0008-3194/88/01 7-022/$2.00/0/©JCCA 1988

The move towards research in the health professions: A comparison of Chiropractic and Physiotherapy

James C Wall, PhD*
George I Turnbull MA, MCPA*
Howard Vernon, DC, FCCS(C)**

This paper compares the efforts of physiotherapy and chiropractic to move towards the development of a scientific body of knowledge through research. The history of both professions is discussed with particular reference to the education of the clinical practitioners and the educational faculty. Four cited factors contributing to the paucity of research in chiropractic, namely anti-scientific elements in philosophy, lack of suitable role-models, lack of funds and a lack of understanding of research methodology are also seen as barriers to physiotherapy research. These obstacles are discussed in the light of the strategies being employed by both professions to deal with this issue and their success or otherwise. It is stressed that research by members of both professions is fundamental to ensure professional survival. Solutions are principally concerned with increasing the research output from those institutions which educate future professionals. This new generation will likely ensure that the professions are soundly based on scientific principles. The paper considers, therefore, the pre-professional curriculum primarily, although not exclusively, from a Canadian perspective. (JCCA 1988; 32(1): 17–22)

KEY WORDS: physiotherapy, chiropractic, manipulation, education.

Cet article compare les efforts de la physiothérapie et de la chiropraxie pour assurer le développement d'un corps de connaissances scientifique par la recherche. L'histoire de chaque profession est étudiée en relation avec l'éducation des praticiens en clinique et de la faculté éducationnelle. Quatre facteurs nommés contribuent à la pénurie de recherches en chiropraxie. Mentionnons: les éléments anti-scientifiques en philosophie, le manque de rôles-modèles, le manque de fonds et un manque de compréhension de la méthodologie de la recherche, lesquels sont aussi considérés comme barrières à la recherche en physiothérapie. Ces obstacles sont étudiés à la lumière des stratégies employées par les deux professions pour traiter ce problème et leur succès ou leur faillite. On souligne que le recherche par les membres des deux professions est fondamentale à la survie professionnelle. Les solutions tendent surtout vers l'accroissement du rendement de la recherche des institutions qui forment les futurs professionnels. Cette nouvelle génération fera probablement en sorte que les professions soient solidement basées sur des principes scientifiques. L'article considère par conséquent le curriculum pré-professionnel essentiellement, quoique pas exclusivement, dans un contexte canadien. (JCCA 1988; 32(1) 17–22)

MOTS CLÉ: physiothérapie, chiropraxie, éducation, manipulation.

The need for research in the health professions is one which has long been recognized. In many instances, however, little more than lip service has been accorded this recognition. In an effort to improve the efficiency and cost of health care delivery, the pressure is growing for these groups to develop a scientific body of knowledge through research. It is becoming unacceptable to provide treatments without the evidence to demonstrate that these modalities are safe and effective. This is particularly so in instances where such procedures are rooted in tradition. It is incumbent on the professions themselves to demonstrate to society that the provision of health care is effective and scientifically sound, a result that can only be achieved through systematic research. This paper compares the efforts of two health professions, physiotherapy and chiropractic, to move towards this goal. The paper considers this subject primarily, although not exclusively, from a Canadian perspective.

Physiotherapy has its origins in the provision of massage, remedial exercise and thermal applications, modalities which have been utilized in the treatment of injury and disease since ancient times.[1] In 1895, the precursor of the present-day physiotherapy profession was organized for the first time in the United Kingdom as the Society for Trained Masseuses.[2] As medical electricity and Swedish remedial exercises were incorporated, the profession grew in size and stature and, at the same time, aligned itself closely with medicine under whose umbrella it thrived. In 1920, the Royal Charter was bestowed upon the Society which eventually became to be known as the Chartered Society of Physiotherapy. Many associations of physiotherapy throughout the world, including those of the United States, Canada, Australia and South Africa, were initiated by members of the British Society with this common ancestry possibly accounting for the general uniformity of attitudes within the profession as a whole.

