% of interviewed patients had initiated lifestyle changes that included calcium supplementation, and 26% began vitamin D supplementation. Weight-bearing exercise was implemented by 26% of the 305 interviewed patients, and 20% increased dietary intake of calcium-containing foods. A summary of lifestyle and medication changes is presented in Table 2. Overall, 9% of interviewed patients made changes as a result of pharmacist recommendations, and 13% of patients made changes as a result of a physician recommendation.

Phase II: Monitoring and Management Results

As a result of the Ukrop's and APhA Foundation presentations made to executives of major health plans in the Richmond market and after substantial dialogue, an agreement was reached for third-party compensation in Project ImPACT: Osteoporosis. UnitedHealthcare of the Mid-Atlantic is paying participating pharmacists for the collaborative community health management services provided to its members enrolled in the project. As a result of UnitedHealthcare's participation, enrollment of patients in the second phase of the project is continuing.

Discussion

Only a few manuscripts have evaluated pharmacy-based osteoporosis screening services.⁶⁻¹⁰ But none of the reports employed a broad-based screening approach using the Sahara Hologic Ultrasound Bone Densitometer or revealed a blueprint for pharmacists to implement the services in their own setting. Additionally, payment strategies have not been published for pharmacists to use in seeking payment for community health management services

Table 2. Lifestyle and Medication Changes Initiated After Pharmacy-Based Bone Mineral Density Screening

Intervention Category	% Patients (n = 305)	Patient Action or Clinical Result
Exercise	26	Increased weight-bearing exercise behavior(s)
Diet	20	Increased calcium-containing food consumption
	8	Increased vitamin D-containing food consumption
Medication	30	Began calcium supplementation
	26	Began vitamin D supplementation
	19	Physician-initiated osteoporosis therapy

delivered to a population diagnosed with osteoporosis, as is occurring in the second phase of Project ImPACT: Osteoporosis.

Pharmacists in this project were able to identify 213 patients at moderate or high risk of a future fracture. Of the total patients screened, 78% had no prior knowledge of their risk for future fracture. The identification, education, and referral of these patients through the screening program is an important community health initiative because these might prevent future fractures and other complications of osteoporosis. However, comparison of our results with other published data on pharmacy-based osteoporosis screening is difficult because of differences in technologies and in patients' ages, gender, and other risk factors.⁶⁻¹⁰

One study assessed osteoporosis risk and measured whether medical interventions occurred after pharmacy-based screening.⁶ The follow-up in this study was accomplished via a mailed survey, which had a lower response rate than did our telephone follow-up, 32% versus 57.3%. However, the prior study achieved a high percentage of patients who received a DXA measurement (41%) and/or treatment after discussing the results with their physician (35%). But what is not clear in the previous research is whether nonprescription therapies were accounted for in these numbers. In our project, an additional 30% of patients began taking calcium supplementation, and 26% initiated vitamin D supplementation. Another study reported that of the women screened for osteoporosis, two thirds stated that they would begin a calcium supplement.⁷ Other studies have reported behavioral changes after BMD testing, but these were not conducted in community pharmacies or using the same technology as in our study.¹¹⁻¹³

Pharmacists are in a unique position to become involved in the care of patients at risk for or with osteoporosis. Initially, pharmacists could provide education and advocacy for prevention in the younger population by promoting a healthy diet, adequate calcium intake, and exercise. The newer portable bone mineral densitometers offer opportunities for pharmacists to expand services by including osteoporosis screening in their practices. Screening services increase public awareness of the risk factors of osteoporosis

and give pharmacists opportunities to recommend appropriate over-the-counter calcium and vitamin D supplementation. Additionally, pharmacists can refer at-risk patients to physicians and begin to develop collaborative relationships among the patient, pharmacist, and physician. Further, after a diagnosis of osteopenia or osteoporosis is made, the pharmacist can work in collaboration with the physician and other members of the health care team to help provide education and medication therapy management, including improving adherence to therapy.

A very important aspect for providing a blueprint for pharmacists to use in implementing pharmacy-based BMD screening is the justification of the equipment for the screening. All of our patients were willing to pay out of pocket for screening services. Approximately 500 patients would need to be screened to reach the initial break-even point for each screening device if the pharmacy charged around \$25 for the screening. Studies reveal patients have indicated willingness to pay as much as \$30, \$35, or \$50 per test.^{7,9,10} Additionally, revenue should be generated for the pharmacy through sales of nonprescription items such as calcium and vitamin D supplements and if needed, prescribed medications for preventing or treating osteoporosis. Revenue might also be generated from sales of other items while patients are in the pharmacy, grocery store, or mass-merchandising outlet for the screening. Our project revealed that 9% of the patients screened were not regular supermarket customers and that 72% of patients were not regular pharmacy customers. Ukrop's might have gained grocery and/or pharmacy customers as a result of the enhanced services.

The expansion of the pharmacist's role through ongoing monitoring and management services may also prove to be valuable in the care of patients with osteoporosis. If the pharmacist receives a referral from a physician for a patient to be enrolled in the community health monitoring and management program, the pharmacist may want to consider implementing a formal collaborative practice agreement if allowed by the state's pharmacy practice act. In Virginia for example, a physician, pharmacist, and patient may enter into a collaborative practice arrangement as long as all parties agree. With regional payer support that aligns incentives for each of these participants, pharmacists should be able to implement and sustain collaborative community health management services for patients with a diagnosis of osteoporosis.

