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Extra-Ambulatory Activities and the Amputee

Drew A. Hittenberger, CP*

Extra-ambulatory activities and their use in the treatment of amputated individuals have received considerable publicity. Initially motivated by a personal drive for physical accomplishment, many patients have discovered unsuspected levels of performance. It is this high level of performance, combined with the sense of personal accomplishment, that has captured the public's attention.

The purpose of this article is to examine the need for physical exercise among amputees in hopes of making such activities the norm rather than the exception in rehabilitation and daily activities. To better understand the physical limitations imposed on the amputee and their effect on exercise, the following areas will be discussed:

1. Need for physical exercise among amputees.
2. Areas of limitation.
3. Factors in extra-ambulatory prosthetic design.

Need for Physical Exercise

The level of physical activity a person attains naturally affects his quality of life. This motivates a general public concern for physical fitness. The physically handicapped are no exception. In fact, to the younger, more aggressive amputee, the level of physical activity he is able to exert is critical. Today, despite this need for physical exercise, figures show that most amputees become limited in their ability to participate in physical exercise programs.[1] This disability seems greatest for the amputee who was active prior to amputation. Whether the patient was active prior to amputation or not, the end result is the same—inactivity. As one patient put it, "There are those of us in whom the spirit of physical exertion becomes tarnished . . . it no longer becomes important to be so active. The effort is too much."

While it is natural to decrease one's level of activity after amputation, some serious questions remain. Are the members of the rehabilitation team doing all they can to maximize the patient's level of activity? if everything is being done for amputees, why do so many continue to be physically inactive? Why do so many lose their ability to participate in physical exercise and lack the basic skills for sports activities despite the need for such physical outlets?

Most patients lose their ability to participate in physical exercise programs not only as a result of amputation, but also, and perhaps more importantly, as a result of poor post operative care.

Areas of Limitation

There are many reasons why amputees are inactive, perhaps as many reasons as there are amputees. Age, level of amputation, and general physical condition of the patient are usually considered the primary reasons why amputees are limited. But the reason amputees are inactive, in the majority of cases, is not due to a physical cause, but to a lack of information. Not many people, including the rehabilitation team, know about extra-ambulatory activities.

To illustrate this, examine the current level of rehabilitation. Presently, rehabilitation focuses most of its attention on a basic activity (walking), and once this minimal level of activity is achieved, assistance is usually discontinued. This in effect limits the patient's functional capabilities and discourages patient participation in physical activities.

*Director, Research Prosthetics, Prosthetics Research Study Center, Seattle, WA

Stating that an amputee cannot participate in extra-ambulatory activities without knowing of the possibility is like asking someone a question in French without his knowing the language, and then saying "Look, I told you he didn't know the answer." A person needs to know how to do something or have knowledge about something before he can be expected to do it. The problem then, is not lack of ability, but lack of knowledge. If it is our purpose to increase the amputee's level of activity, a considerable amount of attention needs to be directed toward extra-ambulatory activities and the communication of this information.

A recent survey on functional capabilities[2] discovered that of those amputees questioned, 60% currently participate in some form of sporting activity, indicating a definite desire on behalf of the patients to participate in physical activities.

The most common activities (Table 1) are swimming and fishing, and the least common, due to discomfort, are running and walking long distances. During running, a substantial amount of irritation occurs because of the impact and the rotational forces within the prosthesis, which cause tissue irritation. Despite this irritation, however, amputees continue to run because running is a prerequisite for many other physical activities. The most active patients are young individuals whose amputation resulted from either congenital deformity or trauma. Sex and length of time since amputation have little effect on the patient's ability to exercise, while age and level of amputation play a definite role in determining functional ability.[2] Other factors, including pain, social embarrassment, and lack of organized training programs, must also be considered.

