The Orthopedist as Clinical Densitometrist: Cost- and Time-Effectiveness

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Abstract

We tested the hypothesis that an orthopedic surgeon and his or her staff can efficiently and economically provide a bone densitometry service. This hypothesis reflects a philosophy that orthopedists should take a more active role in identifying patients at risk for osteoporosis. We evaluated the cost- and time-effectiveness of an orthopedic surgeon and his medical assistant in completing reports and related correspondence for dual-energy x-ray absorptiometry scans conducted in an orthopedic subspecialty clinic. Cost analysis showed that completing 14 or 15 reports per month was required to break even and that completing up to 40 reports per month was a highly efficient and economic use of the surgeon's time.

The presumptive diagnosis of osteoporosis is often brought to a patient's attention after a low-energy fracture. In an adult, a distal radius fracture from low-energy trauma is often the event that heralds osteoporosis onset.[1] However, a relatively low percentage of these patients receive appropriate medical treatment for this underlying disease.[2-8] As they often attend to patients with these fractures, orthopedic surgeons are in an ideal position to initiate evaluation of the patient's additional risk factors for osteoporosis and to act on the results of such an evaluation.

In this context, we have been examining how orthopedic surgeons can become more involved in the prevention, diagnosis, and treatment of osteoporosis for adult patients with low-energy fractures. In a recent study,[9] we surveyed 107 surgeons in our greater referral area regarding their opinions about their involvement, or patient involvement, in initiating and treating patients with osteoporotic fractures.

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Am J Orthop. 2007;36(1): 15-22.

The majority of the surgeons surveyed (68%) felt that expanding their practice into prescribing pharmacologic treatments for osteoporosis is appropriate. In turn, 51% of the surgeons surveyed believed that an osteoporotic fracture, along with several other clinical risk factors, is sufficient for considering initiating antiresorptive pharmacologic treatments. However, 72% of the surgeons would consider initiating treatment only after confirming osteoporosis by dual-energy x-ray absorptiometry (DEXA) scan. Despite the apparent need and use for DEXA scanners, however, it was noted that they would not consider providing a bone densitometry service in their clinic or otherwise more aggressively intervene in initiating diagnostic workups of osteoporosis because they perceived that this would not be cost-effective or would significantly increase their already busy work schedules.[9] To our knowledge, no studies have tested this first hypothesis by evaluating the role of the orthopedic surgeon as clinical densitometrist.

"...orthopedic surgeons have [a growing interest] in taking a more active role in diagnosing and treating osteoporosis."

The interest that orthopedic surgeons have in taking a more active role in diagnosing and treating osteoporosis appears to be growing. Evidence for this growth is seen in the increasing number of publications on this topic.[4,9-21] Results of a recent survey distributed to the membership of the American Academy of Orthopaedic Surgeons (AAOS) provides additional evidence that orthopedic surgeons are interested in providing better medical care for these patients. Approximately 1500 surgeons responded to questions about their current involvement in treating patients with osteoporosis and the surgeons' willingness to expand their practices to include osteoporosis treatment (survey results in Figure). This interest is also reflected in the increasing number of orthopedic surgeon subspecialty groups that have DEXA scanners for evaluating patients at risk for osteoporosis (Hologic, Inc, personal communication).

Our decision to offer a bone densitometry service in our orthopedic clinic was based on studies showing that patients at risk for osteopenia and osteoporosis are much more likely to seek and receive medical treatment when provided with information that includes a quantitative

