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The Delivery of Orthotic and Prosthetic Services in America—A Physical Therapist's View

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INTRODUCTION

At a time when we hear much talk about competition, regulation, and reimbursement, and their impact on the health delivery system in the United States, it seems appropriate to take a step back and look at where orthotic practice has been and where it might be headed.

The overall purpose of this paper is to describe the development and practice of orthotics in the United States. I will provide some background on the historical development of the field, and examine the supply of, and need for, orthotic personnel in the United States. A number of educational programs provide training, and these will be discussed. Membership in professional organizations and certification will be described previous to the provision of data specific to device fabrication and delivery. My conclusion will provide perspectives on the future of orthotics and prosthetics in the United States.

HISTORICAL DEVELOPMENT

The word "orthotics" is taken from the word "orthostatic," from the Greek "ortho," to straighten, and "statikos," to cause to stand.[1] According to Dr. Sydney Licht in the "Preface to the First Edition" of *Orthotics, Etc.*, the word "orthotic" is relatively new. Connoting the field of straightening deformities with external supports, it was first used by Dr. Vern Nickel in a report of conferences on upper extremity devices for the National Foundation of Infantile Paralysis Respiratory Centers in 1953.[1] "Orthotics" was originally adopted in 1960 by orthotists and prosthetists in America when they formed the American Orthotic and Prosthetic Association from the original Artificial Limb Manufacturers' Association.[2]

Although it first meant the straightening of deformities with external support, the term orthotics today refers to the profession, including the art and science of the application of a device applied or attached to an external surface of a body to improve function. As was noted by Dr. Licht,[2] the field of orthotics now has expanded to include many systems, devices, and technologies which not only are unattached to the patient, but technically do not fall under the umbrella of the term orthosis—thus the use of the term "etcetera" in the title of his ninth volume by Williams and Wilkins.

Orthotics or Orthetics?

According to Dr. Sidney Licht,[2] one classics scholar believes that prosthesis means both the replacement of a lost part and help for a part. Orthosis means to straighten. Neither word adequately describes the field of orthotics and prosthetics as practiced today, or that which will be practiced in the future.

In 1955, Dr. Robert L. Bennett of Warm Springs, Georgia, used the word "orthetics" to describe an exhibition of braces

used to increase function in severely disabled persons.[2] Despite the fact that the word "orthetic" is relatively new, we are fortunate in that a rich history in the field reflects a rational and orderly development from seemingly simple beginnings.

The history of bracing or splinting, as it was called, can be separated into two parts. The first may be considered a non-surgical period between the time of Hippocrates through the 19th century. During this period, treatment consisted of manipulation and the application of orthotic appliances. The second era, the era of modern orthopaedics, relies on the use of antiseptic and aseptic surgery and more modern orthotic designs and materials.

Pioneers of the early period were Ambroise Pare (1509-1590); Dr. Hugh Owen Thomas (1834–1901), the "bonesetter" for whom many items are still named; and Sir Robert Jones, a nephew of Owen Thomas, who may be considered the "father of orthopaedic surgery." All were accomplished and innovative bracemakers.

Surgery gradually replaced bracing as the keystone in the practice of orthopaedics, and the bracemakers moved from physicians' offices into hospitals or private offices. Although some remain today in hospitals, the office practice of the independent practitioner businessman continues as the model.

During the last half-century, two events served to focus attention on the role of orthotics and prosthetics. Soldiers injured in World War II benefited from the services of those trained to develop and provide for the artificial replacement of limbs. Following the increased interest in prosthetics due to World War II, a similar interest in orthotics arose via the National Foundation for Infantile Paralysis, following the two polio epidemics around 1950.

According to Dr. Vern Nickel,[1] the development of respirators and tracheostomies created a need for better upper extremity orthotics and people to design, fabricate, and fit them. The need for manpower in the orthotics industry led to the development of formal educational programs, producing orthotists and prosthetists, starting in 1956. These programs have grown both in numbers and in scope since the first baccalaureate degree in orthotics began in 1962.