Limitations

The most serious limitation of Project ImPACT: Osteoporosis is that most of the patients self-selected into the screening program, and therefore the patients enrolled may not be representative of the general population. However, our patient group is likely representative of a population that would participate in other community pharmacy-based screening programs. Another limitation of this project is that only 53.7% of patients were available for follow-up interviews. Therefore, the reported screening results may be representative of a population that is more engaged in their health care.

Conclusion

A key component to prevention and treatment of osteoporosis is early identification of patients at risk for the disease, including intervention with education about lifestyle changes and supplementation with calcium and vitamin D. This project indicates that when pharmacists—highly accessible health care providers—become involved in this important role in community health, appreciable numbers of at-risk patients can be identified and referred for appropriate treatment. The first phase of the project provides confirmation that patients are willing to pay for pharmacy-based osteoporosis screening services. Additionally, after screening and appropriate diagnosis, responsibility of the pharmacist can be expanded to include the delivery of community health monitoring and management services. One major third-party payer is now paying participating pharmacists for delivering these expanded collaborative community health management services to its members.

References

1. National Osteoporosis Foundation. Physician's guide to prevention and treatment of osteoporosis. 2000. Accessed at www.nof.org/physguide, February 5, 2004.
2. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Osteoporosis prevention, diagnosis, and therapy. *JAMA*. 2001;285:785–95.
3. National Osteoporosis Foundation. Disease Statistics. December 2002. Accessed at www.nof.org/osteoporosis/stats.htm, February 5, 2004.
4. American Association of Clinical Endocrinologists. 2001 Medical guidelines for clinical practice for the prevention and management of postmenopausal osteoporosis. *Endocr Pract*. 2001;7:294–312.
5. Bluml BM, McKenney JM, Cziraky MJ. Pharmaceutical care services and results in Project ImPACT: Hyperlipidemia. *J Am Pharm Assoc*. 2000;40:157–65.
6. Elliott ME, Meek PD, Kanous NL, et al. Pharmacy-based bone mass measurement to assess osteoporosis risk. *Ann Pharmacother*. 2002;36:571–7.
7. Farina RD, Corbett AH, Edwards MD, et al. Osteoporosis screening: is screening effective? Can it be done economically? Will people pay for it? *US Pharm*. 1999;24:38–43.
8. Elliott ME, Meek PD, Kanous NL, et al. Osteoporosis screening by community pharmacists: use of National Osteoporosis Foundation resources. *J Am Pharm Assoc*. 2002;42:101–10.
9. Lata PF, Brinkley NC, Elliott ME. Acceptability of pharmacy-based bone density measurement by women and primary healthcare providers. *Menopause*. 2002;9:449–55.
10. Cerulli J, Zeolla M. Impact and feasibility of a community pharmacy bone mineral density screening and education program. *J Am Pharm Assoc*. 2004;44:161–7.
11. Rolnick SJ, Kopher R, Jackson J, et al. What is the impact of osteoporosis education and bone mineral density testing for postmenopausal women in a managed care setting? *Menopause*. 2001;8:141–8.
12. Rubin SM, Cummings SR. Results of bone densitometry affect women's decisions about taking measures to prevent fractures. *Ann Intern Med*. 1992;116:990–5.
13. Holt LH, Taft LB, Moulthrop JM. Bone density measurement: survey of use and impact on treatment. *Menopause*. 1997;4:219–24.

PHARMACY THROUGH THE AGES

William R. Warner, Pharmacist



Many of the early pharmaceutical manufacturing companies were founded by pharmacists. Over the years many names of the founder and the company have disappeared through mergers, acquisitions, and business failures.

One of the earliest manufacturers was William R. Warner, an 1856 graduate of the Philadelphia College of Pharmacy. Warner perfected a process to sugar-coat pills, thus alleviating the problem of taste that accompanied many of the medicines in use. Initially he manufactured these pills in his drugstore and sold them through Bullock and Crenshaw of Philadelphia and then under his own name. By 1886 his business had expanded and he built a separate manufacturing plant in Philadelphia, Warner Hall.

Warner was an early promoter of pharmaceutical specialties to both pharmacists and physicians. This 1893 advertisement shows the plant with the firm's name prominently displayed. The name is repeated in the sign on the wagon, "William R. Warner & Co Manufacturing Pharmacutists."

The Warner Company acquired a number of other companies, including Richard Hudnut the cosmetic firm in 1888; Chilcott Laboratories in 1945. Other acquisitions included Lambert, manufacturer of Listerine, and Emerson Drug Company, manufacturer of Bromo-Seltzer. The biggest merger however was the acquisition of Parke Davis in 1970. In 2000 Pfizer purchased Warner-Lambert. In 2000 the name Warner Chilcott reappeared when Galen Pharmaceutical acquired the name for its prescription pharmaceutical products in the United States.

SOURCE OF ARTWORK: THE GRADUATE. 1893;1:61.

Dennis B. Worthen, PhD, is Lloyd Scholar, Lloyd Library and Museum, Cincinnati, Ohio, and JAPhA Contributing Editor, Heroes of Pharmacy. Illustration courtesy of the Lloyd Library and Museum.