

CONTINUING MEDICAL EDUCATION

Changing Behavior and Improving Outcomes

JEFFREY K. STROSS, H. RALPH SCHUMACHER,
MICHAEL H. WEISMAN, and DAVID M. SPALDING

A study was undertaken to determine if an intensive continuing medical education program in rheumatology could improve patient care. Fifteen primary care practitioners, who fit the description of educationally influential physicians, completed a 2-week academic medical center-based preceptorship. Improvement in physician knowledge, from a mean score of 65.3% to a mean of 82.9%, was documented using pre- and post-tests. Significant changes in physician behavior were documented using chart audits and patient interviews. The use of diagnostic tests and corticosteroids, and physician-patient interactions were the areas of greatest improvement. Functional outcomes for patients, measured by the Sickness Impact Profile, also improved. These findings suggest that a well-designed continuing medical education program can effect some changes in physician knowledge and behavior that will result in at least short-term improvement in patient outcomes.

Presented in part at the 47th Annual Meeting of the American Rheumatism Association, San Antonio, TX, June 1983.

From the University of Michigan Medical School, Ann Arbor; the University of Pennsylvania School of Medicine, Philadelphia; the University of California, San Diego School of Medicine; and the University of Alabama School of Medicine, Birmingham.

Supported by a grant from Merck, Sharp & Dohme.

Jeffrey K. Stross, MD: Associate Professor of Internal Medicine, University of Michigan Medical School; H. Ralph Schumacher, MD: Professor of Medicine, University of Pennsylvania School of Medicine, and Director, Arthritis-Immunology Center, VA Medical Center, Philadelphia, Pennsylvania; Michael H. Weisman, MD: Associate Professor of Internal Medicine, University of California, San Diego School of Medicine; David M. Spalding, MD: Assistant Professor of Internal Medicine, University of Alabama School of Medicine.

Address reprint requests to Jeffrey K. Stross, MD, Department of Internal Medicine, D3211 Medical Professional Building, University of Michigan, Ann Arbor, MI 48109.

Submitted for publication July 3, 1984; accepted in revised form May 6, 1985.

Both enthusiasm and doubt have been expressed about the ability of continuing medical education (CME) to change physician behavior and improve patient care. In spite of this apparent inconsistency, 35 states have mandated participation in CME for relicensure, and most specialist societies are considering recertification procedures that include CME participation (1). While many attempts have been made to evaluate the efficacy of CME, few studies have fulfilled key methodologic standards and their results may not be valid (2,3). In addition, most studies have failed to examine the impact of CME on patient and disease outcomes. A recent randomized trial of CME demonstrated conflicting results and suggested that additional studies be carried out to refute, confirm, or expand the findings (4).

This study was undertaken to determine if a well-designed CME program in rheumatology could improve patient care. The method of analysis progresses systematically, by first assuring that learning takes place, then that a change in behavior results, and finally, that an improvement in patient outcome occurs. This paper describes the results of the study.

METHODS

This study had 3 components: identification and recruitment of the target audience, development and implementation of the educational program, and evaluation. Eighteen primary care practitioners who fit the description of being "educationally influential physicians" were identified using previously developed methodology (5). An educationally influential physician is one who, with relative frequency, formally or informally influences other individuals' behavior in a desired way. Fifteen of these individuals were recruited into the project by 1 of the 3 project coordinators. The other 3 were unable to participate because of difficulties in sched-

uling. These participating physicians were in practice in areas with >20,000 population where there was no formally trained rheumatologist available in the immediate vicinity.

An educational program designed to improve the rheumatologic knowledge and skills of these physicians was carried out at 3 academic medical centers. The educational program was centered around a preceptorship of 2 weeks duration, each week separated by 1 month. Specific educational objectives were developed for each subject area, which included rheumatoid arthritis, osteoarthritis, crystal deposition disease, low back pain, and monarticular arthritis. These objectives were derived from needs assessments done in recent projects, were oriented to common problems and techniques, and stressed history-taking, physical assessment, diagnostic tests, radiographic assessment, joint aspiration and synovial fluid analysis, therapy, and the use of consultants (6). The same CME program was delivered to groups of 5 physicians at each center and consisted of didactic presentations and patient care activities. While the program utilized small group interactive dynamics to maximize learning and minimize faculty teaching time, individualized instruction was given to physicians based on their pretest results.