SUPPLY OF TRAINED PERSONNEL

In order to meet the patient orthotic and prosthetic needs of the future, one must consider both the projections for practitioners and for manpower in related professions, since orthotists and prosthetists deal in a medical and paramedical arena.

In 1982 there were 66,485 medical students in training in the United States, meaning 16,700 graduates each year.[3] They are trained by 53,750 full-time medical faculty, at a cost in excess of 6.3 billion dollars. There are 2,667 orthopaedic residents in 180 programs in America, and 605 Physical Medicine and Rehabilitation residents in 65 programs, down 50 from 1982. It is interesting to note that in the 1982 American Academy of Orthopaedic Surgery Manpower Survey,[4] 42 percent of those who responded felt there were too many orthopaedic surgeons in their geographic area. Plans call for these programs to continue to train 2,267 physicians each year in the years to come.

Now consider that there are currently 350,000 MDs and 15,000 DOs practicing in the U.S. By the year 1990, the combined number is projected to reach 560,000. Since many O&P professionals relate directly to orthopaedic surgeons, it is of interest to note that there were 12,250 fellows in the American Academy of Orthopaedic Surgery in 1982, and many more MDs without board certification doing orthopaedics. By 1990, it is projected that there will be 17,500 board certified orthopaedic surgeons. Additionally, there were 2,200 physiatrists, although their numbers are not growing nearly as fast as those of orthopaedic surgeons.

Of the non-physicians, nurses as a group comprise the largest number of providers of service, with about 1,360,000 in active service in 1982. Seventy-five thousand nurses are trained each year, up from 44,000 per year as recently as 1970. Contrary to what might have been written, according to the Institute of Medicine study

of 1983,[5] there was and is no shortage of nurses, only a problem of poor distribution and a difficulty in finding nurses to work in areas such as surgical intensive care. By 1990, there are expected to be two million nurses in America.

Physical therapist schools graduated 2,888 students in 1981 from 82 schools. Since new programs are continually being opened and accredited, that number should surpass 3,000 per year by 1985.

There are some 40,000 physical therapists in the U.S. According to recent Bureau of Labor statistics, a 1.9 percent unemployment rate exists for physical therapists, which is second only to physicians at 1.5 percent. In summary, it appears that there will be an increasing supply of orthopaedists and related professionals, and the impact of substitution among providers cannot be estimated at this time.

NUMBER OF ORTHOTISTS AND PROSTHETISTS IN PRACTICE SETTINGS

Since 1949 there have been more than 880 prosthetist/orthotists, 1,392 orthotists and 1,232 prosthetists certified by the American Board for Certification in Prosthetics and Orthotics, Inc. (ABC). On July 1, 1982, there were 817 COs, 739 CPs, and 580 CPOs in good standing. This total of 2,136 represented the current certified work force in orthotics and prosthetics (Figure 1). Assuming the present 2,136, an addition of nine to ten percent per year for eight years, and one to two percent retirement rate, by 1990 there will be approximately 4,000 orthotic/prosthetic practitioners in America, in contrast to 560,000 MDs, two million nurses, and 40,000 physical therapists (Figure 2).

At this point in time in the United States, orthotists and prosthetists practice in five major settings (Figure 3):

1. *Private offices.* Since the late 1880s, orthotists sought to move out of physicians' offices and hospitals in an effort to be independent providers of services and devices, and to avail such services to many physicians and patients. This practice setting remains the most prevalent.
2. *Institutionally Based Service/Consultation.* Many large institutions such as hospitals—particularly children's hospitals, rehabilitation centers, or rehabilitation and research institutes—provide orthotic/prosthetic services from an internal staff. Rehabilitation facilities draw upon many disci-

