Cost-effectiveness of the Arthritis Self-Help Course

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Objective: To evaluate the cost-effectiveness of the Arthritis Self-Help Course in reducing the pain of arthritis, the leading cause of disability in the United States and a common problem among older adults.

Methods: A decision model was used to examine the cost-effectiveness of the Arthritis Self-Help Course among individuals with arthritis over a 4-year analytic horizon from 2 perspectives, namely, society and the health care system. The Arthritis Self-Help Course was assumed to reduce pain by 20% and physician visits for arthritis by 40% among individuals receiving conventional medical therapy. Estimates for program costs, costs for physician visits, and time and transportation costs were derived from the published literature and expert opinion. Sensitivity analyses were conducted on all relevant parameters. Arthritis pain and costs (program, physician visit plus/minus time and transportation) were expressed as cost per person per unit reduction in pain. Because nearly all analyses showed the program to be cost saving, we simply report the reduction in joint pain and the cost savings, because standardizing cost savings is not a useful concept.

Results: From both the societal and health care system perspectives, the Arthritis Self-Help Course was cost saving in base-case analyses (reducing pain by 0.9 units while saving $320 and $267, respectively) and throughout the range of reasonable values used in univariate sensitivity analyses. Cost savings were due primarily to reduced physician visits.

Conclusions: The Arthritis Self-Help Course is a cost-saving intervention that further reduces arthritis pain among individuals receiving conventional medical therapy. The benefits for both patients and health care providers warrant its more widespread use as a normal adjunct to conventional therapy.

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Arthritis, which is the leading cause of disability in the United States, limits independence and reduces quality of life. An estimated 38 million Americans (15.0% of the population) had arthritis or another rheumatic condition in 1990, more than two fifths of whom were aged 65 years or older. In the year 2020, 60 million Americans (18.2% of the population) are projected to be affected by these disorders. In 1990, an estimated 2.8% of Americans (7.0 million) experienced limitation in activity (a measure of disability) from these conditions; among those aged 65 years or older, the estimate was 11.6% (3.7 million). In 2020, 3.6% (11.6 million) of the population is projected to suffer limitation in activity because of arthritis or other rheumatic condition. Direct and indirect costs for arthritis were estimated to total $65 billion in 1992 and are likely to increase dramatically as the baby boom cohort ages; about half of Americans aged 65 years or older have arthritis or another rheumatic condition.

Despite the higher prevalence of arthritis, primary prevention is limited because only a few risk factors, such as obesity in the case of knee osteoarthritis and, for several types of osteoarthritis, sport or occupational joint injury, have been identified to date. Numerous secondary and tertiary prevention measures are available, however, including medications to reduce pain and inflammation, educational and physical activity interventions, and total joint replacement surgery. However, although many of the educational and physical activity interventions might reduce pain and disability, increase an individual’s perceived sense of control over the disease, and improve quality of life, most remain underused.

When considering the use of a programmatic intervention for arthritis or another chronic condition, knowledge of its cost-effectiveness may be extremely important. Yet the cost-effectiveness of many public health interventions has not been determined; indeed, applying economic analysis techniques to public health prac-
METHODS

We used a decision model to examine the cost-effectiveness of the ASHC over 4 years following participation. Cost-effectiveness analyses of prevention programs assess the relative costs of accomplishing an outcome. We used 2 perspectives—that of the health care system (medical costs only) and that of society; the second perspective includes all costs and benefits, regardless of who incurs or receives them. The health care system perspective permits an assessment of the impact of the ASHC on the health care resources of entities such as insurers and managed care organizations. The societal perspective allows a comprehensive look at the economic impact on a community.

COSTS

We used the decision model to compare expected costs and reduction in pain for those enrolling in the ASHC and those not participating in the program. For the societal perspective, we included the program cost per enrollee, costs for physician visits for arthritis over 4 years, and costs for personal time and transportation for either attending ASHC sessions or making physician visits. For the health care system perspective, we included the program and physician visit costs, but not the personal time or transportation costs. We did not address costs for medications, joint replacement surgery, physical activity, disability, or depression for either perspective because we did not have good cost data for these outcomes.

