



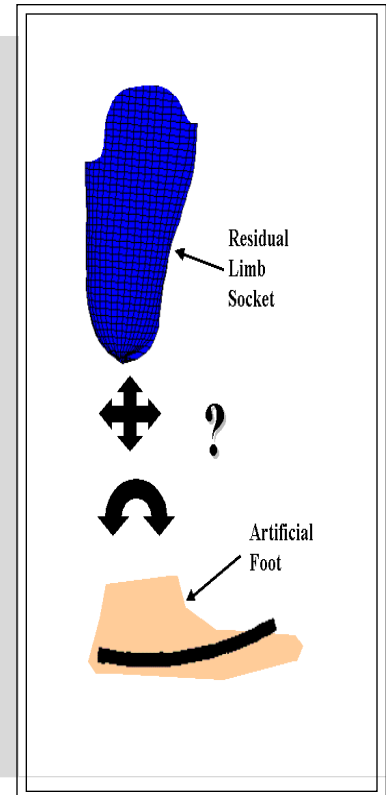
Capabilities

Communicating the Science of Prosthetics and Orthotics

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Research on Roll-Over Shape Alignment of Transtibial Prostheses is Directed at Development of a Clinical Aid

By Andrew H. Hansen, MS



Two major components of a transtibial prosthesis (below-knee prosthesis) are the residual limb socket and the artificial foot. The socket and foot are connected together to form the below-knee prosthesis. The spatial orientation of these two components with respect to each other is called the alignment of the prosthesis.

The process of transtibial prosthesis alignment currently involves three stages. The first stage is bench alignment. In this stage, the prosthetist will set up the alignment of the prosthesis at his/her bench using recommended starting points from the foot manufacturer.

Static alignment is done with client standing

The second stage of alignment is called static alignment. During this stage of alignment, the client dons the prosthesis and stands while the prosthetist makes visual observations of their posture. Adjustments to the alignment are made if the prosthetist is not satisfied with the client's standing posture. After static alignment adjust-

ments have been made, the alignment process enters into the third stage called dynamic alignment.

During dynamic alignment, the client walks as the prosthetist visually inspects their walking pattern. If the prosthetist feels that the client would have a better walking pattern with a different alignment, he/she will align the foot accordingly. The dynamic alignment process continues until both the client and the prosthetist are satisfied with the function of the prosthesis.

Dynamic alignment phase currently is necessary

The process just described has been used by prosthetists for many years. However, the scientific basis and goals of the process are still unknown. Hannah et al. (1984) believed that the goal of alignment was a symmetrical walking pattern for the client. Zahedi et al. (1987) suggested that the process may be aimed at reduc-

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Roll-Over Shape Alignment

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ing step-to-step variability. Although both of these factors seem important to the alignment process, evidence supporting them has been limited. Additionally, new

NUPRL-RERP has led to our hypothesis that the goal of transtibial alignment is to align the roll-over shape of the artificial foot, as closely as possible, with an ideal roll-over shape for the prosthesis user.

We call this hypothesis the *Roll-over Shape Alignment Hypothesis*.