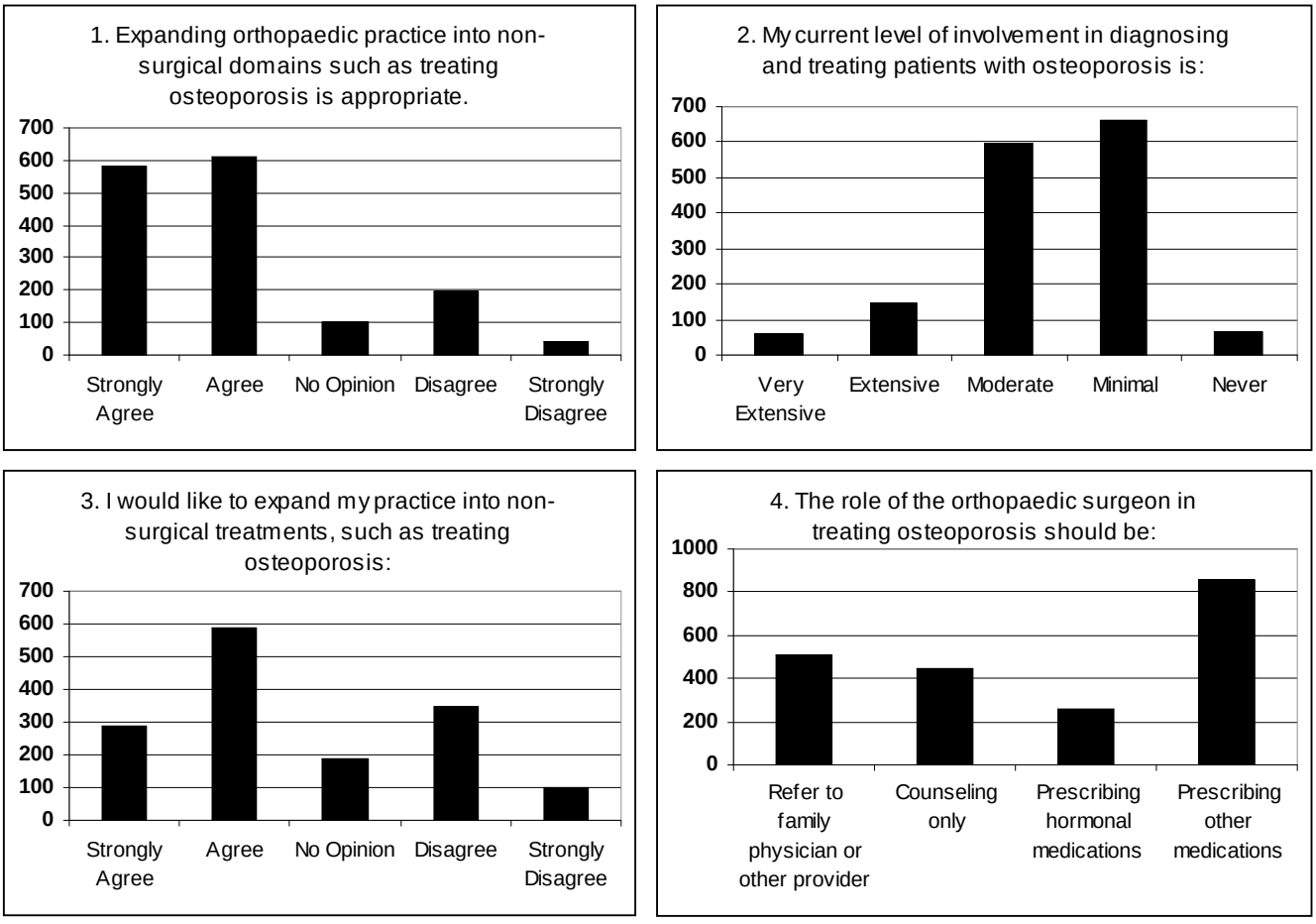

Figure. American Academy of Orthopaedic Surgeons survey results distributed to the membership in March 1999 and published in the Councilor's Report. Available at: http://www.aaos.org/aaos/archives/bulletin/aug99/fline1.htm. Accessed December 12, 2006. Reprinted with permission.

bone density measurement showing significantly low bone density.[22-25] This decision was also influenced by data clearly showing that such medical intervention can substantially reduce incidence of initial or subsequent low-energy fractures in middle-aged and older individuals.[26-32] Our philosophy for providing this service is consistent with the statement by Tosi and Lane[21] that "bone-density measurement must not be seen as a generator of revenue or as an end unto itself, but rather as an important part of a total program of prevention, diagnosis, and treatment of osteoporosis." But, as altruistic as this philosophy seems, it is important for any service to function cost-efficiently. A practice would normally require evidence that a service could be provided at least at neutral cost before offering it. Principal investigator Dr. Skedros was able to demonstrate this to his colleagues.

In this study, we tested the hypothesis that a private practice orthopedic surgeon, with the assistance of staff, can economically and efficiently provide a clinical bone densitometry service. This hypothesis reflects a philosophy that orthopedic surgeons should take a more active role in identifying patients at risk for osteoporosis or osteoporotic fracture and in initiating and referring them for medical workup and treatment.