Evaluation efforts were designed to measure changes in physician knowledge and behavior, and patient outcome. Two tests of cognitive knowledge based on the educational objectives were developed and validated. Each test was administered to a representative group of physicians, and no significant differences in physician performance were noted. One of these tests was used as the pretest and the other as the post-test. Clinical skills were evaluated by direct observation of joint examinations and the performance of arthrocenteses. Changes in physician behavior (process items) were studied by chart audits and patient interviews, and changes in patient outcome were measured using patient interviews and the Sickness Impact Profile, a 136-item questionnaire that has been validated as an outcome instrument in patients with chronic diseases (7). Demographic data, items from the medical history, physical findings, results of diagnostic tests, therapy, response to therapy, complications, and referral patterns were recorded for each patient. Since these data were directly related to the educational program, if they were not present in the medical record, they were obtained in the interview process, as were data concerning the physician-patient relationship.

Each physician was asked to identify 20 patients with rheumatic diseases (rheumatoid arthritis, osteoarthritis, gout, low back pain, collagen vascular disease, monarticular arthritis) in his/her practice and to secure the patients' permission to participate in the evaluation process. Prior to the program and 4 months after the educational intervention, their records were audited against predetermined criteria, and each patient was interviewed and completed the Sickness Impact Profile. Patients were also asked to evaluate their overall level of functioning before and after the 4-month period; a 5-point scale was used. A score of 1 indicated excellent function or marked improvement, 3 indicated intermediate or stable function, and 5 indicated extremely limited function or a marked decrease. Because of fiscal constraints and the pilot nature of this project, no control subjects were concurrently studied.

Statistical analyses were made by Student's test for continuous data and chi-square test for categorical data.

RESULTS

The pretest cognitive knowledge scores of the 15 physicians averaged 65.3%, which improved to 82.9% following the program ($P < 0.05$). An improvement in clinical skills was also noted; at the completion of the preceptorship, each physician could satisfactorily perform and interpret a joint examination and an arthrocentesis.

The 15 physicians identified and recruited a total of 263 patients with rheumatic diseases. Of these, 228 (86.7%) were interviewed and completed the initial outcome instrument. The most frequent reasons for not participating were logistic (12 patients) and language barriers (10 patients). Of the 228 patients initially interviewed, 202 were seen by their physicians in the 4 months after the intervention, and qualified for inclusion in the followup study. One hundred eighty-five (92%) of these patients completed the followup process. Of the 17 patients who were not available, 3 died, 8 moved away, and 6 refused to participate. Only those patients available for both data collections were included in the analysis, and their demographic data are noted in Table 1. The demographics were similar to those in other reported series of rheumatic disease patients seen in primary care practices (8). The characteristics of those 43 patients not included in the study were similar to those of the group as a whole.

Significant changes in the utilization of diagnostic tests were noted in the post-program audits (Table 2). More patients had erythrocyte sedimentation rate evaluations and joint roentgenograms ordered or performed during the 4-month followup period. No changes in the use of most systemic medications were noted except for a significant decrease in systemic steroid utilization. The number of arthrocenteses per-

Table 1. Demographic characteristics of the rheumatic disease patients

| | Number | % |
|----------------------|--------------------|------|
| Sex | | |
| Women | 128 | 69.2 |
| Men | 57 | 30.8 |
| Diagnoses | | |
| Rheumatoid arthritis | 50 | 27.0 |
| Osteoarthritis | 103 | 55.7 |
| Gout | 8 | 4.3 |
| Low back pain | 12 | 6.5 |
| Other | 12 | 6.5 |
| Average age, years | 63.9 (range 20-87) | |