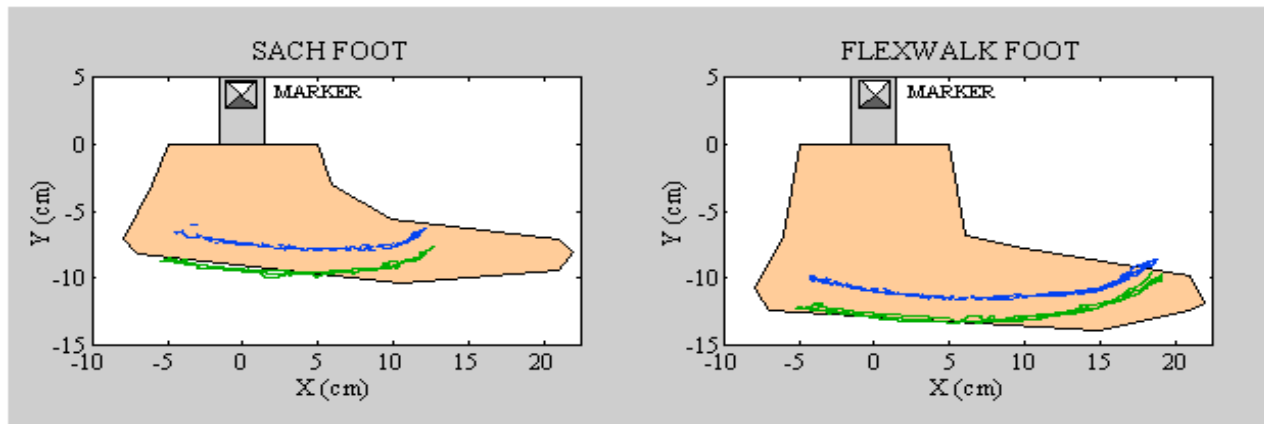


Figure 1 - Roll-over shapes of two prosthetic feet. The roll-over shapes are for the feet alone while the bottom curves are the roll-over shapes of the feet with fairly flat, soft-soled shoes.

alignment methods based on either approach would still necessitate a dynamic phase with walking trials.

At NUPRL-RERP, we have been investigating a new hypothesis that takes the mechanical properties of the artificial foot into account to align transtibial prostheses. Mechanical properties of prosthetic feet have been studied at NUPRL-RERP for several years, beginning with Sandifer (1993). One of the major findings of these studies is our belief that the most important feature of a prosthetic foot for walking is the geometry, or shape, that it acquires during the stance phase of walking (Knox, 1996). Because this geometry is the equivalent shape that the prosthesis user feels as they roll-over, we refer to it as the roll-over shape of the foot. During the course of NUPRL-RERP's research on prosthetic feet, three methods have been developed to measure the roll-over shape of the foot. All three methods have been found to give similar results (Hansen et al., 2000). The results of one of the three methods is shown in Figure 1 for two types of prosthetic feet.

The roll-over shapes of these two feet illustrate large differences in the mechanical properties between the different types of feet. The study of roll-over shape at

We believe that the roll-over shape alignment hypothesis explains the current alignment process and that it may be used to make alignment of transtibial prostheses

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Kellie Lim: NIDRR Scholar for the Year 2000

Kellie's internship this summer takes her from the Northwestern University Prosthetic and Orthotic research programs to Washington to share her project with other National Institute on Disabilities & Rehabilitation Research (NIDRR) sponsored scholars

My name is Kellie Lim, and I am a junior majoring in Biological Sciences and Asian Studies at Northwestern University. I am interning at the Northwestern University Prosthetics Research Laboratory and Rehabilitation Engineering Research Program as a Scholar sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR). My interest in this internship lies in the fact that I am a bilateral below-knee amputee and I have a desire to learn more about the field of prosthetics.

Personal knowledge of life with amputations

When I was eight years old, I contracted meningococemia, a bacterial form of meningitis. This disease attacks the circulatory system and blocks the blood from circulating throughout the body. As a result, I became a multiple amputee, losing portions of my legs below the knees, my right arm below the elbow, and several fingers of my left hand. It was difficult learning how to perform the basic tasks of everyday life, but since I was still young, I learned quickly and adapted to my environment. Being naturally right-handed, the loss of my right hand was very difficult; I had to learn how to write again using my left hand. Since I was not fitted with a prosthetic arm until a few weeks after the amputation, I began to use only my left hand to perform every task. To this day, I have only used my prosthetic arm for tying my shoes.

Learning how to walk with prostheses, however, was the greatest challenge. I could not use a walker or crutches because my prosthetic arm was too awkward to

properly place my weight on it. Balancing my body weight while walking was particularly difficult since the prostheses were essentially stilts attached to me. It took me some time to actually think of the prostheses as my legs or an extension of my body, but after becoming dependent on them, my whole perspective of them changed drastically.

Nine years later, I began my college career at Northwestern University. Like many undergraduate students, I had to think about which studies to pursue and which career to aim towards. Since I was already interested in the field of prosthetics, I sought an internship that dealt with research in that area and this led me to the NIDRR Scholars program at NURERP.

The NIDRR Scholars Program provides opportunities for disabled undergraduate students to learn about research on social and technical issues in a wide range of disabilities. Currently, there are fifteen centers across the nation that participate in this program, and each center focuses on different disabilities. Each NIDRR Scholar works with a mentor, a faculty member at the facility, on a research project that deals with some aspect of disability. My mentor is Steven A. Gard, Ph.D., and the topic of my research project was "Quantitative and Subjective Analyses of Walking in an Individual with Bilateral Below-Knee Limb Loss," using myself as the primary subject.

