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SPORTS MEDICINE – HEALTH CARE INFORMATION – SUPPLY AND DEMAND

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ABSTRACT

One field for health practitioners and specialists that is becoming of increasing importance is sports medicine. Many of the techniques have been used in the treatment of diseases or injuries such as broken bones or sprains, but an element in this practice is the speed with which the injury is treated and rehabilitated. The literature is diffused throughout the biomedical and biological science fields. As this is a growing specialty, it opens a challenge and an opportunity for the health science librarian. Availability of the literature is enhanced by on-line access to computerised bibliographic material and data such as MEDLINE; Toxicology Data Bank; Biosis Previews (*Biological Abstracts/Bioresearch Index*); Excerpta Medica; AVLINE; CATLINE; Health Planning and Administration and their corresponding reviews.

The 1980 Olympics have increased the number of reviews and discussions in the literature. This paper is a review of the demand and supply for sports medicine information in the English language in Purdue University. Emphasis is given to the physical, social, and psychological rehabilitation of the athlete patient and the impact on the medical librarian in the provision of information demanded by the sports medicine specialist. Computerised access to the literature sources is discussed as an introduction to their use in this field.

Key Words: Sports Medicine; Health Care; Computerised Retrieval Systems.

Sports play an important part in the activities of most cultures and today sport health care is handled through the team approach with the individual athlete at the core. In the USA this team often includes a physician, a trainer, a physical therapist, a psychological therapist, a nutritionist, an educator, and a coach. At various

stages in the treatment, any one of the team members may assume the major role in working with the athlete. In 1949, the World Health Organisation of the United Nations defined health as "a state of complete physical, mental and social well-being, and not merely the absence of disease" (Jokl, 1974).

Sports medicine is not a new field. Many early Greek physicians were gymnasts who observed the beneficial effects of exercise and sport on the human body and used these observations as a basis to prevent and treat illness. Since World War II renewed interest in the health and welfare of the athlete has been brought about partially by the increase in leisure time available to the majority of the people in the world, with increasing interest and participation in recreational activities of all kinds (Collins, 1973). Within the last ten years, people of all ages are running, whether jogging around the neighbourhood or competing in marathons.

Developments in the field of sports medicine have contributed to the phenomenal growth of public participation in all forms of sport. An increased knowledge of exercise physiology has provided a scientific

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basis for the establishment of better programmes of training and conditioning, including a rational approach to nutrition for those engaged in sports. An improved understanding of the mechanisms and specific pathologies of sports injuries has led to the means of preventing some types of injuries and the development of superior techniques for treating those injuries has made it possible to rehabilitate and usually return those who have been injured to sports activity.

This paper looks at the field of sports medicine and its emergence as a science. It is becoming recognised as a medical specialty in the United States. At a recent conference, "Sports Medicine 1980", held at Purdue University, over 150 physicians, trainers, coaches and students attended. The field has a need for information so that specialists working with the athlete can restore this person to a continued active sports role. This paper is a review of the demand for, and supply of sports medicine information. Emphasis is given to the physical, social, and psychological rehabilitation of the athlete patient and the provision of information demanded by the sports medicine specialist.

The increase in athletic activities and pursuits has led to an increased demand for health care information in the area of sports medicine. I. D. Adams, (1972) in "The Management of the Injured Sportsman" states that the treatment of sports injuries must be based fundamentally on the following principles: (1) complete anatomical restoration of the injured part; (2) preservation of the normal articular mobility without pathological movement; (3) avoidance of loss of muscular power; (4) maximum speed of recovery.

The post World War II increase in the scientific aspect of sport, and the demand for services associated with this activity, has stimulated the growth of a body of literature covering sports medicine. The Health Science Librarian or Information Specialist is knowledgeable in the literature sources and assists in finding answers to questions made by professionals in the field of sports medicine. Within the last 10 years, the availability of the information has been enhanced by the speed and efficiency of computerised retrieval systems. These systems can supply the sports person with a response to a question within a few minutes. Fifteen years ago, there were no generally available machine readable files, and the application of the computer to literature searching was in its infancy.