Methods

Clinic and Surgeon Description

This study was conducted at an orthopedic surgical subspecialty clinic having 4 full-time, board-certified, fellowship-trained orthopedic surgeons and 1 physician assistant. All surgeons were in private practice, and the clinic was 3 miles from the nearest hospital. Three of the surgeons had formed a partnership that maintained ownership of the clinic, which included a Lunar® Prodigy DEXA machine (Lunar Corporation, Madison, Wisc). The densitometry machine in this study was installed as part of a new clinic, and no repair expenses had been incurred. Bone density measurement was viewed as an important part of a total program of prevention, diagnosis, and treatment of osteoporosis.

Surgeon specialties were total joint replacement for hip and knee; shoulder and elbow reconstruction and arthroscopy; hand surgery; and foot and ankle surgery and sports medicine. The clinical densitometrist (Dr. Skedros), who was the surgeon specializing in shoulder and elbow reconstruction and arthroscopy, was interested in studying the role of orthopedic surgeons in identifying patients at risk for osteoporosis and osteoporotic fractures. The surgeon specializing in total joint replacement had formed and codirected an osteoporosis center (within the subspecialty

Table. Fourteen Primary Care Provider Report Customized Templates*

Template	Patient No.	% of Total Patients
Normal scan (spine & hips)	75	36.2
Osteopenia hips, normal spine	24	11.6
Osteopenia spine & hips	19	9.2
Osteopenia spine, normal hips	20	9.7
Osteoporosis hips, normal spine	0	0
Osteoporosis hips, osteopenia spine	5	2.4
Osteoporosis spine & hips	28	13.5
Osteoporosis spine, normal hips	0	0
Osteoporosis spine, osteopenia hips	10	4.8
Follow-up, osteopenia improved	7	3.4
Follow-up, osteopenia worse	3	1.5
Follow-up, osteoporosis improved	5	2.4
Follow-up, osteoporosis worse	5	2.4
Other	6	2.9
Total	**207**	

*Used for 2-page primary care provider report. The orthopedic surgeon created these templates before software that serves a similar purpose became commercially available. Relative percentages of the 207 patients in each diagnostic category are also shown. Definitions for osteoporosis and osteopenia are in accordance with World Health Organization recommendations.[33,34] T scores used to compile this table were based on bone mineral density data obtained from scans of right and left hips and lumbar vertebral levels 2 through 4.

clinic) and was dedicated to osteoporosis evaluation, education, and research.

Dr. Skedros had the following work schedule: Monday and Tuesday, clinic; Wednesday, densitometry report preparation, plus research or surgery; Thursday, surgery; Friday, clinic and research. He worked 55 to 60 hours per week in his clinical surgical practice, which included participation on a trauma call schedule at a level II trauma center (4 or 5 days per month), seeing 175 to 195 patients per month in clinic, and performing 25 to 33 surgeries per month. The other full-time surgeons each typically saw 180 to 210 patients per month and performed 30 to 40 surgeries per month.

Patient Demographics, Osteoporosis Risk Assessment, and DEXA Scanning

All women older than 40 and all men older than 50 who came to the clinic to see a surgeon or the physician assistant were asked to complete a comprehensive unisexual questionnaire that assessed both major and minor risk factors for osteoporosis or osteoporotic fracture (Appendix 1, 2). In some cases, even younger patients were referred to our clinic for DEXA scanning. The questionnaire, designed also to help in identifying patients with osteopenia or osteoporosis not detected with National Osteoporosis Foundation (NOF) criteria, is based on data from various sources (Appendix 2). Although this questionnaire seems comprehensive, it does not always meet the payment criteria of third-party payers. Costs related to increased time in obtaining payment preauthorization and in dealing with other billing-related obstacles and challenges are considered in our analysis.

Time-log and cost-analysis data were analyzed for 207 patients evaluated for axial bone mineral density (BMD) by DEXA scanning during a 7-month period in 2003–2004. For all patients, the lumbar spine and one or both hips were scanned (some patients had had total hip replacement). Of these 207 patients, 182 were women (mean age, 63 years; SD, 15 years; range, 23–100 years), 25 men (mean age, 67 years; SD, 13 years; range, 41–90 years). Fifteen percent of these patients (31/207) were referred to our clinic specifically for DEXA scanning.