When asked about their prosthetist, 28% of the patients in the recent survey felt that their prosthetist knew about extra-ambulatory prostheses. However, of the prosthetists sampled, only 18% encouraged participation, indicating a high reluctance on the part of prosthetists. The reasons for this reluctance is not so much physical make-up, but, as stated earlier, lack of information. When making a prosthesis for extra-ambulatory activities, the prosthetist needs to have knowledge about the activity and must be able to design the prosthesis around the activity. Designing an extra-ambulatory prosthesis isn't easy. It often involves the incorporation of different materials and principals—a time consuming process. As one patient quoted his prosthetist when he was asked about extra-ambulatory prostheses, "'It is too much work and too much adjustment.'" Perhaps a reason why the level of physical activity is so low among amputees is the prosthetist's inability or unwillingness to design a prosthesis for extra-ambulatory activities.

Despite the reluctance on behalf of the prosthetist, 6% of the patients sampled used special equipment for sporting activities while the remaining 94% either indicated a willingness to make do with their current prosthesis or were unaware of adaptive devices available to them.

When informed about the existence of these devices, a majority asked why they had never been told about these prostheses before, indicating a need for additional information in the areas of prosthetic design, training programs, and support organizations.

To make a patient more comfortable with his individual situation, he can often be directed toward meeting other amputees. Through this social interaction the patient can find support by sharing similiar situations with other amputees and by finding he is not alone in confronting the problems associated with amputation. Often it is this kind of support that can make the difference between the patient being successful or unsuccessful in obtaining his maximum potential. (For a list of organizations serving physically disabled persons interested in sports and recreation, see p. 7).

Prosthetic Design

Advances in prosthetics are based on two things: 1) patients' need for improved function, and 2) technical knowledge. Based on this need for improved function, advances in prosthetic components and systems will continue to be developed. Recently, with an increase in extra-ambulatory activities, prosthetists have begun to realize the need for extra-ambulatory prostheses. Some prosthetic innovations already exist,[3] but additional research is needed in this area.

The most common activities requiring prosthetic modification are swimming, running, and skiing. Since each one of these activities is different, the prosthetist must design the prosthesis specifically for that activity.

Swimming

Of primary importance for a swimming prosthesis are: 1) its ability to hold up under water, and 2) its ability to float. A swimming prosthesis must be made out of waterproof materials. If not, special attention must be taken to seal any material that can absorb

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Table 1: Avocational Activities

	Below Knee	Above Knee	Bilateral	Total
Fishing	46	11	5	62
Swimming	29	11	4	44
Dancing	28	8	5	41
Hunting	19	4	1	24
Bowling	15	5	—	20
Golfing	15	5	—	20
Hiking	11	3	1	15
Baseball	9	3	2	14
Basketball	7	3	1	11
Running	6	2	1	9
Snowskiing	4	3	—	7
Football	4	2	1	7
Skating	4	1	1	6
Horseback riding	—	3	1	4
Gardening	3	—	1	4
Miscellaneous*	6	6	1	13

*Miscellaneous includes waterskiing, motorcycling, soccer, flying a sailplane, frisbee, cutting wood, cheerleading, boating, pingpong, and uneven parallel bars.

water such as wood or leather. When wood becomes wet, it swells and causes delamination.

Regarding the question of buoyancy, the prosthesis must be able to float, yet give little resistance to immersion. If the prosthesis is too buoyant, the patient is unable to submerge the device while swimming, which can cause the prosthesis rather than the patient's head to be above the water. To solve this problem, some prosthetists have designed prostheses that fill with water, which solves the buoyancy problem associated with the use of foams. The only problem with this design is that the water also needs to drain out fairly rapidly and if it doesn't, the prosthesis will remain full of water or leave a trail of water in its path.

Running

As stated earlier, running is a prerequisite for most sports activities. Due to the rotational and impact forces on the residual limb during running, a considerable amount of attention is needed in this area. Of particular importance in the design of such a prosthesis is suspension. The prosthesis must be suspended securely so as to eliminate all or as much pistoning as possible. To do this, the prosthetist can incorporate a rubber suspension sleeve or a thigh lacer with waist belt. The thigh lacer aids in medial/lateral stability, and also decreases the rotational forces on the residual limb. Therefore, if the patient is extremely active, whether he has a short residual limb or not, it is recommended that a thigh lacer be used.