The objectives of the study were to identify functional limitations of the prostheses and to identify compensatory actions employed by the bilateral below-knee amputee. The

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Kellie Lim: NIDRR Scholar

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gathering and processing of data on my walking study was performed at the VA Chicago Motion Analysis Research Laboratory. By comparing my data to those of an able-bodied female, I learned about how I had adapted to walking with prosthetic limbs.

My pelvic tilt may help me walk more efficiently

I found that one of the more surprising aspects of my gait was that I hip hiked to increase foot clearance during swing phase. That is, I lift my hip higher on the side of my swing leg than an able-bodied individual to gain foot clearance. I also found that my pelvis has a

sustained anterior tilt, which I had noticed before this research but considered at the time as simply poor posture.

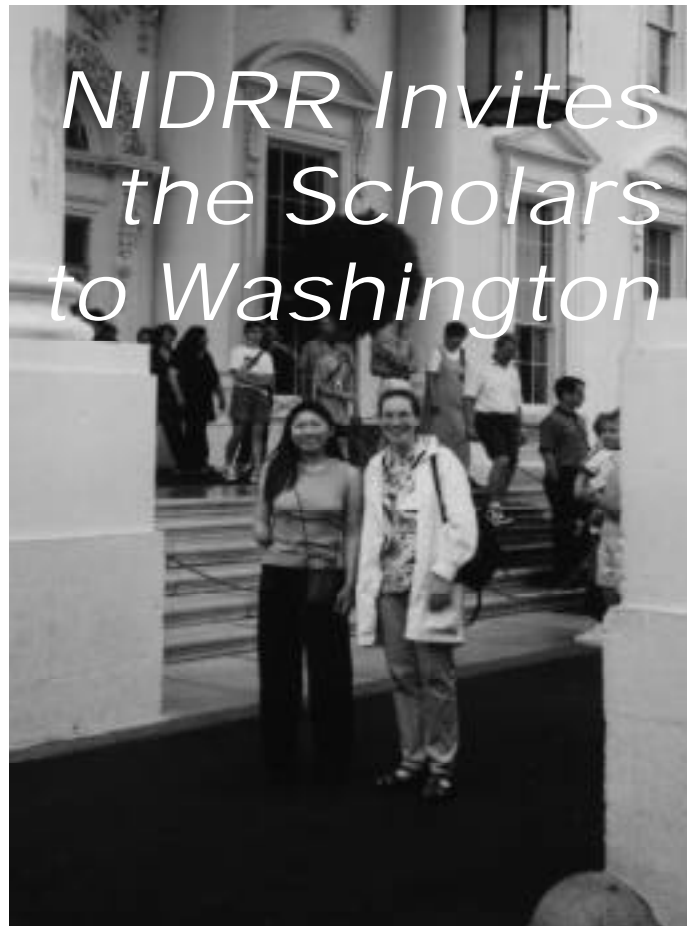
For cadence, step length, and walking speed, my data was compared with that of five able-bodied females. The data was plotted on graphs, and the general trends of the graphs showed that my cadence, step length, and walking speed were within the range of the able-bodied females but were more narrowly defined. In other words, during my walking trials I did not reach the full ranges of each parameter values that the able-bodied females did. I believe that my ranges of cadence, step length, and walking speed are narrower because of lessened stability.

My ground reaction force data was similar to those of an able-bodied female. However, when I initially loaded my prosthesis with each step, I placed much more force on the ground than the average female. I interpreted this result as my need to “feel” the surface of the ground. ❖

In May 2000, all the NIDRR Scholars were invited to attend a conference in Washington, D.C. in order to meet other Scholars and to exchange information about their individual projects. I was very excited to attend this meeting since I had never been to the nation’s capital and I wanted to learn about the areas other Scholars were researching.

The Scholars represented a wide range of learning and physical disabilities, and this, I believe, was the best part of the conference. Having little exposure to people with disabilities, I thought it was amazing how some Scholars adapted to the environment and excelled in every aspect of life.

Every Scholar gave a presentation of their research, and some opted to provide a short biography as part of the presentation. The willingness to talk about their disabilities and how they overcame challenges provided a view into their lives and their courage. When it was my turn to present my project, I became quite nervous. I have little experience in speaking in front of groups, and having to explain technical aspects of gait



Kellie (left) and Dr. Margrit Meier, post-doctoral student at NUPRL & RERP, join tourists at the White House.

analysis to an audience who may have never been exposed to this field made me self-conscious. Overall, I felt that everyone understood my presentation.