Radiologic Technologist's Duties

Duties of the certified radiologic technologist included performing the DEXA scan (including setting up the analysis on the computer) and printing the results, which were then given to the medical assistant. The technologist performed scans during a regular workday; hence, there were no overtime or incentive payments and no incremental expenses related to the technologist's time spent doing scans. Consequently, the technologist's time spent doing scans was not initially considered in the cost analysis. However, adjustments in the cost analysis were made to account for the fact that increased scan volume would increase demands on the technologist's time. To ensure quality control, the technologist routinely calibrated the DEXA machine as per manufacturer recommendations.

Medical Assistant's Duties

Each of the medical assistant's duties was timed to the nearest 15 seconds. These duties included obtaining additional information by contacting the patient or the patient's primary care physician or other primary care provider (PCP), either by telephone or written correspondence; obtaining previous scan results; and preparing envelopes and photocopying and mailing PCP reports and surgeon-prepared patient letters.

Surgeon Densitometrist's Duties

The surgeon's duties included examining the printout of BMD data for accuracy and artifacts; using customized templates (see Table) to prepare a 2-page PCP report summarizing the patient's BMD results and risk factors for osteoporosis or osteoporotic fracture; completing a Phillipson-Greenwald hip fracture risk assessment form (Appendix 3); and preparing a 1-page patient letter summarizing DEXA scan results. The patient received a copy of densitometry results plus the 6-page *Osteoporosis Overview* from the National Institutes of Health (NIH) Osteoporosis and Related Bone Diseases National Resource Center (available at http://www.osteo.org, the overview includes information about diet, exercise, and medications for increasing bone mass). Recommendations were made for follow-up scans in accordance with NOF regulations, but decisions regarding follow-ups were left to the discretion of the patient's primary care physician.

The surgeon completed 6 to 9 reports in 1 working session, and there were 1 or 2 sessions per week. Time to complete all duties was recorded and rounded to the nearest 15 seconds. Before initiating this study, the surgeon densitometrist had completed and revised templates for the PCP reports and patient letters and had completed 200 reports and related correspondence. The surgeon did not try to

complete scans within a certain period; scan reports were completed and checked without compromising accuracy and quality, regardless of the time required.

Results

Of the 207 patients scanned over the 7-month period, approximately 85% had no intention of having a bone density scan when they came to our clinic. The remaining 15% (n = 31) were referred to our clinic for DEXA scanning. During this 7-month period, approximately 20% to 30% of the nonreferred patients who qualified for a scan according to the risk factor questionnaire (Appendix 1) were scanned. Hence, our clinic could exceed 50 scans per month. The most common reasons patients were not scanned were that the surgeon forgot to order the scan; the patient was not interested in being scanned (more common among men than women); and it was not initially clear if the patient's insurance company would pay for the scan.

Time Analysis

Analysis of time-log data from 207 scans (187 initial and 20 follow-up scans) showed that the orthopedic surgeon required a mean of 8.9 minutes (SD, 1.7 minutes) for report preparation for an initial scan (6 reports per hour) and a mean of 15.2 minutes (SD, 3.3 minutes) for a follow-up scan.

For clerical and correspondence tasks, the medical assistant required 5.0 minutes (SD, 2.0 minutes) for an initial scan and 7.9 minutes (SD, 4.7 minutes) for a follow-up scan.

Patients typically were in the clinic a total of 20 to 25 minutes. Time in the scanning suite (6-7 minutes) was the radiologic technologist's time, which was not considered in our initial cost analysis, as the technologist could perform approximately 3 to 5 scans within most 8-hour workdays. With increased daily scan volumes, however, the technologist's time would become an important consideration in our clinic, and this issue might be an important consideration in other surgeons' clinics. Therefore, additional costs incurred by this technologist were considered in our final cost analysis (described below).

Summarized scan results are shown in the Table.

Cost Analysis

Axial densitometry scans are billed at $220 per scan (CPT code 76075); mean reimbursement is $140 per scan. In Utah, Medicare allows $129.40 per scan, and Utah Medicaid allows $87 per scan. The single largest payer, Medicare, accounted for 57% (118/207) of the scans performed; Medicaid accounted for 4% (8/207).

The single largest expense is the cost of leasing the machine and allocating a portion of the rent expense for the unit. The DEXA machine was purchased through a 5-year lease from a local bank. Property taxes, laundry, postage, and office supplies accounted for less than 1% of the total annual expense. There were no repair expenses incurred during the review period, but such expenses, especially the expense of replacing a failed tube, could be significant (depreciation costs are discussed later).