In 1964, the National Library of Medicine (NLM) MEDLARS (Medical Literature Analysis and Retrieval System) became operational to support the Library's bibliographic publications. Within seven years, NLM provided on-line access to the bibliographic data base MEDLINE (MEDLARS On Line). Today more than 1,000 domestic and foreign centres have access to 19

data bases in clinical medicine through this system. The MEDLINE file covers the literature from 1966 to the present, and is updated monthly. Over 3,000 journals are scanned and indexed daily. Other NLM data bases include Cancerlit, Toxline, Catline, and Health Planning and Administration. In addition to NLM, in the United States, Canada, Europe, Japan, and many other countries, on-line access to information is provided by several vendors: Lockheed DIALOG^R Information Systems; System Development Corporation (SDC); Bibliographic Retrieval Services (BRS); The New York Times Information Bank; EURONET; PASCAL; and PRESTEL. Some of these vendors do not produce the data bases but supply them through a contractual arrangement with the individual producers of the on-line files, such as Biosciences Information Service (BIOSIS PREVIEWS data base); Coaching Association of Canada (SPORT data base). The National Library of Medicine acts as data base producer or supplier and distributor of their 19 data bases.

Information transfer takes place in stages: in the mind of the requestor seeking an answer to a question, in exploring the question with a colleague or librarian, and in obtaining a reference or citation to the information source, and is completed when the inquirer reviews a document and its contents are assimilated to the point that the reader is informed, that is, his state of knowledge on the subject matter is altered or confirmed.

The health care librarian serves as a consultant to the sports medicine professional in his/her need for information. The librarian performs these activities in an information centre, library or media centre. Some of the librarian's skills are: an awareness of what is available in the way of data bases, an ability to choose the data base most appropriate to the requestor's information need, and the capability of searching the files in an on-line interactive mode. The most important skill is being able to interact with users in order to determine the precise nature of their information needs. Sports medicine covers many disciplines that study how individuals react to sports, the demands made on these individuals, as well as the various athletic activities that are a part of this science. Health care information is diffused through many subject areas from biomedicine, engineering, technology, science, and social sciences.

A MEDLINE computer search was run on the question, "the treatment of sports injuries". The key words or search terms selected were: *Sports injuries, sports, sports medicine, therapy, rehabilitation, diagnosis, occurrence* (see Fig 1). Two limitations were placed on the search: human studies and English language articles after 1965. In the analysis of the request, it was broken down into its various aspects. The parts of this request were: (1) sports injuries, or sports, or sports medicine; and (2) treatment in terms of

KEY WORDS

Figure 1

therapy or rehabilitation or diagnosis or occurrence. The sports medicine inquirer was not interested in all articles on sports injuries, sports, or sports medicine or all articles on treatment, but only those articles which discuss both parts of the request, that is sports injuries *and* treatment. The conceptual relationship between these two parts was linked by a process called "boolean logic" — the intersection of the references containing the sports injuries terms and the treatment terms. A Venn diagram would show two circles, one containing references on sports, sports medicine, sports injuries. The other overlapping circle contains references on treatment. The intersection of the two circles then contains references on the treatment of sports injuries (Fig. 2). The input to the computer was performed by the health care librarian in an interactive mode on a terminal through a telecommunication network. These networks throughout the country provide links to the computer. The connection is established by a local telephone to the nearest network access node. Access to telecommunication networks linking the host computer will vary among countries and cities.

ANALYSIS OF THE SEARCH

Figure 2

The results of a computer search is a list of references on the search topic. They may be of two kinds: (1) bibliographic citations, author(s), title, journal source, and if part of the citation, an abstract; (2) data, either numeric or analytical similar to handbooks.

Some of the citations or references retrieved from the MEDLINE search were: *Diagnosis of Acute Knee Injuries with Hemarthrosis; Tartan Turf on Trial: A Comparison of Inter-collegiate Football Injuries Occurring on Natural Grass and Tartan Turf; Physiotherapy in the Management of Sport Injuries; Low Back Pain in Young Athletes: Evaluation of Stress Reaction and Discogenic Problems*. With the refinement of the search by geographic terms, Asia, Africa, Third World Countries, some of the citations retrieved were: *Marathon Running and the Heart: The South African Experience; Characteristics of Several Indices of the Physical Development of Pupils in Khabarovsk Who Participate and do not Participate in Sports; Reaction Time of Indian Hockey Players with Reference to Three Levels of Participation* (see Fig. 3). The period of time for this MEDLINE search was January 1978 to May 1980. MEDLINE can be searched back to 1966 and the librarian would consult with the sports health team member for the time coverage needed.

REFINEMENT OF SEARCH STRATEGY

Figure 3

The nature of literature coverage today is interdisciplinary and it is advisable to search more than one data base for comprehensiveness of subject coverage. Other data bases searched on the "treatment of sports injuries" were: Health Planning and Administration (1975 to present); SPORT (1975 to December 1979); and BIOSIS PREVIEWS (1974 to April 1980). A selection of some of the citations retrieved from those data bases includes: *The Cardiovascular Risks and Benefits of Exercise; Physiology of Exercise; Medical Advice: Haemorrhoid Pain, Morton's Foot, Blood in Urine, Road Shock, Stress Fractures...; Recent Advances in the Bio Mechanics of Sport Injuries; and Causes of Sport Injuries and Measures of Preventing Them*.