The other research projects spanned a wide range of subjects. One project focused on the relationship between religiosity and disability, specifically how the onset of a disability affected an individual's religious behavior. Another Scholar became a mentor at a middle



The White House was just one of the historical sites of Washington that Kellie, shown here with Dr. Steve Gard, enjoyed.

school and organized a program that gave students hands-on experience in rehabilitation engineering. Other research projects concentrated on issues of visual and hearing impairments and the improvement of rehabilitation services for minority groups.

The duration of the seminar was not entirely devoted to presentations. The group was able to tour the White House and the Capitol. I enjoyed the tours immensely since I personally was able to see these historical places, which was much more impressive than viewing them on television or through pictures.

After the seminar in Washington D.C., I will continue to intern at NURERP for the summer. More in-depth analysis will be performed on the data collected from the research project on bilateral below-knee gait.

...former NIDRR Scholar

In 1997, Brian Ruhe worked at Northwestern's prosthetic and orthotic research laboratory as what was then known as a Dole Scholar, precursor program to the NIDRR Scholar program. The intent of the program was to give students with disabilities the opportunity to explore a scientific field of study in the hope that more people with disabilities would choose

I will also be working with and analyzing data for Dr. Gard's research on the gaits of persons with bilateral above-knee and bilateral below-knee amputations.

Research on bilateral lower limb amputation is scarce

Currently, there is not much literature reporting on the gait of persons with bilateral amputations. More attention is focused on study of the gaits of persons having unilateral above-knee and unilateral below-knee amputations. Dr. Gard believes that research into lower-extremity amputee gait will provide new information on how people with bilateral lower limb amputations compensate for their limb loss and may also offer new insight into the gait mechanics of able-bodied persons.



Kellie seems to be wearing an "I made it!" smile as she and Dr. Margrit Meier visit the Capitol Building after a successful presentation at the NIDRR Scholars meeting.

I have already gained much knowledge and new experiences from this internship, and this research has allowed me to understand how I have adapted to walking with prosthetic legs. I want to thank NIDRR and NURERP for providing me with this opportunity to learn about prosthetic research and become part of the process in analyzing and understanding bilateral below-knee amputee gait. ❖

careers in science. Brian Ruhe returned to Wright State University in Dayton, Ohio to complete his B.S. in biomedical engineering after his summer as a Dole Scholar. He has now returned to Northwestern as a candidate for an M.S. in biomedical engineering. He works with Dr. Dudley Childress and Dr. Steve Gard in research on gait of people with bilateral amputations. ❖



Childress is Featured at Conferences and Symposium on P & O

Dudley S. Childress, PhD, Director of NUPRL & RERP and NUPOC moderated a panel discussion at the International Conference of Advanced Prosthetics, held in Newport Beach, CA, April 27 and 28. The session moderated by Dr. Childress focused on an overview of advancements in prosthetics. Other sessions explored surgical advancements and the future of the O & P business.

Childress also spoke at the symposium entitled "Artificial Limbs", held in Albuquerque, NM on May 16. The symposium was held in conjunction with the Pilot Program in Biomedical Engineering Contractors Workshop, sponsored by the Department of Energy. This new program is within the Medical Sciences Division of the U.S. Department of Energy Office of Biological and Environmental Research.

Dr. Harlaar Visits NUPRL&RERP

Clinical Movement Analysis based on multi-media technology was discussed in a presentation by Jaap Harlaar, PhD to the staff and students of NUPRL & RERP on April 17. Dr. Harlaar conducts research on prosthetics and orthotics in The Netherlands.

NUPRL&RERP Staff Attend Gait Conference in Rochester, MN

Steven Gard, Steven Miff and Regina Konz attended the Fifth Annual Meeting of the Gait and Clinical Move-

ment Analysis Society (GCMAS) in Rochester, Minnesota April 12-15. Dr. Gard presented "What Determines Vertical Motion of the Human Body During Normal Gait?"

Childress is Guest Lecturer at Japanese Rehab Medicine Meeting

Dudley S. Childress, PhD, was a guest lecturer at the 37th Annual Meeting of the Japanese Association of Rehabilitation Medicine. Dr. Childress gave two lectures, one on June 22 and the other on June 23. In addition, he visited Tokyo Denki University, an engineering university near Tokyo. While there, he evaluated the TDU microcomputer controlled prosthetic hand, the assisting robot and a feedback gait training system.