As well as tackling the problem of suspension, the prosthetist also needs to consider the matter of interface/liner materials. The liner must be able to decrease the rotational forces inside the socket so as to eliminate friction. Conventional Kemblo®, leather, and Pelite® liners have been used in the past with little success. If the patient is extremely active or has residual limb problems caused by excess rotation, a silicone or sorbathane insert should be used. To further minimize the rotation inside the socket, the prosthetist can incorporate a rotator in the prosthesis. A Greissinger foot can be used to decrease rotational capabilities, and is strongly suggested for those patients engaged in physical activities.

Skiing

Various types of skiing prostheses have been made. Their designs have ranged from incorporating the prosthesis directly into the ski boot, to modifying the patient's existing prosthesis. What is of primary importance in either case is that one maximizes the patient's knee flexion and aligns the prosthesis so the patient's center of gravity lies in front of the ski boot. This is the section of the ski that initiates the turn and if one does not align the prosthesis so that the patient's weight is over the front of the ski, turning will be difficult.

Depending on the patient's level of activity, knee stability and length of residual limb, the incorporation of a thigh lacer into a ski prosthesis may or may not be needed. A turn on skis is initiated by a varus or valgus movement of the knee. If the prosthetist incorporates a thigh lacer into a ski prosthesis, he is in effect limiting knee motion and making the ski harder to turn. Therefore, if the patient can do without a thigh lacer, let him do so, because it gives him more maneuverability.

Before designing a prosthesis for a specific activity, it is critical that the prosthetist look at the functional ability of the patient and the specific activity, and then design a prosthesis around that activity. It is only through this process that the prosthetist can develop a prosthesis that satisfies the patient's individual needs. Ultimately it is the patient's individual needs that dictate prosthetic design.

Conclusion

Despite the limited amount of technical information available on extra-ambulatory activities, they have received a considerable amount of public attention. That attention must now be directed toward decreasing the physical limitations imposed on amputees. This can only be achieved through an increase in patient/team rehabilitation communication, improved prosthetic design, and direct therapy programs. It is only by such means that amputees can experience their true physical potential.

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†Principal Investigator and Director, Prosthetics Research Study Center, Seattle, WA

‡Chief of Rehabilitation, Prosthetics Research Study Center, Seattle, WA

Questionnaire

Send completed forms to Charles H. Pritham, CPO, Durr-Fillauer Medical, Inc., Orthopedic Division, 2710 Amnicola Highway, Chattanooga, Tennessee 37406.

1. How many extra-ambulatory prostheses have you made?
   A. 0–5
   B. 6–15
   C. 16–25
   D. 26–50
   E. Greater than 50

2. What percent of your patients are involved in some form of physical exercise?
   _____ %

3. What percent of your patients ask you about extra-ambulatory prosthetics?
   _____ %

4. List the patients' activities in order of occurrence.
   1. _____ 4. _____
   2. _____ 5. _____
   3. _____

5. What percent of your patients use their prosthesis for a dual purpose—for extra-ambulatory activities and daily activities?
   _____ %

6. What percent of your patients have one prosthesis for daily activities and one for extra-ambulatory activities?
   _____ %

7. Do you inform your patients about handicapped sports organizations?
   _____ Yes _____ No

8. Are you satisfied with the level of prosthetics and its role in extra-ambulatory activities?
   _____ Yes _____ No

9. What do you feel is the primary reason(s) for amputees not becoming more involved in sports activities?

10. Would you be interested in attending a seminar devoted to the topics of sports activities for amputees and extra-ambulatory prostheses?
    _____ Yes _____ No

11. Do you have any suggestions or comments that might improve the level of care for the amputee concerning extra-ambulatory activities?

EDITORIAL

Special Prostheses Enhance Rehabilitation

In the case of a child, conventional wisdom has held that success of prosthetic rehabilitation can be measured by the ability of the child to play, as play may be considered child's work. In the adult, ultimate success was evidenced by the patient's return to his former job or to some other gainful employment. Special acclaim and attention have been given to amputees like Pete Gray, who succeeded as a professional baseball player. Today another criterion can offer a more valid assessment of success. The ability of the patient, child or adult, to participate in life's activities is a better measure. This assessment should include sports and athletic activities, especially those activities formerly enjoyed in the case of an acquired amputee. Fortunately, today's prosthetic armamentarium includes special techniques, components and prostheses that make participation possible in a variety of activities. On the basis of the experience gained in treating more than 700 juvenile amputees, R.C. Hamilton[1] formulated the conclusions about their role in competitive sports as shown in Table 1. Most amputees are not interested in competition, but desire to engage in recreational athletic activities.