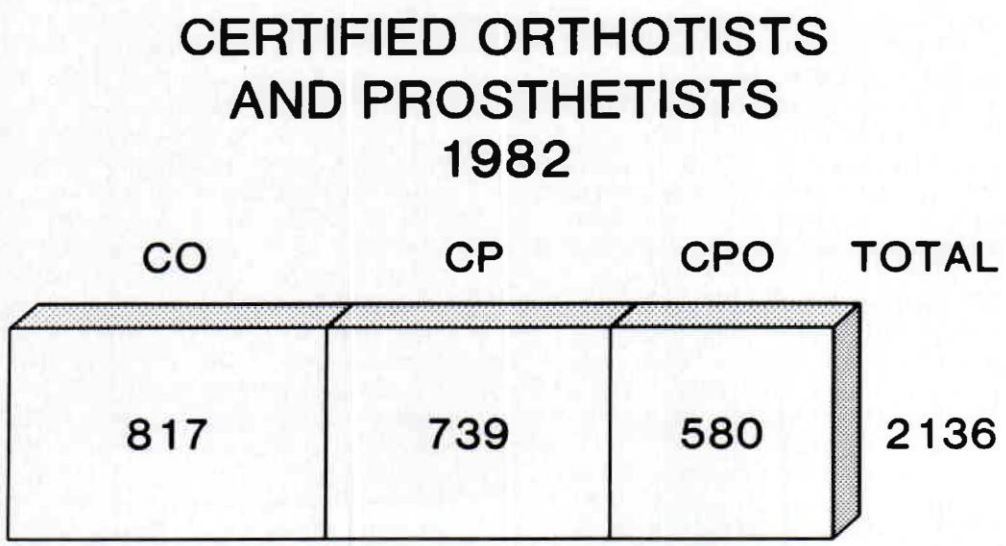

Figure 1. The total number of certified professional orthotists/prosthetists.

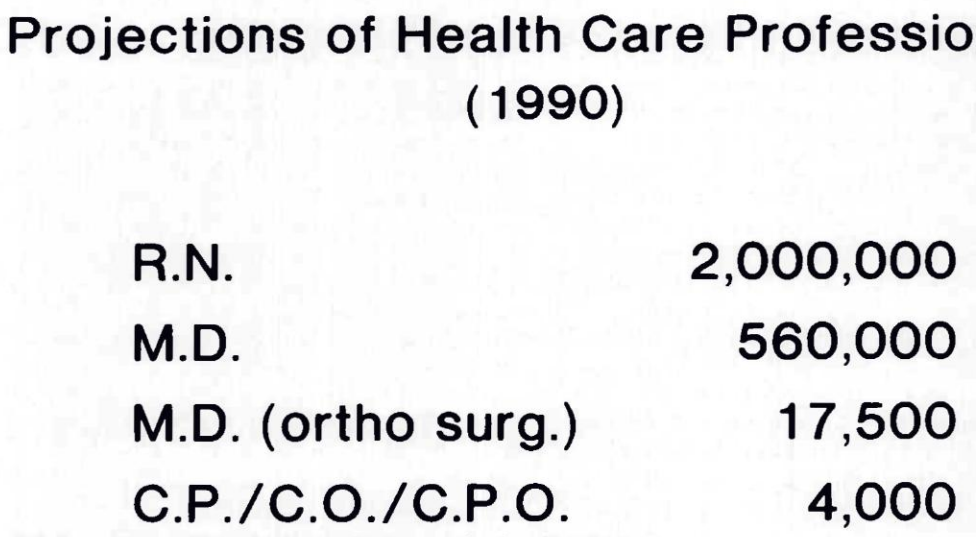

Figure 2. Projected number of health care professionals: 1990.

plines for their services. The range of services which may be found in a facility is reflected in the Vocational Rehabilitation Amendments of 1968, which describe a rehabilitation facility as providing "singly or in combination" one or more of the following services for handicapped individuals: (1) comprehensive rehabilitation services which include, under one management, medical, psychological, social and vocational services; and (2) testing, fitting, or training in the use of prosthetic and orthotic devices.

The fact that the statutory language speaks specifically of orthotics attests to the integral part in the rehabilitation process played by orthotists and prosthetists.