Miff and Doering Earn MS Degrees

Steve C. Miff and John Ernest Doering were awarded Masters of Science degrees in Biomedical Engineering and Mechanical Engineering respectively from Northwestern University in June. Steve's research and his thesis focused on The Effects of Step Length, Cadence, and Walking Speed on Gait Kinematics, Kinetics, and Energetics. Miff also presented a discussion on this topic to the SMPP (Sensory Motor Performance Program) lab meeting May 25. Doering's research was on modeling the Michigan Arm to Explain Limit Cycle Behavior, a phenomenon related to the control of electric-powered arm prostheses.

Kuiken and Stoykov Discuss Artificial Limb Control Methods

At the June 22 SMPP lab meeting, Todd Kuiken, MD and Nikolay Stoykov, PhD, presented "The Use of Nerve-Muscle Grafts to Improve the Control of Artificial Limbs". Dr. Kuiken heads clinical services for amputees at the Rehabilitation Institute of Chicago and is part of the NUPRL&RERP research team.

NU PRL &RERP Staff Help RESNA Celebrate the 20th Anniversary

Dudley Childress recalled the first independent conference held by RESNA, which he chaired, as he spoke at the opening ceremonies of the 20th Annual RESNA Conference held June 28 to July 2, in Orlando, Florida. He also joined four other colleagues in a RESNA Pioneers' celebration sponsored by the Whittaker Foundation. Other

speakers were Jim Reswick, Doug Hobson, Robert Mann, and Gregg Vanderheiden.

Progress of the research projects being conducted by NUPREL&RERP, illustrated by posters and a laptop demonstration, were featured in the program's exhibit. Staff members attending the Conference were Dudley Childress, PhD, Craig Heckathorne, MS and Margrit Meier, PhD. RESNA, founded in 1979, is an interdisciplinary organization focusing on research and delivery of assistive technology for people with disabilities.

NUPOC Staff Deliver Presentations

Mark Edwards, CP and Tom Karolewski, CP presented the Northwestern University-Rehabilitation Institute of Chicago Ischial Containment Prosthesis course at the Cascade Learning Center in Reno Nevada on June 14-15. Mark Edwards also presented at the AAOP National Scientific Symposium on a panel discussion of the Pros and Cons of Early Prosthetic Management for the Transtibial Amputee in March.

Desmond Masterton, CO presented at the Midwest Chapter of AAOP summer meeting on Upper Limb Orthotic Management.

New Instructors Join NUPOC Faculty

Jennifer Richards has joined the NUPOC faculty as a new orthotic instructor and clinical instructor in Physical Medicine and Rehabilitation. Jennifer completed her orthotic residency at the University of Michigan. Robert Lipschutz, CP has also joined the faculty as a part-time instructor in prosthetics. Robert comes from Newington Childrens Hospital, Hartford, Connecticut and was importantly involved in teaching the prosthetics curriculum at the Newington Prosthetics Certificate Program. He will also be a staff prosthetist with the Rehabilitation Institute of Chicago.

NIDRR Conference on Disability Studies Planned for October

Disability Studies: A Global Perspective, is the title of the conference sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR), which will be held October 17-18, 2000 at the National Press Club in Washington. The objectives of the conference are to highlight new and existing programs in Disability Studies. In addition, the conference will compare international viewpoints on Disability Studies research, describe strategies to implement such studies in higher edu-

cation and professional organizations, identify key research and policy issues and develop agendas to address them. Those participating in the conference will also seek to explore the relationship between Disability Studies and Rehabilitation Science as well as examine the concept of emerging disabilities. Conference participation will be by those people on-site and by electronic communications.

The conference organizers are currently compiling a mailing list of conference invitees. If you would like to be invited to the conference or to receive the brochure for the conference, please contact Rona Harper, Events Manager Director at Conwal, Inc., 6858 Old Dominion Drive, Suite 200, McClean, VA 22101, telephone 708/448-2300 or e-mail at bargrosen@aol.com.