Table 2. Areas of change in physician behavior

| Variable | Pre-program response, no. (%) | Post-program response, no. (%) |
|--------------------------------------|-------------------------------|--------------------------------|
| Diagnostic test utilization | | |
| Sedimentation rate | 21 | 38* |
| Joint radiographs | 23 | 60* |
| Antinuclear antibody | 13 | 12 |
| Uric acid | 31 | 28 |
| Arthrocentesis | 17 | 40* |
| Therapy | | |
| Aspirin | 86 (46.5) | 90 (48.7) |
| Gold | 24 (13.0) | 16 (8.7) |
| Nonsteroidal antiinflammatory agents | 150 (81.1) | 144 (77.8) |
| Corticosteroids (intraarticular) | 16 (8.6) | 36 (19.5)† |
| Corticosteroids (systemic) | 38 (20.5) | 26 (14.1)† |
| Physical therapy | 60 (32.4) | 63 (34.1) |
| Physician-patient interaction | | |
| Answers questions | 163 (88.1) | 174 (94.1) |
| Informs patients | 133 (71.9) | 148 (80.0)* |
| Caring physician | 155 (83.8) | 167 (90.3)* |
| Competent physician | 85 (45.9) | 126 (68.1)* |

* $P < 0.01$.† $P < 0.05$.

formed increased, as did the use of intraarticular corticosteroids. The value of judicious use of intraarticular corticosteroids, and minimizing the use of systemic steroids for rheumatoid arthritis were among the points stressed in the educational program. Seventy-five percent of arthrocenteses were performed on patients with rheumatoid arthritis, and 36 of 40 (90%) were done for therapeutic purposes, as they were associated with the instillation of intraarticular corticosteroids. Explicit criteria for the use of intraarticular corticosteroids (9) were applied in each instance, and 39 of the 40 procedures were in accordance with the criteria. Although the value of physical therapy was stressed, and criteria for referrals to rheumatologists and orthopedic surgeons were provided, no significant changes in referral patterns were noted.

The other major area of change was in physician-patient relationships. The length of patient visits increased from 20 minutes to 25 minutes ($P < 0.05$), and when patients were questioned about how well their physicians communicated with them, significant improvements were noted in many areas (Table 2). The patients increasingly perceived their physicians as being more kind, caring, compassionate individuals who did an excellent job of answering their questions and informing them about their disease. The number of patients who considered their physicians competent in the management of their rheumatic problems increased dramatically from 46% to 68% ($P < 0.01$).

Patient outcome was measured in 2 ways: patients' perception of their overall disease course and the Sickness Impact Profile. The patients' perception of disease course improved, with a decrease in scores from a mean of 2.97 to 2.68 ($P < 0.01$). Similar changes were seen on the Sickness Impact Profile (Table 3). Although the psychosocial dimension did not reach the 0.05 level of improvement, the physical and overall scores were significantly improved. The physical dimension subscales showing the greatest improvement were Ambulation and Body Control and Movement, while the psychosocial subscale of Social Interaction significantly improved.

Performance of individual physicians and groups of physicians based on educational site was also evaluated. Improvement in outcomes occurred in all 3 groups and no significant differences between groups were noted. Individual physician performance was also evaluated and improvement in patient outcomes, measured by both scales, occurred for all 15 participants. The improvement was statistically significant ($P < 0.05$) for 12 of 15 physicians. Improvement could not be predicted by use of diagnostic tests, initiation of new therapeutic modalities, or time spent with each patient.

DISCUSSION

Despite widely mandated participation in CME for relicensure, and moves toward recertification procedures that require CME, there is little evidence that CME participation improves the quality of care (1). This study was undertaken to determine if a well-designed educational program, administered to a highly motivated physician group, could improve patient care.

Physicians participating in this program made significant gains in knowledge and clinical skills in the management of common rheumatic diseases. They then returned to their practices and were restudied 4 months later. During this time, changes in the utilization of diagnostic studies, treatment of specific rheumatologic problems, and physician-patient interactions occurred. The use of erythrocyte sedimentation

Table 3. Patient outcome measures, Sickness Impact Profile

| | Pre-program | Post-program |
|------------------------|-------------|--------------|
| Physical dimension | 0.180 | 0.162* |
| Psychosocial dimension | 0.176 | 0.160 |
| Overall | 0.171 | 0.148* |

* $P < 0.01$.

rates as aids in the diagnosis and management of arthritis and the clinical utility of joint roentgenograms and arthrocenteses were key points in the educational program. The changes noted in corticosteroid utilization were also stressed. While there may not be incontrovertible evidence of the value of these modalities, they were selected as outcome measures because they represent appropriate interventions commonly used in rheumatologic practice (10). This may be problematic in the area of roentgenograms since the indications for having them done are dependent on the duration and course of the disease, response to therapy, and availability of equipment.