3. *Supplier and Fabrication Management.* The use of a central production laboratory external to the site of fitting or measuring will probably increase in the 1980s in America. In order for a successful transition into that mode, communication via the written and spoken word is essential. Without communication, central producation can be a nightmare.

   Since many O&P professionals may use the same production facility, highly skilled practitioners who can relate to others and their fitting or measuring problems are necessary. A phone conversation with an orthotist/prosthetist in the field from a knowledgeable and communicative fellow can make the difference between success and failure of a fitting, particularly of a new device, material, or application.

4. *Education.* In the 11 programs available for orthotic or prosthetic entry-level preparation, there are full-time professional faculty responsible for this education. According to the 1976 Ponte Vedra Report,[6] there were 17 full-time certified prosthetists, 24 full-time certified orthotists, and 13 full-time certified prosthetists/orthotists in this area of practice.

   The role of the educators in these facilities cannot be underestimated as they provide the source of the life blood for the future in orthotics and prosthetics. No similar data can be located on the current faculty numbers or locations.

5. *Research.* To the knowledge of this author, few, if any, people work in America today doing only basic research in orthotics/prosthetics. This is in no way to ignore those practitioners who are working on the cutting edge of materials, design, or rehabilitation engineering. However, no known orthotist or prosthetist performs only such

PRACTICE SETTINGS

- PRIVATE OFFICE
- INSTITUTION BASED SERVICE/CONSULTATION
- SUPPLIERS AND FABRICATION MANAGEMENT
- EDUCATION
- RESEARCH

Figure 3. Orthotic/prosthetic practice settings.

research functions. It is included as a practice setting to emphasize the necessary role of research and development in the professions, even though few positions currently exist.

According to Dr. Colin McLaurin,[6] his final examination as a prosthetist, after seven years of training and apprenticeship as a journeyman, was to fit and fabricate a prosthesis from raw materials, to include the socket, knee, and foot. Although this approach apparently develops a skilled artisan, it does little to recognize the cognitive areas so necessary in the skills of the modern orthotist/prosthetist. With the skills currently being taught in the baccaleaureate programs, the professional is moving toward the status of independent prescription, fitting and fabrication, always maintaining the concept of the team which has worked so successfully in the past.

NEED FOR ORTHOTIC AND PROSTHETIC SERVICES

In the preparation of this paper, contacts with numerous offices, bureaus, and data sources were made in an attempt to identify the population in America in need of prosthetic and orthotic services. Although the question has never been addressed directly, the information presented was gathered from the National Health Interview Survey,[7] a nationwide household survey conducted by trained representatives from the U.S. Bureau of the Census. Using scientific sampling techniques, percentages of the population in need of specific devices were identified. These studies have been published in 1969 and 1977.

The results of these studies indicate that 6,250,000 people in America used orthoses, wheelchairs, canes, or special shoes in 1969. By 1977[8] the number had grown on 6,500,000, or about three percent of the

American population. Specifically, people using leg orthoses increased from 233,000 in 1969 to 400,000 in 1977. This represents roughly 1.2 people per thousand population in 1969 to 1.9 people per thousand in 1977.

Looking at the potential market from another perspective, there were 1,392,000 Americans in 1971 having partial or complete paralysis, or 6.9 per thousand population. Of those, 200,000 were victims of hemiplegia. By 1977, the numbers had grown to 1,532,000 people, 237,000 of which were hemiplegic, or about 7.2 per thousand. Spinal cord injuries totaled 150,000, with eight to ten thousand new cases occurring each year.

Of interest is the fact that for the same population survey, those using prosthetic legs numbered .6 per thousand in 1969, or half of those using orthoses. By 1977[8] the figures had jumped to one per thousand using an artificial leg and 1.9 per thousand using leg orthoses or, again, nearly half. Total people reporting using either artificial legs or arms in 1977 were 275,000.