Chiropractic originated in 1895, with the restoration of the hearing of a man through spinal manipulation by D.D. Palmer. Co-incidentally, this was the year that the physiotherapy profession was first organized. The ranks of chiropractors grew from that time, with many of the early practitioners being converts from the practice of allopathy. By the early 1900's the Palmer College of Chiropractic had been established in Davenport, Iowa. Two major traditions developed within this profession from that time; Gibbons[3] describes these as the purist (straight) and eclectic (mixer) traditions. In Canada, chiropractic education has been centred at the Canadian Memorial Chiropractic College (CMCC), founded in 1948 and memorialized to D.D. Palmer, who was born in Port Perry, Ontario.

* School of Physiotherapy, Dalhousie University
** Canadian Memorial Chiropractic College
Address for Correspondence:
Dr. JC Wall, School of Physiotherapy, Dalhousie University, Halifax, Nova Scotia B3H 3J5. (902) 424 2630.

Both professions have grown in Canada at remarkably similar rates as can be been seen from the following data taken from the Canada Health Manpower Inventory.[4] In the ten years from 1974 to 1984 the total number of chiropractors in Canada increased from 1,506 to 2,804, a growth of some 86.2%. This has resulted in a decrease in the population per licensed chiropractor for the same ten year period from 14,986 to 9,009, an improvement in potential accessability of 39.9%. In the same period the number of active members of the Canadian Physiotherapy Association increased from 2,991 to 5,350, an increase of 78.9%. The population per physiotherapist decreased from 5,980 to 3,900, a 34.8% decrease. From 1974 to 1979 there was a steady increase in the output of graduates from the schools of physiotherapy, from 268 to 448. However, since then the number has remained relatively unchanged, although there are still far more physiotherapy vacancies than there are qualified therapists to fill them. Interestingly, the number of chiropractic graduates in Canada grew from 66 in 1974 to 97 the following year and thereafter showed steady increases until 1982 when it reached 146. In 1984 there was a decrease in the number of graduates to 127.

There have been other developments most particularly with respect to education. The British system of physiotherapy, for long the model copied by other countries, is still largely hospital-based and administered, and the qualification for licensure to practise, Member of the Chartered Society of Physiotherapy, remains at the diploma level. In Canada, all but one programme have become university based with a baccalaureate degree as the minimum qualification set by the Canadian Physiotherapy Association for new membership. To meet this requirement the one community college-based programme has set up a process whereby students are graduated through a university to which it is affiliated. In the United Kingdom a growing number of schools are moving towards degree programmes either in association with universities or through the Council for National Academic Awards (CNAA). However, these degrees are taken in conjunction with the syllabus of the Chartered Society of Physiotherapy, membership of which is awarded at the same time. In the United States, the minimum qualification is also a baccalaureate degree from a recognised school although plans are in place to introduce a master's degree as the entry level preparation by 1990. This goal, however, is becoming increasingly difficult to meet and may require reconsideration.

An independent system of federally accredited colleges of chiropractic exists in North America, England and Australia. A minimum of two years' undergraduate training is required as a prerequisite to the four year course in professional training at one of these colleges. Following graduation from a college of chiropractic a student must undertake accreditation examinations before being permitted to practise. These examinations are administered by the National Chiropractic Examining Boards and, with few exceptions, by each province and state.

The chiropractic Colleges are independent and exclusively involved in chiropractic education, factors which tend to isolate them from other institutions of higher education. There has been a great deal of discussion as to the merit of moving chiropractic education into the university sector to overcome this problem of isolation. Indeed, one of the recommendations in the Report of the Ontario Council of Health on the Scope of Practice and Educational Requirements for Chiropractors in Ontario[5], was that the CMCC seek affiliation with a university and that the basic science courses be taught at a university and that these courses be the same as for other health care practitioners. While the latter two recommendations have recently been achieved, the first and major recommendation of outright affiliation has remained elusive.

It is abundantly clear that the move to university based programs has been the single most important factor in the development of a research base in physiotherapy. The lack of university based chiropractic schools, on the other hand, has been identified[6] as a factor which has hindered the development of chiropractic science. These authors have also identified four other factors as being responsible for the general lack of rigorous chiropractic investigations.[6] These are: 1) anti scientific elements in chiropractic philosophy, 2) lack of Scientist-Practitioner (SP) role-models, 3) lack of understanding of research methods and 4) lack of funds for research. Similar barriers to progress could also be said to exist in physiotherapy. We would like to consider these factors and how both physiotherapy and chiropractic have dealt with them, and with what success.