Beginning in Europe in the late 1940's, skiing was one of the first sports to be "adopted" for amputees. In the United States there has been a great interest in this activity, as manifested by the formation of the National Amputee Ski Association. Special ski boots and outriggers have been developed. The unilateral below-knee amputee can ski with or without a prosthesis. The bilateral below-knee uses the four track technique with two prostheses, two skis and outriggers. The unilateral above-knee usually must ski on the intact leg using the three track technique. The bilateral above-knee can use short prostheses without knee mechanisms. Cross-country skiing is recommended solely for the below knee amputee. According to Bernice Kegel, the average amputee can learn to ski intermediate and expert slopes in one fourth the time an abled-bodied skier needs, and with a far greater degree of proficiency.[2]

Swimming is an activity that can be enjoyed by amputees of all ages. If the swimmer is able to stay afloat safely without a prosthesis, opportunities are plentiful as swimming facilities are fairly common in our society. For the amputee who wishes to enjoy aquatic activities, several options are available:

A. Swimming without a prosthesis
B. Peg legs for use on the beach and possibly swimming
C. Sockets attached directly to swim fins
D. The utility or beach prosthesis used to ambulate on the beach but not for swimming
E. The swimming leg worn while in the water[2]

Water skiing is another activity that can be enjoyed by amputees.

Wheelchair sports have been organized for amputees, also. A rather detailed classification of degrees

Table I

Suggested Areas of Athletic Participation by Unimembral and/or Uncomplicated Amputees

	AK	BK	AE	BE
Football	0	+	±	+
Soccer	0	±	+	+
Fencing	±	+	+	+
Swimming	0	±	±	+
Gymnastics	±	±	±	±
Basketball	0	±	±	±
Wrestling	±	+	0	+
Track	0	0	+	+
Field	±	+	+	+
Golf	±	+	+	+
Tennis	±	+	+	+
Baseball	0	+	±	+

\+ Participation encouraged
± Participation equivocal
0 Participation difficult or impossible

of disability has been developed to maintain fairness in competition for men and women. Competition is now commonplace in wheelchair basketball, marathon races, bowling, field events, table tennis, and archery; there are even international events.

Special prosthetic adaptations have been developed for the lower extremity amputee who is interested in participating in the following activities.

A. Golfing—a rotor in the shank[3]

B. Flying—portable hand controls and a special SACH foot[4]

C. Boating[2]

D. Horseback riding[2]

In the upper extremity, special adaptations may be necessary for certain activities. The standard terminal device may be used for given activities, especially in the case of the unilateral amputee. For other activities the amputee may find it more convenient to remove the prosthesis completely. By and large the ability of the bilateral upper limb amputee is dependent upon the strength and mobility of the residual limbs. For the upper limb amputee, M.D. Robb[5] has grouped activities into those requiring closed or open skills. When the environment or activity is highly unpredictable and constantly changing, open skills are needed to adjust to and/or regulate the environment. Closed skills are those such as swimming, bowling, and golf activities which are performed in a comparatively stable environment. Among the recreational activities for which adaptive devices have been developed are:

A. Rein bar for horseback riding[6]

B. Special terminal device for fishing[7]

C. Terminal device for bowling[8]

D. Fletcher-Motis adapter for archery[9]

E. Universal joint terminal device for golf[9]

F. Additional devices adapted for hockey,[10] skiing,[11] and driving[12]

G. Baseball glove terminal device for the unilateral below elbow (this has always been a popular item among teenage boys in our clinic)[13]

Swimming can usually be accomplished without prostheses and special appliances. However, it may require minor adaptations of stroke techniques, kick modifications and a special breathing pattern.[13]

It should be apparent even to the casual observer that there are benefits to be derived from the use of secondary prostheses or adaptive devices by amputees. The physiological benefits will flow to the cardiopulmonary system as the result of the physical activity.