The ASHC program costs were based on the average of high and low budgets used by the Arthritis Foundation to train 5 teams (2 lay instructors per team), each of whom would teach 3 classes on average. Program costs for training the instructors included room and board for the trainer, facility and equipment rental, training materials for the 10 teachers, advertising expenses, refreshments, and time (18 hours) and transportation costs (see below) for the trainer and instructors. Program costs for the actual course included facility and equipment rental, training materials, advertising and recruitment, liability insurance, mailing and registration, indirect expenses for staff coordinators, and time and transportation costs for the instructors and participants. Ranges for program costs used the high and low budgets (Table 1). Using data from the Arthritis Foundation, we estimated the mean number of ASHC sessions attended by program completers to be 5.2 and by program dropouts to be 1.0.

Individuals with arthritis were assumed to receive their arthritis care from primary care practitioners, such as general and family physicians. The cost per physician visit for arthritis was estimated to be $50, the low end of the range for a level 3 office visit for an established patient in the Physician’s Fee and Coding Guide13; we used a range of $45 to $55. Using the experience of the study by Lorig et al.12 we estimated that those completing the program would average 3 visits per year for the 4 years and those not completing the program would average 5 visits per year. We used a range for the average number of annual visits of 2 to 4 for those who completed the program and 4 to 6 for those who did not.

The costs of personal time and transportation for attending program sessions were assumed to equal the cost for visiting a physician. We estimated time costs to be $8.70 per hour based on the distribution of income for men and women at the mean age of participants2; this was multiplied by an estimated 2.5 hours of time door-to-door. To this estimate of $21.75 we added transportation costs of $0.25 per mile × 7.5 miles each way, for a total baseline estimate of $25.50 (range, $22.80-$28.20).

We presented costs in 1995 dollars; future costs were discounted at 3% per year.

CONDITIONAL PROBABILITIES

Participants were considered to be ASHC program completers if they had attended 4 or more of the 6 sessions; otherwise, they were considered to be program dropouts. The probability of program compliance, ie, being a program completer, is typically presented to a group of about 15 participants in a community setting, such as a senior center, library, church, or shopping center. The ASHC has components on the effects and uses of medications, nutrition, patient-physician communication, types of arthritis, and appropriate use of injured joints; interactive participatory components on designing individual physical activity, relaxation, and pain management programs; and methods for solving problems that arise from the illness. Studies of program participants have found that improved outcomes correlate most strongly with a person’s level and growth of perceived self-efficacy (an attribute akin to confidence) in coping with the consequences of chronic arthritis.11,12 The ASHC is currently available in all 50 states as well as in Canada, Great Britain, Australia, New Zealand, the Netherlands, and Scandinavia.11,12

In this study, we address the public health value of the ASHC by evaluating its cost-effectiveness in reducing arthritis pain, the symptom of most concern to patients with arthritis, from 2 perspectives—that of society and that of the health care system.
completer, was estimated to be 0.9 based on the Arthritis Foundation experience that 5% to 10% of those who enter the program drop out after 1 session, but almost all the remainder finish. That same experience suggested low and high values for being a program completer to be 0.8 and 0.95, respectively.

HEALTH OUTCOME

Perceived level of arthritis pain was the health outcome used; we did not address depression, surgery, use of medications, physical activity, or disability. We estimated baseline pain and pain reduction using data from a study by Lorig et al.6,10,12 This study consisted of 2 parts: a 4-month randomized, controlled experiment6 conducted in 1984 and a follow-up of these and other participants for 4 years. The study used volunteers with physician-diagnosed arthritis recruited from 5 northern California counties through public service announcements in the local media, senior citizen centers, and a community clinic. Important positive effects on pain in the 4-month experiment were seen in the ASHC group compared with the formal control group.6 The control group then received the ASHC and this 1984 cohort was followed up for 4 years. The benefits originally observed at 4 months persisted, and a second group that had taken the ASHC in 1985 was followed up for 4 years also with similar results. These 2 cohorts (n = 177 and n = 224) of individuals were similar in age (mean, 65 years), sex (mean, 80% women), education (mean, 14 years), and disease distribution (62%-66% for osteoarthritis; 13%-24% for rheumatoid arthritis; and 14%-17% for other forms of arthritis). The 2 cohorts did not have a formal control group for the 4-year period, but comparison groups with osteoarthritis and rheumatoid arthritis were followed up to measure important baseline and outcome information, and analyses showed that the observed pain benefits of the ASHC contrasted with outcomes observed in the comparison groups for both diseases.