Given an annual direct expense of $17,300, excluding labor, break-even occurs after 123 scans (or 10.5 scans per month). As 31 of 207 patients had been referred for scanning from other clinics, the break-even point could easily be reached by scanning patients from our clinic. However, depreciation costs and a service contract, in addition to other labor-related issues (to be described), would eventually become necessary. In this context, 14 or 15 scans per month would be needed to cover these additional costs.

In terms of revenue generated, completing 6 or more reports per hour represented an efficient use of the surgeon's time. With this weekly scan volume, the surgeon was able to remain proficient in analyzing scans and preparing reports without compromising quality. Spending 1 to 2 hours per week preparing initial scan reports provided enough revenue to cover all costs and generate $250 to $350 per hour in profit (the lower end of this range is more representative of the additional time required if only repeat scans were processed). Follow-up scans generated approximately 25% less profit per hour because of the additional time required to complete the report. As the proportion of follow-up scans increased with time, profitability would also proportionally decrease. Profits from our densitometry service are divided among the owners of the DEXA unit, in accordance with Stark II regulations.

Although the surgeon considered writing more than 10 reports per week burdensome (because it conflicted with clinical or surgical duties), our cost analysis revealed that more than 20 new or repeat scans per month (approximately 5 scans per week) was highly cost-effective. In fact, because of the high fixed costs, the more scans reviewed, the more profit generated. Within the surgeon's clinic, the medical assistant, radiologic technologist, and billing staff absorbed the extra duties into their normal work schedule because of the limited volume of scans (see additional analysis below). If the number of scans were increased significantly (ie, >40 scans per month), additional labor costs would be incurred. It is suggested that a trained and certified medical assistant could reduce the surgeon's time commitment an estimated 25% to 50% by helping prepare reports. Commercially available DEXA reporting software, now available from the major manufacturers of densitometry machines, will also help significantly reduce the time required to prepare these reports and related correspondence.

Business Unit Opportunity Cost. To surgeons, the value of spending time reviewing DEXA scans versus performing another revenue-generating task is called "opportunity cost." This analysis was conducted to show the opportunity cost of reviewing scans versus performing other tasks.

For all activities, the orthopedic surgeon's mean compensation (gross salary) is $170.10 per hour, according to the Medical Group Management Association (MGMA).[35] Generally, an hour spent performing surgery will provide much more compensation than an hour spent seeing

patients in the office, so the best person to use for compensation comparisons may be the nonsurgical orthopedic specialist. A 2003 MGMA survey indicated that a nonsurgical orthopedic specialist has a gross hourly salary of $85.87.[35]

In the scenario presented, a surgeon who processes 20 new scans per month would increase his or her gross hourly rate to $388.57 per hour for each hour spent reviewing DEXA scans, given the expense structure outlined (calculated monthly: 20 new scans x $140 mean reimbursement = $2800 – $1440 expenses / 3.5 hours). Consequently, an orthopedic surgeon could be reimbursed at an hourly rate at a revenue level similar to that achieved with many types of surgical procedures.

DEXA services that require capital outlays for buildings or for build-outs of existing space may generate a lower gross hourly rate because of additional overhead. Full determination of the potential for this service in an orthopedic practice requires a thorough evaluation, including market, competitive, and net present value analyses and inclusion of costs for service contracts and equipment depreciation. Preauthorizing payments for scans and dealing with other billing-related obstacles and challenges could also increase the workload for office staff. In the case of our practice, performing more scans would also increase the radiologic technologist's work hours. In considering these myriad possibilities, our cost analysis revealed that the break-even scan volume would need to be increased from 11 or 12 per month to 14 or 15 per month. Maintenance service agreements and repairs could drive this break-even figure to 16 or 17 scans per month.

Discussion

Our findings support the hypothesis that a cost-effective densitometry service can be provided in a busy private practice orthopedic surgeon subspecialty clinic.

Results showed that 10.5 scans per month were needed to break even (ie, to cover the costs of monthly scanner payment, rent, property taxes, etc). However, 14 or 15 scans per month were required when we extended our analysis to include equipment depreciation and service contracts, dealing with additional payment and billing obstacles, and an increased proportion of repeat scans. In terms of revenue generated, cost analysis showed that completing 20 or more reports per month was a highly efficient use of the orthopedic surgeon's time. However, the surgeon considered more than 40 scan reports per month burdensome, because of the time involved.