1 Anti scientific elements in philosophy

Of fundamental importance to the development of a scientific body of knowledge, which serves to define and render a profession unique, is the recognition by the members of that profession of this need. Both the chiropractic and physiotherapy professions, which have traditionally relied largely on practitioner-based skills and services, have functioned without seriously questioning the efficacy of their treatments. Education has consisted essentially of the passing on of skills from teacher to student, a process that Currier[7] refers to as "ecclesiastical succession". Keating et al[6] define these anti-scientific elements in chiropractic philosophy as deriving from a position in which deductive reasoning alone, suffices to make self-evident and fully tenable the theories which support the profession. As well, the overuse and abuse of anecdotal evidence and testimony of therapeutic success, coupled with pride in a non-orthodox perspective on health and disease, has lead many practitioners to eschew scientific and objective methods of demonstrating the efficacy and validity of the profession's diagnostic and therapeutic methods.

The professional bodies are clearly concerned that a greater emphasis must be placed on legitimizing the body of knowledge, which defines their particular profession, through research. The Canadian Physiotherapy Association (CPA) stated, as its first priority for the 1978–80 time period, "the develop-

ment of an academic body of knowledge which is the science and art of physiotherapy, through research".[8] This same priority was again identified as the Association's primary objective in the goals for the '80s.[9] Gowland and Clarke[10] have suggested that the promotion of research as a central tenet of the CPA implies the belief that physiotherapy should have a scientific background that justifies and consolidates its existence as a true profession. This pressure for a greater research base from within the profession in Canada is a reflection of what is happening in other countries. The same call for research is in evidence, for example, in the United States[11], Britain,[12] New Zealand,[13] and South Africa.[14] Indeed, one of the objectives of the American Physical Therapy Association is to "meet the physical therapy needs of the people through development and improvement of physical therapy education, practice and research..."[11] This clearly implies that research must be regarded as an expected component of the professional behaviour of physiotherapists, together with their more traditional activities of clinical practice and, to a lesser extent, education.

In similar fashion, in 1975 the research community in Canadian chiropractic met at a seminal conference hosted by the CMCC and the Canadian Chiropractic Association. Here, the profession affirmed its commitment to the rapid development of research in an effort to support chiropractic as a scientific discipline. The major thrust of this conference was aimed at CMCC establishing an active Division of Research and conducting "... experimental research into the basic science subjects relative to chiropractic" and "... clinical studies on the effectiveness of chiropractic care."[15] One of the recommendations of the Report of the Ontario Council of Health on the Scope of Practice and Educational Requirements for Chiropractors in Ontario, was that a research programme be established. This in fact has been done and a director of research has been appointed, a move that has occurred at most chiropractic colleges in the United States. As with the physiotherapy profession, the recognition for research in chiropractic is not limited to North America.[16,17] Clearly therefore, both professions are adopting philosophies which recognize the need for a scientific body of knowledge, and that this need is universally perceived. However, in recognising the deficiency and stating the need for action to rectify it, only the first step has been taken.

As a means of attaining its stated first priority, the Canadian Physiotherapy Association instigated the establishment of the Physiotherapy Research Foundation of Canada. This foundation is considered to be a separate body from the CPA and serves to raise money in order to fund research by physiotherapists. This notable step, however, was accompanied by the removal of research as the number one priority of the professional association on the premise that the new Foundation would assume the major responsibility for future direction in this area. The implication of this action is that the establishment of the Foundation has resolved the research problem in physiotherapy in the eyes of the professional body, an assertion which could be potentially dangerous.