NUPRL& RERP Presentations at VA Career Development 2000 Available

Many of students and practitioners who read *Capabilities* or visit us on the Web request copies of articles and presentations about the research projects conducted by NUPRL&RERP. A full listing of this material is on our web site at <http://www.repoc.northwestern.edu> under the heading "Publications". The "Article Index" lists articles and presentations from 1964 to present. Among the latest additions to that index are presentations made by NUPRL&RERP staff at the Department of Veterans Affairs Research and Development Conference 2000, held February 20-22 in Arlington, VA. The presentation titles are:

Gard, S.A. (2000). "Ingredients for Success in VA Rehabilitation R&D Career Development: An Awardee's Perspective."

Gard, S.A., Childress, D.S., Konz, R.J. and Grahn, E.C. (2000). "The VA Chicago Motion Analysis Research Laboratory: A Tool for Studying Human Movement and Evaluating Prosthetic and Orthotic Performance."

Miller, L.A. and Childress, D.S. (2000). "Propulsive Methods for Crutch Ambulation."

Rolock, J.S. and Tucker, K. (2000). "Squirt Shape—Development of an Automated Fabrication Technique to Enhance Prosthetics CAD/CAM."

Weir, R.F., Childress, D.S. and Grahn, E.C. (2000). "Development of an Externally Powered Prosthetic Hand for Persons With Partial Hand Amputations."

Please see page 12 of *Capabilities* for other educational material offered by NUPRL & RERP. ❖



Ted and Loretta Thranhardt Resource & Information Center Dedicated

The Ted and Loretta Thranhardt Resource and Information Center was dedicated on June 12, 2000 at the Northwestern University Prosthetics-Orthotics Center (NUPOC). The ceremony and reception honored Ted and Loretta Thranhardt for the generous donation and challenge drive that raised \$80,000.00 for the renovation and upgrade of the prosthetic and orthotic center library.

The Thranhardt Resource and Information Center houses an extensive collection of text books, videos, periodicals and other printed materials focused on research into and application of prosthetic and orthotic prescription, fabrication, fitting and evaluation of outcome. In addition, students at NUPOC may use the computer terminals to conduct research using the Northwestern University medical and other libraries and the Internet. For example, students may access RECAL, a service which provides abstracts of research in prosthetics and orthotics from research facilities around the world. The students also have access to the Smart Classroom, where most lectures are delivered. The Smart Classroom is equipped with audio visual and computer equipment which makes possible interactive participation in the subject being studied.

Theodore Thranhardt grew up with the field of P & O. His grandfather, Paul Coleman, purchased the rights to the J.E. Hanger name in the early years of the 20th century. His father, Howard Thranhardt, took over the company after World War II and became a national leader during the period following World War II, when emphasis was placed on research and education to advance the field of P & O. In 1975, Ted took over the management of J.E. Hanger.



Gathered at the dedication of the Ted and Loretta Thranhardt Resource and Information Center are: (left to right) Bryan Malas, Director of Orthotic Education, NUPOC, Ted Thranhardt, Dudley S. Childress, Director of NUPRL & RERP and NUPOC, Mrs. Loretta Thranhardt and Mark Edwards, Director of Prosthetic Education, NUPOC.

When the Northwestern University Prosthetic-Orthotic Center was formed in 1958 by Dr. Clinton Compere, Howard Thranhardt was among the important supporters who contributed to the success of NUPOC. Coincidentally, Ted's career began that same year. Ted felt great loyalty to Northwestern University and credited the education he received at NUPOC as a major part of his success. In 1998, at the American Academy of Orthotist & Prosthetists (AAOP), Ted presented a challenge to members of the AAOP. If they would raise \$40,000 in contributions for NUPOC, he and his wife, Loretta, would match that amount. The \$40,000 was raised in six months and, at the 1998 American Orthotic and Prosthetic Association (AOPA) in Chicago, the announcement was made that the \$80,000 would be used to remodel and expand the P & O library at NUPOC and improve classroom teaching aids. The 40th Anniversary of the founding of NUPOC was also celebrated at that time. Over 90 alumni of NUPOC contributed to the Thranhardt Challenge to raise funds to expand the Resource Center. ❖

The VA Presents

News from the
Department of Veterans
Affairs

Coordinated by Robert M. Baum
Prosthetic Network Manager, P&SAS SHG,
VA Headquarters, Washington D.C.

Prosthetic Clinical Reorganization of VA Desert Pacific Health Care Network Prosthetic Service Line

By Ed Ayyappa MS CPO FAAOP

The Prosthetic Service Line, Desert Pacific Health Care Network has recently undergone a bold new reorganization. A comprehensive review of related activities within the network was conducted which led to a unique reorganization of authority, policy and procedure for this large southern California-Nevada Health Care Network.