Thus, there is the question of how much time the surgeon feels comfortable dedicating to densitometry. In an alternative scenario, a trained and certified medical assistant might perform some of the clerical duties associated with DEXA reporting. In our clinic, such a system is essential when scans exceed 40 per month. However, for this system to work (and to ensure accuracy and quality control), close supervision by the surgeon densitometrist is required.

On the DEXA scan reports we give to PCPs is the statement: "It is our philosophy to have the patient's personal physician prescribe and coordinate all treatment for osteoporosis." With this the surgeon densitometrist transfers any additional workup and medical treatment to the patient's PCP. This philosophy is consistent with the current standard of care in our community.[9,20] Data on orthopedic surgeons' typical work schedule also suggest that taking on these added responsibilities may not be feasible in a "time-effective" context for many of them (US 2000–2001 data available at www.aaos.org/wordhtml/opus2000/index.htm). Supporting this suggestion are several facts: In the United States, orthopedic surgeons typically work 57 hours per week (~60 hours for surgeons younger than 44), see 95 patients per week, and perform 34 surgical cases per month; 92% of surgeons spend as much or more time than they want in clinic already; and only 34% are interested in expanding their surgical volume. In addition, on average, surgeons may not view their training as adequate for medically managing a patient with osteoporosis.[9]

But is a bone densitometry service, offered at one location, effective in facilitating the medical treatment of patients at risk for osteoporosis or osteoporotic fracture at another location? Recent studies have shown that an independent bone densitometry service, such as ours, can be effective in facilitating the workup and treatment of these patients by their personal PCPs.[22,23,36-37] This finding is especially important, as orthopedic surgeons are often the first physicians to evaluate and treat patients with apparent osteoporotic fractures. It is our view that the level of our DEXA service is on par with or exceeds the level offered by the 6 other DEXA services in our metropolitan area, all of which are operated by radiologists. We provide our patients with educational materials regarding osteoporosis prevention and treatment and, if needed, diagnosis-targeted letters emphasizing medical follow-up. In a randomized, controlled trial of premenopausal women (predominantly white), Winzenberg and colleagues[38] found that providing individualized bone density feedback in the form of minimal educational intervention (eg, information leaflets) was effective in increasing hip bone density over a 2-year period. Additional studies are needed to determine if our patients with osteopenia or osteoporosis are more likely to seek medical follow-up than are patients referred to densitometry services that do not provide additional diagnostic and educational information.

Our male and female patients are also evaluated with a risk factor questionnaire (Appendix 1) that considers nearly all the important risk factor data for completing a DEXA report. This information, which is included on the 2-page PCP report summary, is also essential for billing (PCPs who refer patients to our clinic for DEXA scanning are not required to provide *ICD-9-CM* codes) and is most commonly required for non-Medicare patients who do not meet NOF criteria for DEXA scanning.[39,40] For such patients, we have devised templates for "appeal letters" requesting payment for denied claims. These letters are sent with a copy of the patient's risk factor questionnaire. When these steps are taken, our success rate in obtaining

payment on denied claims is on the order of 85%. Our billing staff can prepare and submit requests for payment, and payment appeals, within their usual work schedule. However, additional time required for preauthorizing payment for some scans and dealing with other billing obstacles could increase the workload of office staff beyond their usual work schedules. Another potential additional cost is that of the radiologic technologist's increased work hours. When we entered these possibilities into our cost analysis, we found that in our clinic we would need to increase the monthly break-even volume from 11 or 12 scans to 14 or 15 scans. Maintenance service agreements and repairs could drive this break-even number to 16 or 17 scans per month. Densitometrist training and education that would incur additional cost, but were not included in our analysis because they are not yet nationally mandated, include certification through the International Society for Clinical Densitometry (ISCD). The ISCD Web page (www.iscd.org) provides information on certifications and courses available through the ISCD and on public policy issues that effect clinical densitometry, including issues related to reimbursements for bone density scans.