2 Lack of scientist-practitioner (SP) role-models

It is well recognised that those involved in educating professionals act as role-models and as such greatly influence the development of attitudes and beliefs in that profession.[18] Educators in both physiotherapy and chiropractic have traditionally come from the ranks of clinicians with relevant experience. In the United Kingdom a specific qualification was instituted by the Chartered Society of Physiotherapy for those wishing to pursue a teaching career in a school of physiotherapy; the Diploma for Teachers of Physiotherapy. This course of study, which involved supervised teaching in a recognized professional school, was of two years' duration and included time studying such theoretical areas as instructional methodology, educational psychology and curriculum design at a college of education. Arrangements were also made with associated universities and colleges of higher education to study anatomy and physiology in depth. Depending on the expertise within each school, opportunities also existed to acquire greater clinical expertise. This model, which has undergone regular streamlining and modification, persists in most British schools. Physiotherapy education in Canada was founded on the system used in the United Kingdom. Indeed many if not all of the faculty were originally recruited from or trained in Great Britain. A survey of physiotherapy educators in Canada, the United States and five other countries, shows that 92%, 93% and 97% respectively hold physiotherapy qualifications,[19] a reflection of the basic tenet that it takes a physiotherapist to teach physiotherapy. This survey identifies, particularly in the United States, a lack of qualified faculty who can advance the goals of the profession by contributing to the body of knowledge through research and who can provide students with the background information and skills to make them effective in clinical practice. This suggests that the requirement is for better qualified physiotherapists to undertake this role. Traditionally the major barrier to this route has been the lack of graduate courses in physiotherapy, causing potential faculty to look to other disciplines for graduate programmes. Thus many therapists have obtained graduate degrees in such areas as anatomy, physiology, physical education, kinesiology and education. Some have remained within those disciplines and have been lost to the profession. With the growth of graduate programmes within physiotherapy it might be assumed that this particular problem would abate. However, the growth of these graduate degrees in physiotherapy is accentuating the need for higher qualified faculty to run the courses and supervise research projects. This problem appears to be acute in the United States and is jeopardizing the plan to institute a graduate degree as a basic qualification.

The CMCC has recognized that this problem also exists in chiropractic education and research. In 1974, a programme of post-graduate studies at the College known as the Residency Programmes, was initiated. Since that time over 24 D.C.'s have graduated from this intensive two-year post-professional training. A major research study is a primary requirement for

certification and as such, these younger graduates have quickly matured into teacher/practitioners with a strong base in research methods. The success of this programme in filling the needs of research and in creating role models, as clinician-scientists, for future graduates is evidenced in the following events. Graduates from the Residency Programmes include: a) the current CMCC Director of Research; b) a co-principal author of the most authoritative Canadian chiropractic clinical study on low back pain;[20] c) two co-investigators of the most current clinical trial of chiropractic management of low back pain; and 4) three co-investigators along with CMCC's Director of Research, involved in a major clinical trial of chiropractic care in migraine headaches. In the United States Palmer College of Chiropractic is taking a somewhat different route with a plan to implement two Master's degree programmes, one in anatomy and the other in the area of clinical practice. Other American colleges are, however, developing residency programmes similar to CMCC's in order to better prepare future faculty to undertake a role in research.

In the meantime both professions are faced with a shortage of faculty with higher degrees, particularly doctorates, to meet a growing demand. This is a particularly acute problem for the majority of physiotherapy programmes that are now based in universities, where other faculties generally recruit teachers, even at the most basic grades, with a doctorate degree as a minimum qualification. The disparity is clear and has to be addressed. One possible solution is the appointment of highly qualified scientists from outside the professions as faculty members. In physiotherapy less than 8% of the faculty in Canadian schools come from outside the ranks of the profession.[19] There are, however, indications that this may be changing. Because of the lack of qualified physiotherapists, the recognition that research must urgently be done together with the requirement for faculty with doctoral degrees in order to offer graduate programmes there is a greater willingness to accept non-professionals into the ranks of the faculty. At Dalhousie University, for example, two of the 8 full-time faculty are non-physiotherapists. The experience at this institution has been that such a move has significantly improved the research effort particularly with respect to grant monies received and papers presented and published. However, the entrenched antagonism towards non-physiotherapists is highlighted in one of the compulsory factors demanded by the Accreditation process of the CPA, which is that the Head of such a programme must be a physiotherapist.