The most interesting changes were noted in the patients' perceptions of their physicians and their physicians' ability to help them. The physicians spent more time with their patients, answered their questions more effectively, gave them more information about their condition, and were thought to be more kind, caring, compassionate, and competent. It was hoped that these efforts would result in improved patient compliance, but no changes were noted. The increase in time spent with each patient may reflect the educational efforts, as well as the increased number of procedures performed. The next step was to determine if this change in knowledge, skills, and behavior would result in improved patient outcomes. Both measures, i.e., a subjective assessment by patients and a functional assessment using the Sickness Impact Profile, documented a parallel improvement.

Since we did not have concurrent control groups, we cannot say with certainty whether improvements in physician performance and patient outcome would have occurred regardless of the intervention or because of the fact that both groups knew they were being studied (Hawthorne effect). Changes in physician performance were not evident in other recent studies (11,12), and the outcome instruments were coded in a manner that maintained anonymity. Therefore, these data suggest that changes in physician knowledge and skills as a result of a CME program caused a change in physician behavior that may have resulted in improved patient outcome. While process and outcome should be closely linked, objective evidence supporting this is not prevalent (13). This is true for many reasons: outcome may be difficult to define and measure, especially in chronic diseases; the cost may be prohibitive; and the logistic problems may be overwhelming. We were fortunate that a validated outcome instrument was available, funding was provided, and a dedicated group of physicians was available to facilitate the data collection activities.

While these data are provocative, their usefulness may well be limited. The target audience, physicians thought to be educationally influential by their peers, was carefully selected to provide a group of well-motivated individuals who are actively involved in educational activities and possess excellent interpersonal skills. Even though these individuals have been shown to influence physician behavior, no studies have been done to determine if this would be translated into improved outcomes. If changes in outcome could be achieved as a result of an educational program, this would be the ideal audience to study. Unfortunately, these people are usually few in number in any single community, and the results may not be applicable to other subjects.

The educational program was also tailored to the needs of the group. It was 2 weeks in duration, with a 1-month interval between the first and second weeks. It was delivered to groups of 5 physicians; this facilitated discussion, but still allowed for individual attention. Various formats were used, most of which demanded active participation by the physicians. The subject matter was clinically relevant for primary care practitioners and was designed to provide immediate, practical advice in the management of common rheumatic conditions. This educational offering was labor-intensive for both instructors and trainees, demanding a 2-week commitment from the busy practitioners and many hours of intensive teaching by medical school faculty. While the participants thought that it was the best CME program they had attended, the time commitment was great, and the availability of medical school faculty would be a major limiting factor in the future.

Although there are many potential explanations for the improvements in outcome, it is possible that each physician carefully selected those patients who would report favorably about their relationship to their physician. While this possibility exists, the fact that less than half the patients thought their physicians were competent in the pre-program evaluation is evidence against this bias. Other studies have noted a strong positive relationship between patient satisfaction and functional outcome (14). It is possible that the increased use of joint injections with their dramatic immediate effects contributed excessively to a temporarily improved outcome that cannot be maintained over longer periods of time. Longer followup would be needed to document this. Analysis of this subset of patients did not reveal a significant improvement in their outcome when compared with those who did not receive intraarticular injections. The significant adop-

tion of joint injections is of interest since there are likely to be financial advantages for the physician as well as therapeutic benefits for the patient. Some other changes in physician behavior which we had hoped to produce could not be documented. Whether some trends, such as less use of gold, might mean a switch to more appropriate agents cannot be determined from the data we collected.