EDUCATIONAL PROGRAMS

There are currently 12 practitioner-level programs located in the United States.[9] In addition, there are four technician or assistant-level programs. There is also a practitioner residency training program of one year in length at the Newington Children's Hospital, Newington, Connecticut, whose stated purpose is to allow a graduate orthotist one year of specialized education under supervision, dealing specifically with the orthotic needs of children. Since the residency concept is not new to medical and paramedical education, it is unfortunate that it took until 1980 to get the first program under way.

Using the stated enrollment figures published in *Orthotics and Prosthetics*, Fall, 1982,[9] 175 students will graduate per year from these 12 schools. It should be noted that 30 of the 175 students, about 17 percent, come from the Army orthotic school, whose model differs from most others in that no formal education is required prior to admission. According to the current standards of ABC, graduates of this program do not qualify to sit for the orthotic board examination and therefore do nothing to increase the credentialed manpower in the field for the future.

In keeping with a resolution passed at the Ponte Verdra meeting of 1976, there is only one sub-professional in orthotics and prosthetics, the technician. It was also recommended that only the education program be certified by ABC, and the technician be registered, as opposed to being certified.

PROFESSIONAL ORGANIZATION/ CERTIFICATION

Certification of both professionals and facilities is administered by the American Board for Certification in Orthotics and Prosthetics, Inc. This board was established in 1948 through a combined effort of the orthotic and prosthetic industry and the American Academy of Orthopaedic Surgeons.[10] The ABC promotes high professional standards, high quality facilities, and develops and administers examinations in prosthetics and orthotics. Additionally, the organization serves as an appeal committee for alleged violations of established standards of practice, ethics, or law.

DEVICE FABRICATION AND DELIVERY

There is no data which describes the state of affairs in America today with respect to the subject of fabrication or prefabrication. Costs associated with certified personnel, plastics, ovens, vacuum forming, and Occupational Safety and Health Administration regulations in the late 1960s and early 70s gave birth to the concept of central fabrication, or production of devices from a centralized geographical location, often apart from the fitting center or office. Central fabrication allows technol-

ogy to be applied rapidly, without the need for each facility to purchase, use, and maintain expensive, modern, high-technology equipment.

Central fabrication is a natural extension of prefabrication, concentrating on any device which can be mass produced in predetermined sizes, lengths, thicknesses, or configurations. This feature allows the practitioner to modify the device to fit any change necessary. If the entire device needs custom fabrication, it too can be fabricated at a centralized location from a cast or mold taken by the certified practitioner and sent to the laboratory. This system is analogous to the current production of dentures, eyeglasses, and other medical or dental devices.

When central fabrication was first developed, it was done to allow the practitioner more time to do other things. In the future, it will allow the practitioner to survive, as profit margins will be held in check by governmental controls put in place in an effort to control health care related costs.

In a recent survey compiled by Charles H. Pritham, CPO,[11] 17 percent of the respondents indicated that their patients in need of leg orthoses received 100 percent plastic devices. Sixty-one percent indicated that they delivered 75 percent plastic and only 25 percent metal, whereas only 15 percent used less than 25 percent plastic and, therefore, 75 percent metal orthoses. Reasons cited for using plastic instead of metal were weight, cosmesis, versatility, etc. Of those responding, the most commonly cited disadvantage of the plastic ankle-foot orthosis (AFO) was the inability to adjust the ankle in dorsi- or plantar-flexion. No data exists concerning criteria used for such plastic or metal AFO fittings. Therefore, the data in this survey is incomplete. Since the process from prescription through fitting may involve a number of professionals besides the orthotist, consistency between geographical areas or facilities may be difficult to demonstrate—even in the presence of increasing central fabrication availability.

An analysis of certified orthotic and prosthetic facilities in America reveals a total number of 521.[10] Of these, 119 are certified in orthotics, 123 are certified in prosthetics, and 279 are certified in both. These facilities are most numerous in the states of California (54), Michigan (35), New York (34), Ohio (34), Illinois (33), and Pennsylvania (28).