The employment of non-professionals as full-time faculty members is an area in which physiotherapy could draw on the experience of chiropractic where non-chiropractors have been recruited to teach mainly in the basic sciences. This replicates the situation that exists in medical schools where non-medically qualified faculty, specialised in the medical sciences, such as microbiology, anatomy and pharmacology, are predominantly responsible for teaching these subjects. These faculty also spearhead the research effort in these areas. It would be thought that the faculty in the chiropractic colleges with doctorates in the basic sciences would likewise be the leaders in the effort to put chiropractic on a strong scientific base. However, this does not appear to be the case since the contribution of these faculty to the research effort does not seem to have reaped the rewards that might have been expected. Perhaps this is why Keating et al[6] have specifically called for the promotion of a "scientist-practitioner" (SP) model for training. The CMCC has recently expanded its research faculty to include three dual DC/PhD scientists, in keeping with the SP model, as well as one PhD in Biomechanics.

Apart from simply recruiting faculty, be they from within or outwith the profession, it is important for future development to ensure that a mechanism exists by which, at least in the short term, new or young faculty members can receive appropriate training in research. In chiropractic, the Fellowship programme exists for precisely this purpose and through it Canadian DC's receive support for postgraduate training. CMCC's programme has supported one DC/PhD and a number of DC/MSc candidates, all of whom have retained a strong clinical orientation and have remained within the academic realm. Palmer College of Chiropractic has introduced a similar programme in an effort to verse chiropractic graduates in scientific method and research. In the so-called "PhD extension programme", a chiropractor, who wishes to teach at Palmer, may be supported during a PhD programme at another institution. In return for this financial support, the person must agree to teach at Palmer for two years following completion of his/her doctorate. To date only one candidate has enrolled in this programme. Since there are no PhD programmes in chiropractic per se, it is self-evident that doctoral research training has to be undertaken in a related discipline, a situation which also existed in physiotherapy until very recently. The growth of PhD programmes in physiotherapy, albeit slow, is addressing this problem.

3 Lack of funds for research

The major source of funds for research in academic institutions are those provided by government agencies such as the Medical Research Council and Health and Welfare Canada. The demand for these funds is considerable and growing with a resultant intensification of competition. This situation, in turn, results in even greater difficulty for those with relatively little research experience in obtaining funds from these sources. Physiotherapy research, however, has achieved some success in accessing funds from federal agencies. Of the research monies granted by the Canadian federal agencies to research in the area of rehabilitation, physiotherapy is second to rehabilitation engineering in level of support, ahead of the medical specialty in that field; physiatry.[21] This does not, however, imply that physiotherapy research is being adequately supported by these agencies.

According to Keating et al[6] no chiropractic college has ever received support for scientific research from the National Institutes of Health (NIH). In Canada the same can be said for

lack of support from the federal agencies for research into chiropractic science. Something of a catch-22 situation prevails. No funds exist to do research and, without a track record in research, funding is difficult to obtain. Chiropractors are further burdened by their isolation from the mainstream academic community. Here another catch-22 exists: in order to legitimize the profession so it can ultimately affiliate itself with a university, research is demanded, but government funds are all but inaccessible to undertake that research because CMCC is not part of the university system.

It would be all too easy to allow this lack of access to government funding to become an excuse for not undertaking research projects, but this rationalization is not acceptable. It must be realised that this difficulty in attracting funds, without a track record, is not restricted to health professions attempting to put their discipline on a sound scientific base. Exactly the same dilemma is faced by the majority of young faculty in most university departments. One common solution to this has been the development of programmes to provide seed monies to these people to initiate research projects. These funds may in fact be provided from government sources or from within the university and are normally restricted to new faculty members or, in the case of more experienced faculty, for the purpose of undertaking some pilot work to strengthen a future application for external funding. A strategy that has great merit is for the neophyte researcher to team up with more experienced colleagues on grant applications. In the case of the health professions particularly, much can be gained in this regard by working closely with seasoned medical researchers. Both the physiotherapy and chiropractic professions have reaped the rewards of such team efforts in the past but a far greater cooperative effort could further this development.

Fortunately, the federal agencies are not the only route to funding. Research foundations specifically set up by the professional associations, primarily using funds generated from membership, are an important source of research funds. In both Canada and the United States this has been done for both physiotherapy and chiropractic. Such foundations would appear critical in the early stages of developing a research base. The chiropractic profession has, of necessity, followed this route. Two research foundations have been established which are wholly independent of the mainstream institutions in health care research funding. In the United States the Foundation for Chiropractic Education and Research (FCER) has been in operation for over 14 years, while in Canada, the Chiropractic Foundation for Spinal Research (CFSR) has flourished for a decade. CMCC's research programme as well as the research efforts of the other Canadian chiropractic research centres, have benefitted greatly from grants from these two foundations.