For arthritis pain, Lorig et al.12 used a 10-point visual analog scale.14 With this method the respondent indicates the severity of pain by placing a mark on a 10-cm scale anchored and scored from 0 as no pain to 10 as pain as bad as it can be. The mean reported baseline score in the study by Lorig et al.12 was 5.0. The pain score at 4 years for program dropouts and nonparticipants was also 5.0, based on studies that show either similar or worse pain after 4 years.12 Because having less pain was considered unlikely for dropouts and nonparticipants, the low value for the range at 4 years was set at 4.9, the high value at 5.5. The pain score at 4 years for program completers was 4.0, based on the 20% reduction observed by Lorig et al.12; we used a range of 3.5 to 4.5 units. We did not discount arthritis pain because we know of no conceptually sound way to do so.

ANALYTIC APPROACH

Analyses were conducted in SMLTREE,13 a decision analysis software program. The SMLTREE analyzes costs and health outcomes simultaneously to estimate the expected total cost and expected value of the health outcome for a particular strategy. We used parameter estimates described in Table 1. As noted, base-case values were assigned conservatively and were estimated, along with ranges, using a 4-year evaluation of the ASHC12 supplemented by the expert opinion of researchers in the field as well as by the Arthritis Foundation staff. Univariate sensitivity analyses used the extremes of ranges (Table 1) to look for influential parameters; more extreme values were also examined to find the threshold that would result in the program costing rather than saving money. Two multivariate sensitivity analyses were performed: a best-case scenario used the one end of the range of estimated parameters that favored the program; a worst-case scenario used the other end of the range. The measure of interest was the cost of the program for a 1-unit (ie, 20%) reduction in joint pain from the baseline of 5.0 units in the population with arthritis. Because nearly all analyses showed the program to be cost saving, we simply report the reduction in joint pain and the cost savings, because standardizing cost savings is not a useful concept.

RESULTS

SOCIETAL PERSPECTIVE

Without program participation, the estimated 4-year arthritis-related cost per person would be $1445, with the pain level unchanged at 5.0. Using base-case values for the population with arthritis, the ASHC program was found to be cost saving, reducing pain by 0.9 units (18%) at a savings of $20 (Table 2). In univariate sensitivity analyses, the model proved to be robust, remaining cost saving for all values examined. Threshold values in univariate analyses that would result in the program costing rather than saving money were outside, and usually far outside, the range of likely estimates: program cost per initial program participant of $30,000, cost per physician visit for arthritis of only $13.41, number of physician visits for arthritis per year for ASHC completers of 4.2 and for ASHC dropouts and nonparticipants of 3.8, and probability of completing the ASHC of only 0.22. In multivariate sensitivity analyses, the best-case model reduced pain by 1.9 units (38%) at a savings of $1057. The worst-case model reduced pain by only 0.32 units (6%) at a cost of $198.