Since there are about 220 million people in America, there are about 10 certified facilities per state on an average, or one facility for 422,000 population. Obviously the state averages are difficult to use. Some states, like Wyoming, have no certified facilities and therefore have distribution problems—even though, as in Wyoming's case, the state may have a relatively small population.

The Veterans' Administration (V.A.) is the largest orthotic and prosthetic central purchasing and delivery system in the United States. According to information supplied by Mr. Frederick Downs, Jr., Director of Prosthetic and Sensory Aid Services for the V.A.,[12] in the fiscal year 1981–82, the V.A. spent nearly 100 million dollars. This includes all phases of prosthetic-orthotic activity, from training programs to testing and distribution of devices, to direct prosthetic device services. Total cost associated with the provision of 130,313 orthotic appliances was $6,096,997, of which nearly 80 percent was internally supplied. Total prosthetic devices and sensory aid supplies numbered 1,330,767, at a cost of $79,115,303. Included in the internally supplied category are custom fabricated shoes, a service not readily commercially available.

THE FUTURE FOR ORTHOTICS AND PROSTHETICS

The future for orthotics and prosthetics in America appears headed in the direction of other allied health care, but different from the other medical and paramedical models (Figure 4). The data clearly demonstrate that by the year 1990 there surely will be present an oversupply of fully trained physicians, about 560,000 in number, or 70,000 in excess of predicted needs. The supplies of nurses and other allied health

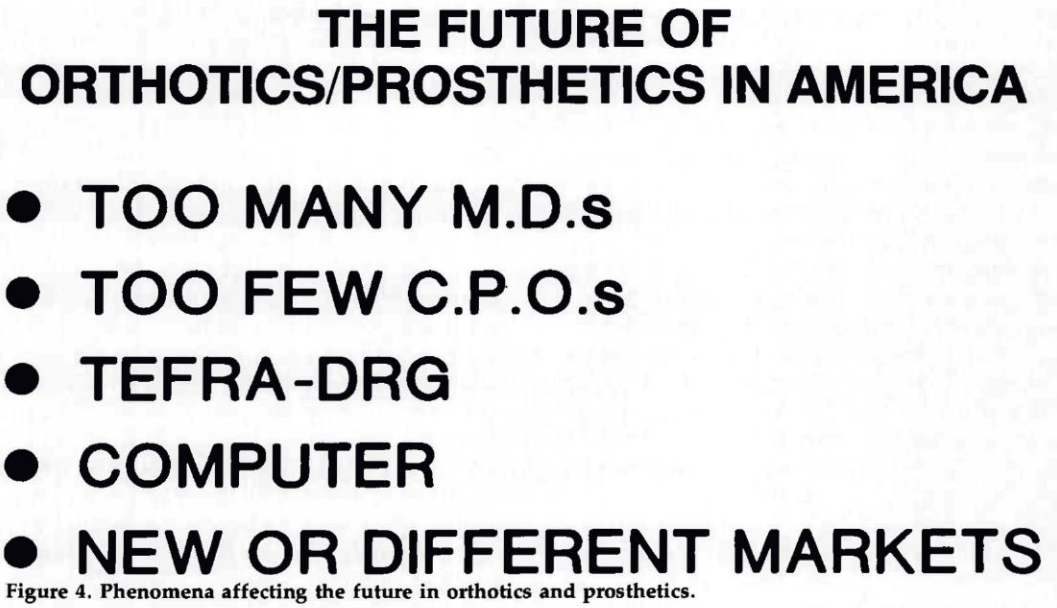

Figure 4. Phenomena affecting the future in orthotics and prosthetics.

professionals, while larger, are not predicted to be in excess by 1990. There will surely be a shortage of certified orthotists/prosthetists by 1980 standards. However, the federal policies which will be necessary to deal with the physician excess will certainly have an effect on other providers such as orthotists and prosthetists.

Two theories which describe what may occur as a result of this physician oversupply suggest some interesting propositions.[13] One theory, the pyramid model, predicts that the group at the top, the physicians, will react to the oversupply by reclaiming many tasks which had previously been delegated to nurses, therapists, orthotists, or others, in times of shortages of physicians or growth. The second theory predicts that the forces of a competitive marketplace will cause physicians to increase their productivity by using more assistive personnel, resulting in an overall growth for all.