However, there is another even greater benefit—the psychological uplift—realized by the patient who achieves new heights of pleasure, pride, and increased self esteem by participation in physical recreation and/or competition. This aspect is so important to the total treatment and rehabilitation of the amputee patient that we must educate clinicians and third party carriers so that ordering such devices will become routine for all who have the ability and desire to use them. Furthermore, third party carriers should pay for them as routinely as the standard prostheses. In this manner we can give our patients the opportunity to participate in and enjoy life more fully—the essence of rehabilitation.

Charles H. Epps, Jr., MD
Professor and Chief
Division of Orthopaedic Surgery
Howard University Hospital
Washington, DC

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Sources for Extra-Ambulatory Activities

Joanne K. Shamp, CPO*

There is an acute emphasis today upon health, diet, exercise and recreation. This interest spans our nation and pays no regard to physical disability.

As prosthetic practitioners we are in a position to greatly enhance individual lives by facilitating health consciousness with up-to-date prosthetic care and the dissemination of accurate information.

The following listing is intended as a referral source of specialized sport groups for individuals with amputations. Listed are just a few of the hundreds of national, state and local organizations that represent the sport and recreation interests of many disabled groups.

An excellent resource for referrals, especially in the western United States, is the *Directory of Recreation and Leisure Services for Physically Handicapped Individuals*, edited by Mickey A. Christiason, MS, MTRS.

It is available for $8.95 plus $1.00 mailing fee ($1.00 discount to handicapped persons) from:

Mickey A. Christiason, MS, MTRS
11066 Gonsalves Place
Cerritos, California 90701

National Amputee Golf Association

5711 Yearling Court
Bonita, California 92002

Coordinates a program that includes sixteen tournaments during 1982. Membership is presently over thirteen hundred nationwide. Newsletter published.

International Senior Amputee Golf Society (ISAGS)

Lincoln Garden
2901 West Bush Boulevard, Suite 910
Tampa, Florida 33618
(813) 935-7256

This organization is part of the Amputee Golf Association but caters only to senior amputees 50 years and up. They have completed six successful years of conducting a Senior National Amputee Tournament that is held the first weekend of November each year.

National Amputee Skiing Association

3738 Walnut Avenue
Carmichael, California 95608
(916) 484-2153

Instructional group with local chapters.

United States Ski Association, Central Division

Handicapped Skiiers Committee
6832 Marlette Road
Marlette, Michigan 48453

National Handicapped Sports and Recreation Association

Capital Hill Station
P.O. Box 18664
Denver, Colorado 80218

The National Handicapped Sports and Recreation Association is dedicated to the promotion of sports and recreation activities for the handicapped.

Through its national community-based chapter organization the NHSRA provides year round activities in a natural public environment in such diverse activities as snow and water skiing, sailing, river rafting, tennis, hiking, horseback riding and others. The NHSRA also sponsors the annual Handicapped National Ski Championships.

Amputee Sports Association

P.O. Box 9525
Savannah, Georgia 31412
OR: George C. Beckmann, Jr.
Vice-President, St. Joseph's Hospital
11705 Mercy Boulevard
Savannah, Georgia 31406
(912) 927-5406

"The Amputee Sports Association is unique in that its objective is to provide both competition and recreation. That is to provide for amputees the opportunity to learn by instruction and demonstration, both the rules and regulations of a given sport or activity, as well as how the individual might paricipate safely." Sports provided include, "golf, swimming, diving, weight lifting, table tennis, volleyball, badminton, bowling, archery, track and field events, and gymnastics."

*Shamp Prosthetic Center, Inc., Norton, Ohio

Colorado Outdoor Education Center for the Handicapped (COECH)

P.O. Box 697
Breckenridge, Colorado 80424

The COECH offers a sled ski program with a rural living situation. Year-round courses are also offered in backpacking, rock climbing, fishing, wheelchair camping, snow-shoeing, ski touring, sled skiing, and mountain orienteering. Students range in age from 4 to 76. In addition, training courses are offered which teach professionals and paraprofessionals how to work with disabled people in wilderness settings.