HEALTH CARE SYSTEM PERSPECTIVE

Without program participation, the estimated 4-year arthritis-related cost per person with arthritis would be $957, with pain again remaining at 5.0 on a scale of 10.0. Using base-case values for the population with arthritis (but removing the personal cost of time and transportation), the ASHC program again was cost saving, reducing pain by 0.9 units (18%) at a cost savings of $267 (Table 2). In sensitivity analyses, the model again proved to be robust, remaining cost saving at all values examined. Again, threshold values in univariate analyses that would result in the program costing rather than saving money were outside, and usually far outside, the range of likely estimates: program cost per initial program participant of $345, cost per physician visit for arthritis of only $43.33, number of physician visits for arthritis per year for ASHC...
The findings of this secondary data analysis show that broad use of the 6-week Arthritis Self-Help Course in conjunction with conventional medical therapy can be a highly cost-effective public health intervention, substantially reducing pain while reducing overall costs compared with the prevailing practice of receiving conventional medical therapy without an accompanying self-management program. The cost savings we found resulted primarily from fewer physician visits and were present from both the societal and health care system perspectives. Most important, in univariate sensitivity analyses these cost savings persisted throughout the expected range of important parameters, such as program cost, cost for a physician visit, and cost for personal time and transportation. Even the multivariate sensitivity analyses supported its use. The best-case scenario saves even more money for the same reduction in pain. The worst-case scenario from the health care system perspective costs just $84 over 4 years to reduce pain by 0.32 units, a bargain compared with comparable medication costs. Even the worst-case scenario from the societal perspective, a cost of $198 over 4 years to reduce pain by 0.32 units, is likely to be viewed as a bargain because the additional costs fall on the person with arthritis, who is probably willing to trade time and transportation costs for the pain reduction.

The pain reduction seen with the ASHC is substantial, amounting to an estimated 20% to 30% of and additive to that seen with medical interventions such as nonsteroidal, anti-inflammatory drugs. These findings underscore the importance of the ASHC as an adjunct to conventional medical therapy and suggest that its use...
effects of those medications. In addition, reduced pain, might have found such a change in medication use in the 4-month ASHC evaluation, longer-term follow-up might have found such a change in medication use as well as fewer of the frequent and costly adverse effects of those medications. In addition, reduced pain, an important indication for expensive joint replacement, might have resulted in fewer operations.

Current recruitment for the voluntary ASHC program is about 50% with multiple recruiting letters; making the program a standard adjunct to conventional medical therapy would likely increase recruitment and thus disseminate its benefits more widely. Finally, those considering adopting this program should consider that pain and cost reductions appeared early after the ASHC and persisted during 4 years of observation, which suggests that they may well persist for additional years with additional cost savings.

The strength of this study is that both univariate and multivariate sensitivity analyses found the evidence favoring the ASHC to be robust despite the use of widely varying values for important parameters, suggesting that the findings would hold up even if some of the estimates were not precise. There are potential limitations to the analysis as well, however. As in any cost-effectiveness analysis, we had to make assumptions about important variables using the best available data which, in these analyses, came from the opinions of experts as well as the single study evaluating the ASHC. Another possible limitation is that much of the data came from a single study, using a population consisting of relatively well-educated women from northern California. Whether the benefits observed in this population would be seen with other populations has not been measured, but arthritis occurs more often in women than men throughout the United States, and again the robustness of the findings suggests the ASHC could be beneficial for a variety of demographic and geographic groups, even if their outcomes differed from those observed herein. Another possible limitation is that we had no information on the clinical spectrum of disease severity in the published evaluation. Study volunteers, however, came from a variety of sites and had a variety of diagnoses, suggesting that they should be reasonably representative of disease severity in the general population.

Information on the effectiveness of prevention programs is needed to make judgments about public health priorities, to select intervention strategies, and to allocate resources, especially among older adults who as a group are heavy consumers of health resources and are disproportionately affected by arthritis. There is sufficient evidence of the ASHC’s value from both the societal and health care system perspectives to warrant its more widespread use by managed care groups and other providers of health services. Because many of those who suffer from arthritis are older than 65 years, the ASHC program should be of interest to Medicare as well.

Future evaluation studies, perhaps conducted in a managed care setting, could provide stronger and more specific evidence of the role of the ASHC in managing arthritis by addressing a broader range of outcome measures (disability, depression, self-efficacy, or costs) in different demographic groups, deciding how to convert arthritis pain into a more standard quality-of-life measure, evaluating outcomes among individuals with different types and severity of arthritis, considering cost-reducing modifications to the ASHC, and following a cohort for longer than 4 years.

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