Highlights of the restructuring include establishment of a network Director of Clinical Activities aligned under the network Director of the Prosthetics Service Line. The Clinical Director was given broad scope to initiate constructive and creative change.

Primary immediate goals of the Clinical Director include the identification of a referral treatment center with gait lab for complex orthotic and prosthetic patients, increased focus on prevention of amputation and ABC Certification of all O&P labs, which is a prerequisite for establishing National Commission on Orthotic and Prosthetic Education (NCOPE) approved prosthetic residency programs. Other goals address development of unique componentry recording forms which are precise, easy to use, and well accepted by physicians. Cost savings are expected to result from NCOPE O&P residencies to enhance patient care, provision of O&P training courses for all VA clinical staff and PM&R and Orthopaedic residents from associated medical schools, which include UCLA, UC Irvine and UC San Diego.

With the goal of identifying station to station variance in clinical responsibility by staff members and improving continuum of care, a comprehensive review of prosthetic clinical activities has been conducted since October 1, 1999. This review has continued to the present and has been appended by weekly site reviews at major

network stations within the Prosthetics Service Line, Network 22. This review has included:

- a. Complete review of clinic organization, assessment of expertise available within network, prescription coding, inter-service communication, prescription generation, billing procedure, terminology, assessment of staff prosthetist education, certifications, background and history of clinic team interaction, cost assessment and price quote submissions from private sector prosthetists and orthotists treating amputees from all clinics. The review involved all clinic activities at or associated with Greater Los Angeles, San Diego, Las Vegas, Long Beach and Loma Linda.
- b. A questionnaire survey of clinic physicians and therapists.
- c. Telephone and in-person interviews with prosthetists, orthotists and P & O contractors at each station concerning prescription generation and componentry usage.
- d. Review of variance in prescriptions from clinic to clinic and comparison with available decision support system and national prosthetics data.

Out of this review has evolved an Affiliation for Clinical Excellence (ACE) Program which reaches out to all medical disciplines within the network through various means to achieve uniformity and integration of treatment approaches. This affiliation provides a system for patient referral to address problems of complex amputees and veterans with unique and severe skeletal, neurologic and muscular pathologies.

The ACE Program utilizes a full service gait laboratory as a diagnostic tool for performance assessment. The Prosthetics Service Line Gait Lab (Formerly PACT

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Prosthetic Clinical Reorganization of VA Desert Pacific Health Care Network

Continued

gait lab begun in 1986) was the first full service lab focusing on prosthetic and orthotic assessments in the VA system. Prevention of amputation is a main focus and instrumented pressure technologies are regularly used on neuropathic patients. The lab has the capacity to integrate the instrumented performance data of pressure measurements, kinematics, kinetics, energy cost, dynamic electromyographics, and temporal information in the assessment of artificial limbs and braces.

The clinic physician generates a consult request for such assessment. The data is then provided to the physician along with a prosthetic or orthotic recommendation. Based upon that information, the physician is then in a position to generate a prescription based upon the gait data and assessment.

Clear need for higher level of training has emerged

Our review and experience with the wide variety of clinic settings within our Network has clearly pointed to the need for a higher level of training by all clinic participants, including physicians, therapists, prosthetists, and case managers. Physical Medicine schools, such as UCLA, UCI, and University of Alabama have a reputation for excellent physician training in prosthetic rehabilitation. Yet lecture time directly relating to prosthetics and orthotics is limited to about 40 hours of lecture at these schools. It is generally agreed that the certified prosthetist with 4-5 years of experience and baccalaureate minimum educational level has more knowledge about prosthetic componentry, alignment, socket design and prosthetic prescription principles than any other member of the medical team. Physicians rely enormously on the clinical input of such prosthetists.

While there are some physicians who have a fully developed and integrated global knowledge base of prosthetics, more often the physician has the role of team leader and the baccalaureate level VA prosthetist generally takes the lead of a team of private sector prosthetists attending clinic to advise the prescribing physician about componentry and prosthetic trouble shooting. This approach makes for a harmonious work environment and a great teaching clinic. There are several within the network.

The importance of fully trained university graduates in prosthetics and orthotics cannot be overemphasized. Recently, all labs within network 22 have been certified in order to establish the prerequisite for prosthetic residencies and draw such baccalaureate level graduates into the VA system. The result is that our network

has been very successful in hiring these highly trained and motivated young men and women. It is our policy that at least one such professional should be assigned to every major prosthetic clinic in the system.