Children's Camp

Physical Therapy Department
Children's Hospital of Pittsburgh
125 Desoto Street
Pittsburgh, Pennsylvania 15213
(412) 647-5480 Barbara Roehl

This annual camp is offered free for children between the ages of 12 and 18 who have congenital or acquired amputations.

Adapted Aquatics

Local Chapter—American Red Cross

Program of instructional and recreational swimming for individuals.

The Handicapped Boaters Association

P.O. Box 1134
Ansonia Station, New York 10023
(212) 877-0310

The Handicapped Boaters Association's primary function is to share information. HBA's monthly magazine, *Boating World Unlimited,* features articles about handicapped boaters, boating programs, product information, and interviews with manufacturers, boating administrators, and Coast Guard officers, among others.

Meetings and Events

Please notify the National Office immediately concerning additional meeting dates. It is important to submit meeting notices as early as possible. In the case of Regional Meetings, check with the National Office prior to confirming date to avoid conflicts in scheduling.

1982, October 19–23, AOPA National Assembly, Shamrock Hilton, Houston, Texas.

1982, October 23–24, Foot Management in C.N.S. Disorders, Lecture and Practicum, Blythedale Children's Hospital, Valhalla, New York.

1982, October 28–30, Houston Center for Amputee Services at the Institute for Rehabilitation and Research Seminar on "Successful Upper Extremity Prosthetic Function For The Child and Adult," Stouffers Greenway Plaza Hotel, Houston, Texas.

1982, November 12–13, Third Southern California Course on the "Current Concepts—the Diagnosis and Care of the Patient with Neuromuscular Disorder," Rancho Los Amigos Hospital, Downey, California.

1982, November 12–13, Workshop, sponsored by Freeman Manufacturing Company, Century Airport Inn, Atlanta, Georgia.

1982, December 5–8, American Medical Association's Interim Meeting of the House of Delegates, Fountainbleu Hilton, Miami, Florida.

1982, December 6–8, Department of Orthopaedics and Rehabilitation, University of Miami Medical School Post Graduate Course "New Technology in Orthopaedics and Rehabilitation," Sheraton Bal Harbour, Miami Beach, Florida.

1982, December 10–11, Florida Association of Orthotics and Prosthetics Hands On Computer Workshop, Hilton Inn Florida Center, Orlando, Florida.

1983, January 26–30, AAOP Annual Meeting, Hyatt Islandia, San Diego, California.

1983, February 17–19, "Seating the Handicapped Child," International Seating Symposium, Instructional Resources Centre, University of British Columbia, Vancouver, British Columbia, Canada.

1983, April 6–8, First European Conference on Research in Rehabilitation, Edinburgh, Scotland, United Kingdom.

1983, May 5–7, AOPA Region IV Annual Meeting, Downtown Holiday Inn, Jackson, Mississippi.

1983, May 12–14, AOPA Regions II and III Combined Meeting, Colonial Williamsburg, Williamsburg, Virginia.

1983, May 25–28, AOPA Regions VII, VIII, X and XI Combined Meeting, Hotel El Tropicano, San Antonio, Texas.

1983, June 3–5, AOPA Region IX, COPA, and the California Chapters of the AAOP Combined Annual Meeting, Harrah's, South Lake Tahoe, Nevada.

1983, June 19–23, American Medical Association's Annual Meeting of the House of Delegates, Chicago Marriott Hotel, Chicago, Illinois.

1983, September 5–9, The IV World Congress of the International Society for Prosthetics and Orthotics, Imperial College of Science and Technology, London, England.

1983, October 25–30, AOPA National Assembly, Hyatt Regency, Phoenix, Arizona.

1984, June 1–3, AOPA Region IX Meeting, Harrah's, South Lake Tahoe, Nevada.

The following is a list of more organizations involved in recreation for disabled persons, compiled by Drew A. Hittenberger, CP.