We tailored our PCP report to provide fracture risk data. The Phillipson-Greenwald form (Appendix 3) provides treating physicians with an estimated 4-year hip fracture risk based on age and femoral neck BMD. Greenwald and colleagues[41] and Greenwald and Barajas[42] showed that physicians are more likely to initiate appropriate treatment for osteoporosis and osteopenia when hip fracture risk data are given with DEXA BMD data (ie, T scores). PCPs who receive this information from our center have told us that it is helpful in determining which patients with osteopenia (bone density 1.0-2.5 SDs below normal peak level) should be treated more aggressively.

Software for DEXA Scan Reports. Since this study was initiated, commercial software for DEXA scan reporting has become available (enCORE™ version 5.5; Lunar Corporation, Madison, Wisc). This software tabulates and organizes BMD data so that previous scans and current scans can be readily compared—an important timesaving advance. Risk factors can also be listed in the scan report. Using this software is estimated to reduce the time needed to complete a scan report by approximately 25%, which would be especially beneficial when completing more time-consuming follow-up reports. This software, however, costs approximately $3500. Similar software packages are available from other bone densitometry equipment manufacturers.

For clinic owners who do not want to purchase these programs, the sample templates used in this study (Appendix 3) can be downloaded from our Web site (www.teambone.com/osteo/osteo.html).

Conclusions

Our study results show that a busy private practice orthopedic surgeon and his or her staff can provide a cost-effective clinical bone densitometry service. At our clinic, this service was cost-effective when we performed 12 to 40 scans per month. Including this service in our orthopedic surgical subspecialty practice reflects our philosophy that orthopedic surgeons should take a more active role in identifying patients at risk for osteoporosis or osteoporotic fracture.

Authors' Disclosure Statement and Acknowledgments

No benefits in any form have been or will be received from any party related to this study. The authors report no actual or potential conflicts of interest in relation to this article. The authors wish to thank Todd C. Pitts, Susan Petersen, and Vickie J. Martin for their assistance in completeing this study.

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Appendix 1. Patient's Assessment Form

UTAH BONE&JOINT CENTER

The Two-Minute Osteoporosis Risk Assessment

This simple checklist can provide an indication of whether you are at risk of having or developing **osteoporosis**. This checklist is not a substitute for a medical evaluation.

NAME _____ AGE _____ DATE _____

Are You at Risk?

Risk Factors for Osteoporosis or Osteoporotic Fracture

Please check all that apply to you, then answer the questions below.*

- ❑ Personal history of fracture as an adult (e.g., wrist, rib, pelvis, hip, etc.)
- ❑ History of fracture in a parent or adult sibling
- ❑ Caucasian or Asian race
- ❑ Poor health/frailty
- ❑ Current or past tobacco use
- ❑ Hypogonadism or deficiency of sex hormones (for men)
- ❑ Low body weight (less than 127 lbs.)
- ❑ Loss of 1½ or more inches in height
- ❑ History of anorexia, bulimia, or other similar eating disorder
- ❑ History of exercise-induced lack of menstrual cycles
- ❑ Surgical removal of both ovaries or menopause before age 45
- ❑ Lack of menstrual cycles for more than one year (for reasons other than pregnancy or menopause)
- ❑ Lifelong history of low calcium or vitamin D in diet
- ❑ 2 or more hard liquor drinks or 3 or more beers per day on average
- ❑ Impaired eyesight or poor depth perception, despite correction
- ❑ Frequent imbalance or falls
- ❑ Parkinson's disease, or medicine use for depression
- ❑ Use of insulin for diabetes for 10 years or more
- ❑ On feet 4 hours or less a day
- ❑ Tall stature (more than 5 feet 5 inches) (for women)
- ❑ Current weight is less than weight at age 25 (for women)
- ❑ Exercise less than three times a week ("exercise" means jogging, weight lifting, aerobics, etc.)
- ❑ Excessive production of thyroid or parathyroid glands, or elevated blood calcium — past or present
- ❑ Deficient kidney or liver function for 6 months or more
- ❑ Treatment with Cyclosporine for an organ transplant
- ❑ Anticonvulsant (seizure) therapy (e.g., Dilantin or Phenobarbital)
- ❑ Diuretic therapy with Lasix, Bumex, or Edecrin
- ❑ Current treatment with Librium, Tranxene, Valium, Dalmane, or Ativan for more than 1½ months
- ❑ History of steroid tablet use (e.g., cortisone, prednisone) or high-dose asthma inhalers for 6 months or more
- ❑ Caffeine intake more than the equivalent of two cups of coffee per day (including sodas)
- ❑ Gastrointestinal malabsorption, surgical removal of stomach or small bowel, or frequent diarrhea (e.g., from Crohn's disease or celiac disease)
- ❑ Inability to rise from a chair without arms
- ❑ Rheumatoid arthritis or Cushing's syndrome
- ❑ History of chemotherapy or multiple myeloma
- ❑ Osteogenesis imperfecta
- ❑ Cognitive impairment or dementia

If you answer "yes" to any of the following questions, a bone density scan is recommended.