One of the user groups of data bases at Purdue University is the Department of Physical Education,

Health and Recreation Studies. A selection of topics which have been searched for them in the MEDLINE file includes:

- Physical conditioning and fitness of athletes in relation to the severity, number, etc., of athletic injuries
- Delayed muscle soreness — 24-48 hours after cessation of exercise
- Lean body weight calculation
- Effects of chronic and acute exercise on personal-ity traits and characteristics
- Physiological effects — heart rate, blood pressure, maximal VO_2 uptake of steady state and interval training on middle-age adults
- Protein synthesis and degradation as a result of an exercise bout

The on-line files have corresponding printed publications: MEDLINE (Index Medicus); BIOSIS PREVIEWS (Biological Abstracts and BioResearch Index/RRM); SPORT (Sport & Recreation Index). For a complete retrospective search, it is necessary to use these printed sources as the computer base file does not cover the entire time span of the printed publications. Other publications for the sports medicine professional are "Physical Fitness/Sport Medicine", published quarterly by the President's Council on Physical Fitness and Sports, in co-operation with the National Library of Medicine. This publication is a bibliographic service, encompassing exercise physiology, sports injuries, physical conditioning and the medical aspects of sports.

Several professional associations and societies publish newsletters and journals containing articles on sports medicine. The American College of Sport Medicine is a multi-disciplinary organisation and was founded in 1954. It does not grant degrees or have a formal academic programme, but publishes Medicine and Science in Sports. Within the American Medical Association (AMA) there is an ad hoc committee on Medical Aspects of Sports in whose publication, JAMA, sports medicine articles appear. *The American Journal of Sports Medicine* is published by the American Orthopaedic Society for Sports Medicine and the society holds semi-annual scientific meetings. Other countries also have sport and physical activity associations that publish information. In the United Kingdom, the British Association of Sport Medicine publishes the *British Journal of Sports Medicine*. In Canada there is the Association for Sport and Physical Activity Information, and there is an International Council for Health, Physical Education and Recreation in Europe. The host country for the Fourth International Congress on Medical Librarianship, Yugoslavia, has the Information Centre for Physical Culture

and Sports Medicine in Belgrade; the Centre for Bibliography and Documentation in Ljubljana.

As a commodity sports medicine information has a cost for its provision or acquisition. The sports medicine professional "pays" in a number of ways; time spent in obtaining the printed material, direct payment to an intermediary or a personal contact to a colleague, to say nothing about the cost of producing and/or codifying it. The cost factor must be taken into consideration as the search strategy is developed. At my institution, the Purdue University Libraries, we have recently completed a cost analysis of our Computer-Based Information Service. In 1979-1980, the average cost per search not including salaries of library personnel was \$8.41 US (approx £5). The cost for the computer search described in this paper was \$13.47 (22 minutes on-line, 59 citations). No citations were printed off-line. Our costs are of two types: fixed and variable. The fixed cost is the vendor's charge for the use of the file or data bases, computer connect time, telecommunication, and off-line printing. The variable costs are those expenditures incurred to provide the service. These include computer terminal supplies, search analyst training, user manuals, terminal maintenance, and telephone. The expertise and subject knowledge of the searcher can keep the cost within reasonable limits and the service at a high level. The library or information centre usually purchases printed materials from its book budget and may or may not share the cost with the institution's respective subject departments or units. The difference in paying for the information gives rise to the controversy over free access to information which cannot be covered here.

As the science of sports medicine continues to grow, the literature increases along with the demand for knowledge about the field. The adequate treatment of a sports injury depends upon the player, the coach, the physiotherapist, and the doctor, not in isolation, but in co-operation (Adams, 1972). The information requested will vary with the type of organisation, the sport and the needs of the health care team. Through the use of special reference techniques and a knowledge of library practices, the health care librarian can obtain materials being sought by the sports medicine team. The on-line computerised information system supplies the sources of information in a short period of time, often within a few minutes. Sports injuries treatment, like that of all trauma, must be complete and begun as soon as possible following the injury. **The aim of sports medicine, stated by Millar in 1978, is to improve the quality of life for everyone, regarding health as a positive value and not just the absence of disease.**

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Fig. 1. Purdue University – library users.

Fig. 2. Purdue University library union card catalogue hand search for information sources.

Fig. 3. Union card catalogue hand search for information.

Fig. 4. Prof. Markee performing the computer search described in the article.