National Inconvenienced Sportsman's Association
3738 Walnut Avenue
Carmichael, CA 95608

American Association for Health, Physical Education and Recreation Programs for the Handicapped
1201 16th Street, NW
Washington, DC 20036

Sport for the Physically Disabled
333 River Road
Ottawa KIL8B9
Canada

Adapted Sports Association Inc. Communications Center
6832 Marlette Road
Marlette, MI 48453

National Amputation Foundation
12-45 150th Street
Whitestone, New York 11357

The Amputee Golfers Association
Lakeview Terrace
Watchung, NJ 07060

North American Riding for the Handicapped Association (NARHA)
Whitepost, VA 22663

National Wheelchair Athletic Association
40-24 62nd Street
Woodside, New York 11377

Canadian Association for Disabled Skiing
Box 2077
Banff, Alberta
TO1 OCO
Canada

Follow-up on Endoskeletal Article and Questionnaire

The Manufacturers Reply

Summarized results of the survey concerning endoskeletal prostheses appeared in the Summer, 1982 issue of C.P.O. *(Vol. 6, No. 3). These compiled results were circulated among the manufacturers of endoskeletal prosthetic systems. The following responses were received.*

In regards to the "g" response in the additional comments section, [questioning whether the cost is justified] I will submit the following: Endoskeletal prosthetics is a poor excuse to charge more money, only when it is the excuse that it is being charged to the patient. I can also understand being afraid of the dollar sign where it prevails as fiscal remuneration for an excuse, rather than the patient's welfare. Endoskeletal prosthetics have consistently proven themselves a useful tool in developing value in the patients themselves, and in the patient's rehabilitation accomplishments.

Michael T. Wilson, CPO
Medical Center Prosthetics, Inc.

Manufacturers must keep many things in mind when designing and building a modular system: weight vs. strength, added features vs. weight and strength, and cost to manufacture vs. simplicity. Research and development expenses are subsidized only by sales profits. A good example is that tooling for one simple item may run $80,000, while sales and volume of manufacture does not warrant this expense. In summary, manufacturers do have handicaps.

In reviewing question number ten—what changes would you like to see?—we find 19 answers were provided. Eighteen of the 19 have been researched, and four of these are available now. The others will continue to be researched and will be available in the future.

The field of prosthetics has come a long way in the past 20 years; let us look at what is available now in manufactured parts as to what was available in 1962. We at United States Manufacturing Company believe there will be even more improvements in the next 20 years compared to the last 20.

Dan J. Edwards
Sales Director
United States Manufacturing Co.

Otto Bock, along with several other manufacturers of endoskeletal prosthetic systems, was presented with the survey results from the Winter Issue of *C.P.O.* and was asked for a response. While the total number of endoskeletal prostheses indicated as having been delivered to patients was significant, we must offer our opinion that the total of 27 returned questionnaires is a rather poor response and certainly does not represent a consensus upon which to base any conclusions.

Each manufacturer is individually aware of how many endoskeletal units it produces and sells each year, which gives a general idea of market acceptance. Our experience has been that our endoskeletal units sold continue to increase in significant quantities year after year and this trend has shown no sign of reversing. This in itself is an indication to us that endoskeletal systems have attained a definite place in the armamentarium of components available for prosthetic patient management.

A great number of people seem to support the belief that endoskeletal prostheses were designed to replace exoskeletal prostheses. It is certainly not our company philosophy that one is intended to replace the other. Both types of systems have their advantages and disadvantages and it ultimately should depend on the professional decision of the prosthetist as to which system will best fit the needs of each individual patient. Perhaps many of the complaints about endoskeletal systems are due to improper patient selection criteria rather than deficiencies in the systems themselves.

Another source of trouble with endoskeletal systems is the improper application of fabrication techniques. Recognizing this possibility—and being one of the first manufacturers to offer a complete multiple option endoskeletal system for the lower extremity—we developed a seminar program for instruction in these new techniques. In addition, we have developed Technical Information Bulletins, slide programs and presentations for various technical meetings. Despite these efforts on our part, the sheer numbers of prosthetists in this country and their diverse geographical locations make it nearly impossible to personally instruct every one, even if we could increase the size and frequency of our seminars. Basically, we are able to trace many of the problems to not following technical recommendations. In many cases

the problems have been cleared up rather quickly by following instructions.