*** For Women**

1. I am 65 years of age or older..... Yes ❑ No ❑
2. I am postmenopausal, under 65 years of age, and have one or more additional risk factors (check risk factors above that apply). ..... Yes ❑ No ❑
3. I am postmenopausal and currently have a fracture. ..... Yes ❑ No ❑
4. I have been on hormone replacement therapy for more than two years..... Yes ❑ No ❑
5. I am premenopausal and have 4 or more risk factors (check risk factors above that apply). ..... Yes ❑ No ❑

*** For Men**

1. I am a male over 50 years of age and have 3 or more risk factors (check risk factors above that apply). ..... Yes ❑ No ❑
2. I am a male between 40 to 50 years of age and have 5 or more risk factors (check risk factors above that apply). ..... Yes ❑ No ❑

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Appendix 2

Selection of references used to construct the 2-minute questionnaire:

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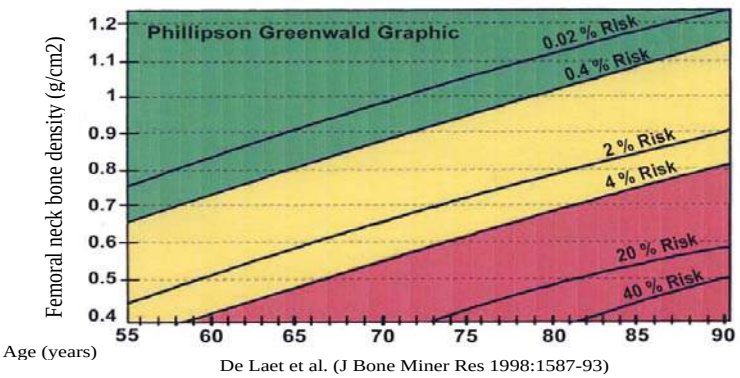
Appendix 3. Phillipson-Greenwald Surgeon's Assessment Form

UTAH OSTEOPOROSIS CENTER -- HIP FRACTURE RISK for WOMEN

Based on Lunar Prodigy™ Dual Energy X-ray Absorptiometer (DXA) Data

Women -- Four Year Prospective Hip Fracture Risk



De Laet et al. (J Bone Miner Res 1998:1587-93)

GREEN: Risk < 1 %
Universal health recommendations *

YELLOW: Risk > 1 %
Treatment needed for significant risks**

RED: Risk > 4 %
Treatment needed (always treat if prior osteoporotic fracture)

Patient Name: _____ Date: _____

Results ("X" on colored chart)

Femoral Neck: The bone mineral density of _____ gm/cm^2 has a T-score of _____.
This represents a _____% current fracture risk for age _____.

Risk Zones

GREEN Age is an independent major risk factor for fracture; therefore a low T-score (e.g., < -2.0) may have low fracture risk in younger age groups:

* *Universal health recommendations*:
1200 mg of calcium and Vitamin D 800-1000 IU daily
Regular exercise
No smoking and limit alcohol intake (1-2 drinks/d)

YELLOW Some factors may make fracture more likely than predicted by bone density alone:

** Significant Risk Factors (*Strongly consider treatment to prevent osteoporosis*):
Family history of osteoporotic fracture (especially maternal hip fracture)
Current use of corticosteroid medication (prednisone or inhaled steroids)
Current smoking
Body weight under 120 pounds

RED Treatment indicated: FDA approved treatments include, for example:
Alendronate, Risedronate, Ibandronate, Teriparatide, Raloxifene, and Calcitonin.

NOTE: Anyone with a prior osteoporotic fracture requires pharmacological treatment regardless of bone density measurement.

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Greenwald, Barajas. 2000. Better bone density reporting: T score report versus fracture report with outcome analysis. J. Bone and Mineral Research. 15:S401.

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