System wide standards of care of our veterans have been a main focus and work in progress since the inception of the Prosthetic Service Line. As a means of facilitating that goal, a prescription recording system which differentiates basic standards of care was established. A centralized system wide review of clinical appropriateness for all private sector prosthetic quotes over \$500 was instituted. A system-wide quality assurance weekly tracking report of all in-house custom devices delivered in the network was developed as well as a uniform network-wide standard operating procedure for all labs. A manual identifying appropriate clinical guidelines for prescription at all amputation levels was disseminated.

An annual conference, beginning in October 2000, for all clinic physicians, therapists, prosthetists and administrative personal is seen as an important venue to disseminate, explain and, when appropriate, modify our adopted standards of care. In integrating various approaches, the clinical affiliation program has produced a system which assists the clinics and physicians in providing a detailed precise prescription in minimal time.

This system records types of componentry based on the etiology of the condition. For example, basic gait performance differences between dysvascular patients and traumatic patients, with or without an amputation, have been studied. Energy cost and foot switch studies have consistently shown that the dysvascular patients are slower, less dynamic walkers than traumatics. Therefore many prosthetic or orthotic components which are designed and marketed for a dynamic level of performance are inappropriate for the typical dysvascular geriatric patient. These components often have increased weight and complexity, which may translate into increased maintenance.

In the 1960's and 1970's prosthetics were simpler. Only a few foot and knee choices were available. Knowledge of biomechanics was in a rudimentary stage. Prosthetists and orthotists were trained to be technicians. Their education and energy focused on fabrication. Today the majority of their baccalaureate education and subsequent residency experience is focused on assessment, clinical concepts, design, and mechanical application of devices.

Since that early period, the medical model outside the VA has shifted enormously. In the current private sector model, more often than not, the prosthetist is the vital interface between the central fabrication laboratory and the patient. The requirement for a high level of com-

Prosthetic Clinical Reorganization of VA Desert Pacific Health Care Network

Continued

munication skill and a broader knowledge base is no longer optional. The role of the orthotist and prosthetist is not fabrication but rather assessment and casting (often by means of computer systems) with many of the components of the systems made in a central fabrication lab under the direction of the clinical prosthetist.

Placing emphasis on the patient interface personnel (the educated board eligible prosthetist) is vastly more important than hiring technicians to make things. Utilization of wholesale commercial central fabrication while ensuring that the VA has adequate staff for direct patient care is at once the most patient oriented and cost efficient way to use our available human resource dollars and optimize the quality of treatment. This is the approach taken by Desert Pacific Health Care Network.

Conclusion

The Affiliation for Clinical Excellence program is a promising work-in-progress for addressing existing deficiencies in the clinic system. The improved multidisciplinary communication, novel recording formats, emphasis on education of prosthetists, physicians, and therapists, patient referral system with comprehensive gait lab assessments available to physicians when required and a proposed annual conference of clinicians are just a few of the approaches being utilized to improve the efficiency of patient flow and multi-disciplinary communication. These changes have generated optimism in patients and medical staff. Emphasis on uniform standards of care and the enhancement of educational programs has improved perception of quality care, heightened readiness for CARF/JCAHO reviews, led to quality improvement procedures and met a prerequisite for other programs which improve the quality of care for the veterans entrusted to our care. ❖

Please send us your articles, success stories, comments or suggestions for future issues in the VA Presents. E-mail: Robert.Baum@Mail.VA.Gov. Address: PSAS SHG (113), 810 Vermont Ave., NW, Washington, DC 20420. Phone (202) 273-8515. Fax: (202) 273-9110.

Roll-Over Shape Alignment

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easier. We are currently developing and will soon be testing a computer program and accompanying fixture for transtibial alignment that uses this hypothesis. The computer will store the roll-over shapes of different commercially available feet and tell the prosthetist the correct alignment for each foot. The alignment parameters will then be transferred to the alignment fixture and the prosthesis will be made with that alignment.

This procedure could eliminate the dynamic alignment process, reducing the amount of time needed to finish a transtibial prosthesis. This type of alignment may also eliminate the need for alignment hardware as it would allow prostheses to be manufactured with the alignment "built in", thus reducing their weight and cost. ❖

References

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