It must also be said that not all research requires vast sums of money. Many projects can be undertaken with very limited funding providing the desire and the time are available. This means making time available for research, time that would otherwise be used for teaching, administration or clinical duties. It also means that research effort must be recognized when a faculty member is assessed for tenure, promotion or merit. It is precisely because research is such a fundamental part of the contribution to the university by a faculty member, that teachers of physiotherapy, who operate in that academic milieu, are becoming so involved in research. The consequences for not doing so are stagnation, retrenchment or worse.

4 Lack of understanding of research methods

Despite the stated need for more research involvement by physiotherapists and the priority given to this by the various professional governing bodies, the number of practitioners actively engaged in research remains low, although interest in research appears to be increasing. In 1983, for example, there was a 33% increase in the CPA Research Division membership, resulting in a total of 288 members plus 22 students.[22] This growth must be seen as an encouraging trend. Unfortunately, this apparent interest does not necessarily translate into actual research involvement. It has been estimated that, of the 768 physiotherapy positions available in the Metropolitan Toronto area, only 8 (1%) are actual research positions.[23] According to an estimate by Holliday[23], 2 to 3% of physiotherapy manpower should be devoted to research in the future. This situation also exists in the United States. According to a 1980 survey of physical therapists in California, the percentage of physiotherapists who spend 50% or more of their time in research was a lowly 0.6%.[24] To determine the reasons for this apparent lack of involvement in research, the survey considered, among other things, the barriers to involvement in research by physiotherapists. The results indicated that those physiotherapists, not involved in research, cited unfamiliarity with the research process as the chief obstacle.[24] This survey concluded that the solution to the problem is education. While no data exist, it could be argued that a similar situation prevails in chiropractic.

There are essentially three formal routes through which education in the research process can be achieved: continuing education courses, graduate study, and the undergraduate curriculum. It would appear that a policy of relying solely upon changing the behaviours of current members of either profession, who are not involved in research, may reap little reward. One must therefore look to the education of the professional before graduation.

The move to the baccalaureate degree as the minimum requirement for licensing has allowed schools of physiotherapy to increase the emphasis on research in the curriculum. Indeed, the recommended core curriculum, which was approved by the Board of Directors of the CPA in 1982, includes a requirement for the study of scientific inquiry.[25] The Council of Chiropractic Education (CCE), the accrediting body for Canadian and American chiropractic colleges, has developed similar standards for research methods courses in the chiropractic curriculum. It is anticipated that, within a very short time, all of the accredited colleges will offer core courses in research methodology.

Of particular importance in the research process are the

concepts of discovery and problem solving. Bruner[26] has argued that the discovery approach to learning is highly effective, particularly in the development of strategies of problem solving. Beard[18] has also pointed out that it is sensible to match the techniques of course evaluation with course objectives. If the objective of a course in research methods is to prepare a student to undertake research, then it seems important that the student be exposed to the whole research process.[27] Of considerable importance is that a student should undertake a research project in order to put theoretical concepts of research methodology into practice. Of note here is the fact that CMCC has, as a requirement for graduation, the completion of an investigative project. As such the didactic programme in research methods is put into actual practice in the final clinical year of professional training. This permits a fusion of the research and practice skills and attitudes.

Hopefully, the programmes outlined above regarding faculty upgrading and the development of scientist-practitioner role models will feedback into the undergraduate curricula of physiotherapy and chiropractic and, in time, will produce the necessary transformation in students in both of these professions. This is clearly a long-term solution to the lack of research in these health professions. It is, however, probably the only lasting solution. The other issues addressed above are simply short-term solutions to a very pressing problem.

Conclusion

For professions which have their educational base in universities, the pressure on faculty to produce research will ensure that research will be done. For professions outside of the university system, this drive may be less focussed but no less necessary. However, whatever the educational base, the need for research by members of both the physiotherapy and chiropractic professions is of fundamental importance in ensuring professional survival. This is a pressing problem, the solutions to which are principally concerned with increasing the research output from those insititutions involved in educating the future members of the professions. It is this new generation of professionals that will be expected to ensure that the professions are soundly based on scientific principles. This implies a continued and greater involvement with research.