The prosthetist has the choice of using any of several manufacturers' systems, each with its own unique features. If alignment capability in the definitive prosthesis is desired, an IPOS or OTTO BOCK System can be used. If it is felt that this permanent adjustability is detrimental, the USMC or AFP Systems can be used instead. When the Otto Bock foam cover is too difficult or time consuming to shape, or lacking in durability, there are other alternatives. These include the foam-in-place technique offered by Medical Center Prosthetics, and the option of a prefabricated cover. Choices also exist for the prosthetic skin, such as our nylon stocking, USMC's newly developed cover, or a covering of the paint-on variety.

The foregoing statements are not meant to give the impression that Otto Bock is insensitive to the needs of the prosthetist or, more importantly, to the desires of patients they serve. We recognize fully the need for improvement of endoskeletal systems. The covers need to be more durable and easier to fabricate. The structural and functional components need to be made lighter and more sophisticated. Unfortunately, many of these things are easier said than done, but our research department is constantly striving to develop new and better systems.

We very much appreciate the opportunity to comment on this survey and would encourage a much greater response to such surveys in the future. This type of feedback on a much larger scale could be very helpful to all manufacturers. Along this line, we are wondering what suggestions might be offered for quickly disseminating information on new products or techniques so everyone interested could become qualified to use them for maximum benefit to the patient. If anyone has some workable ideas for accomplishing this objective, we are certain all concerned would benefit greatly.

Jack Hendrickson, CP
Otto Bock

More Endoskeletal Responses Added to Questionnaire Results

Two questionnaire responses were received too late to be included in the compiled results published in the Summer *C.P.O.* One individual reported that 75% of definitive prostheses fit were of endoskeletal construction and the other reported fitting 150 endoskeletal prostheses (actual numbers, not a percentage). Their responses to questions two through nine were very much in line with the majority of others received. Their written responses are included below:

10. What changes would you like to see made?

First respondee:

1. improved covers
2. hydraulic knees

Second respondee:

1. Lighter in weight
2. Improvements in the visual, tactile, and sound aspects of prostheses
3. Longer lasting cosmetic covers, internally and externally
4. For H.D./H.P. prostheses, better sitting ability
5. Standardization of tube sizes and connectors to facilitate "intermarriage" of components
6. More instructional courses by prosthetics/orthotics schools or manufacturers to deal with "practical every-day" problems

11. Additional comments:

First Respondee:

The ability to make either major or even subtle changes in a definitive prosthesis, months or even years after initial fitting, has always appealed to me. The more I use the Bock system the more confident I become of it and I find myself fitting a higher percentage [75% last year, Ed.] . . . every year. I find the poor durability of the cover a minor trade off . . . most of my patients agree. I practice in Montana, so you can guess my patients do not always give their prostheses the easiest use. I am a firm believer in the concept.

Second respondee:

Our first choice of components for any amputee (re: level of amputation, sex, job or environmental factors) is the endoskeletal prosthesis. My first reason for this is ease of maintenance/replacement of components. This single factor keeps patients coming back knowing they can get things "fixed" quickly. In our present rush society this factor cannot be overlooked.

Cosmesis is becoming a more important factor every day, regardless of the patient's sex or age.

For too long, we have, as professionals, trained our patients to think: 'functional restoration is your main objective.' Having been involved with many patients who are "prosthetic failures," I have learned a few very important lessons as to why they are on crutches, in wheelchairs, or have empty armsleeves.

Consumers in general, today, are more educated and interested in knowing their options. The prosthetist has the responsibility to inform his patient as clearly and completely as possible concerning what is available. He may end up referring the patient to a colleague if he does not have the necessary skills to satisfy his client. A satisfied, happy patient is not a side benefit to our existence. It is a must.

Through publications such as this one and many others around the world, we have an obligation to keep up-to-date on new developments as well as contributing our findings in return. It is not necessarily always true that something we are having success with is known to most colleagues. Try and publish articles with photographs and you will be surprised at the response.

Clinical Prosthetics and Orthotics . . . C.P.O.

American Academy of Orthotists and Prosthetists
717 Pendleton St., Alexandria, VA 22314

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3347 PRAC CO
Mr. Henry K Saur
200 Maple Point Dr
Langhorne, PA 19047