A potential pitfall in this type of research is an error of analysis. This error is likely to be operative if all of the following criteria are present: the study provides an end point for which the providers could not be assumed to be interchangeable; the results are likely to be applied to a population beyond that being studied; and the analysis was not performed using an approach that took provider effort and provider-patient interaction efforts into consideration (15). While we cannot state with certainty that the providers were interchangeable, they were all primary care providers with similar demographic characteristics who were selected because they were educationally influential. We have cautioned against the application of these results to a broader population, and we have analyzed the data in several ways to study provider efforts as well as provider-patient interactions. Consequently, we do not believe the criteria for error of analysis have been fulfilled in this paper. In view of the pilot nature of the project, an ideal experimental design was not possible. We hope this initial effort will stimulate others by demonstrating that a change in knowledge may result in a change in behavior which may improve patient outcomes. Each of these is difficult to measure, and it may not be feasible to carry out a controlled study.

Our study supports the idea that CME may well be able to effect changes in physician behavior that result in improved patient outcome. The most reasonable interpretation of our findings underscores the concept that for this to happen, attention should be paid to the factors that motivate physicians to participate in CME, as well as to the potential detracting factors. With these in mind, educational programs that are based on need, have immediate practical value, and are stimulating, convenient, and affordable have the greatest chance for success.

ACKNOWLEDGMENTS

We are indebted to Mary Rose Mueller, RN, Barbara A. Murphy, RN, and James M. Richards, PhD for their diligent efforts in abstracting records and interviewing patients, and to Neil Cronin for his support in planning this project.

REFERENCES

1. Berg AO: Does continuing medical education improve the quality of medical care?: a look at the evidence. *J Fam Pract* 8:1171-1174, 1979
2. Sackett DL: Design, measurement and analysis in clinical trials, Platelets, Drugs and Thrombosis. Edited by J Hush, J Cade, AS Gallus, E Schonbaum. Basel, S Karger, 1975, pp 219-225
3. Department of Clinical Epidemiology and Biostatistics, McMaster University Health Science Center: Clinical epidemiology rounds: how to read clinical journals. V. To distinguish useful from useless or even harmful therapy. *Can Med Assoc J* 124:1156-1162, 1981
4. Sibley JC, Sackett DL, Neufeld V, Gerrard B, Rudnick KV, Fraser W: A randomized trial of continuing medical education. *N Engl J Med* 306:511-515, 1982
5. Hiss RG, MacDonald R, Davis WK: Identification of physician educational influentials in small community hospitals, Proceedings of the Seventeenth Annual Conference on Research in Medical Education. Washington, DC, 1978, pp 283-288
6. Stross JK, Bole GG: Continuing education in rheumatoid arthritis for the primary care physician. *Arthritis Rheum* 22:77-81, 1979
7. Deyo RA, Inui TS, Leininger JD: Measuring functional outcomes in chronic diseases: a comparison of traditional scales and a self administered health status questionnaire in patients with rheumatoid arthritis. *Med Care* 21:180-192, 1983
8. Stross JK, Bole GG: The impact of a new rheumatologist on the management of rheumatic disease patients in community hospitals. *Arthritis Rheum* 26:1033-1036, 1983
9. Kelley WN, Harris ED Jr, Ruddy S, Sledge CB, editors: *Textbook of Rheumatology*. First edition. Philadelphia, WB Saunders, 1981, pp 556-557
10. McCarty DJ: Treatment of rheumatoid joint inflammation with triamcinolone hexacetonide. *Arthritis Rheum* 15:157-162, 1972
11. Stross JK, Bole GG: Evaluation of a continuing education program in rheumatoid arthritis. *Arthritis Rheum* 23:846-849, 1980
12. Stross JK, Hiss RG, Watts CM, Davis WK, MacDonald R: Continuing education in pulmonary disease for primary care physicians. *Am Rev Respir Dis* 127:739-746, 1983
13. Sackett DL, Haynes RB, Taylor DW, Gibson ES, Sicurella J, Tugwell PG, Sibley JC: Process versus outcome in the clinical management of hypertension (abstract). *Clin Res* 27:443A, 1979
14. Wooley FR, Kane RL, Hughes CC, Wright DD: The effects of doctor-patient communication on satisfaction and outcome of care. *Soc Sci Med* 12:123-128, 1978
15. Whiting-O'Keefe QE, Henke C, Simborg DW: Choosing the correct unit of analysis in medical care experiments. *Med Care* 22:1101-1114, 1984