Acknowledgements

The first named author (JCW) would like to take this opportunity to thank Alana Ferguson who provided much of the information concerning the research effort at Palmer College of Chiropractic, the largest such institution in the United States.

References

1 Adams G. Cerebrovascular disease and the aging brain. London: Churchill Livingstone, 1973.
2 Young P. A short history of the chartered society of physiotherapy. Physiotherapy 1969; 56: 271–278.
3 Gibbons RW. The evolution of chiropractic: medical and social protest in America. In, Haldeman S. (ed) Modern developments in the principles and practice of chiropractic. New York: Appleton-Century-Crofts, 1980.
4 Canada Health Manpower Inventory. Ottawa: Health and Welfare Canada, 1985.
5 Scope of Practice and Educational Requirements of Chiropractors in Ontario. Toronto: A Report of the Ontario Council of Health. February 1973.
6 Keating JC, Nelson JM, Mootz RD. A model for clinical, scientific and educational development. Research Forum 1986; 2: 103–114.
7 Currier DP. Elements of research in physical therapy. 2nd ed. Baltimore: Williams and Wilkins, 1984.
8 Activities for 1978–80 Relating to the Association's Seven Long-term Goals. Toronto: Canadian Physiotherapy Association, 1979.
9 Activities for the Eighties Relating to the Association's Long-term Goals. Toronto: Canadian Physiotherapy Association, 1981.
10 Gowland C, Clarke B. Research: why bother? Physiother Can 1980; 32: 270–274.
11 Bylaws of the American Physical Therapy Association. Phys Ther 1978; 58: 1225–1235.
12 Partridge CJ. Progress in research. Physiotherapy 1982; 68: 353.
13 Ford SG, Molony R, Pyle E, Ongley C, Purgi T. Physiotherapy research in New Zealand realities and possibilities. NZ J Physiother 1986; 14: 7–9.
14 Irwin-Curruthers S. Education and research. SA J Physiother 1986; 42: 25–26.
15 Rozeiu AR, Churchill DA, Mills R. Report of the CCA-CMCC Conference on Research Priorities. Toronto: Canadian Memorial Chiropractic College, 1975.
16 Campbell SA, Dillon JL, Polus BI. Chiropractic in Australia: its development and legitimation. J Aust Chiropractic Assoc 1982; 12(4): 21–30.
17 Inglis BD, Fraser B, Penfold BR. Chiropractic in New Zealand. Report to the Commission of Inquiry, Government Printer, New Zealand. 1979: 223–226.
18 Beard R. Teaching and Learning in Higher Education. Baltimore: Penguin Books, 1972.
19 Walker JM, LeMasters M, Evans PR. Canadian and United States physical therapy educators: Professional characteristics. Physiother Can 1985; 37: 73–79.
20 Kirkaldy-Willis WH, Cassidy JD. Spinal manipulation in the treatment of low back pain. Can Fam Phys 1985; 31: 535–539.
21 Bannerji S. SM Dinsdale Memorial Lecture "Rehabilitation research in the 80's and beyond". International Rehabilitation Conference, Ottawa, 1986.
22 Dean E. Message from the chair. Research Division, Canadian Physiotherapy Association. Res News Views 1983; 1: 2.
23 Holliday PJ. A survey of research contributions of physiotherapists. Physiother Can 1981; 33: 372–376.
24 Ballin AJ, Breslin WH, Wierenga KAS, Shepard KF. Research in physical therapy: philosophy, barriers to involvement, and use among California physical therapists. Phys Ther 1980; 60: 888–895.
25 Recommended Core Curriculum for Physiotherapy Education Programmes. Toronto: Canadian Physiotherapy Association, 1982.
26 Bruner J. The act of discovery. Harv Educ Rev 1964; 31: 21–32.
27 Wall JC, Kozey CL, Turnbull GI. Promoting research in physiotherapy: an undergraduate endeavour? Physiother Can 1985; 37: 19–23.