Another factor which may affect the future of orthotics is the impact of what has come to be known as TEFRA, or the Tax Equity and Fiscal Responsibility Act of 1982. These 1982 amendments to the Medicare Section of the Social Security Act propose the most far-reaching changes in health care reimbursement since the beginning of the program in 1965.

In 1982, the United States spent 322 billion dollars for health care, of which 42 percent was for hospital care and 19 percent was for physician services. Although the figures of $136 billion for hospital care and $62 billion for physicians are staggering, more staggering is the rate at which these dollar values rose over 1981: about 14.9 percent. These figures are providing many with the evidence they feel they need to limit or to put "caps" on reimbursement. It remains to be seen how these reimbursement pressures may alter the practice of orthotics, but it is clear that there will be incentives to hold down fees.

Hospital care was the largest part of the 10.5 percent of the Gross National Product spent for health care in the United States last year. The changes which TEFRA includes were primarily aimed at non-physician costs associated with the Medicare program. These changes will replace a charge system of routine per diem cost limits with a system of limits on total operating cost-per-case, based on each diagnostic related grouping, or DRG. Each patient admitted to the hospital will be assigned a DRG for payment purposes. Payment will then be made on an average length of stay assigned for that particular

DRG. Any days of inpatient care in excess of the approved standard will not be reimbursed to the hospital. The DRG system is the mechanism chosen to implement a prospective payment system, with the overall goal of the program being to control future increases in cost to the federal government on behalf of the Medicare program.

The new payment concept represents the first fundamental change in the payment system for America's hospitals in 50 years. All combinations of the 11,828 diagnoses and 33,000 procedures currently included within the coding system of the *Internal Classification of Diseases* have been consolidated into 468 diagnostic related groups. Payment will be calculated on the basis of the average cost of care for patients in each DRG through the nation's 6,000 acute general hospitals.

What is not clear at this point is what effect this and future program changes will have on O&P services delivered to Medicare beneficiaries, but more importantly, what effect this program change will have on other purchasers of these services, namely private commercial insurers, and Blue Cross. In Iowa, for example, the Insurance Commissioner has called for a prospective payment model to be put in place along with the changes in Medicare. Since in many states Blue Cross acts as the fiscal intermediary for Medicare, there are likely to be many similarities between Medicare and Blue Cross.

The concern for all of us with these trends and changes are the potential for erosion of non-physician or non-hospital services to be capped, cut, or severely limited at the expense of more expensive, better lobbied, inpatient hospital or physician delivered care.

The future for orthotics and prosthetics promises a better engineered, more effective, less-expensive-to-produce product, and the accompanying service of the professional, well trained and experienced in appropriate orthotic applications. Orthotic applications for poorly understood problems will challenge the orthotist of the future. Challenges such as prophylactic knee orthoses represent a revolution in the prevention of injuries in contact sports, such as football. Other applications in the work setting would assist workers with certain stressful tasks, attempting to prevent or reduce the severity and numbers of injuries which result in lost time from work and an overall loss of productivity. This future will certainly involve the use of computer assisted design, modification, and perhaps even fabrication. Mr. Jim Foort in British Columbia has developed a computer assisted program for below-knee socket design, modification, and fabrication. In order to integrate the computer into the practice of orthotics and prosthetics, engineers will be called on for their assistance, continuing to consummate this marriage between orthotists and engineers.

It appears clear that, if the predictions hold true, there will be a shortage of orthotists/prosthetists in 1990. Physicians will undoubtedly be treating many patient types who, like their counterparts of yesterday, will be survivors, due to advances in medical knowledge or technology, allowing even normal people to live longer lives. Along with that challenge goes an equal challenge to make that longer life more functional than previously experienced. Therein lies the challenges for the orthotists and prosthetists of the future.

NOTES

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