
Advanced Education & Research Training Initiative [AERTI]:
Prosthetic-Orthotic Strategic Plan for a Ten-Fold Increase in the
Academic and Research Capacity of the Profession

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Introduction

The purpose of this strategic plan is to develop and establish the framework required to:

1. Train future scientific and academic leaders in the Prosthetic and Orthotic (P&O) field
2. Improve the quality of applied P&O research, education and, ultimately, patient care.

This report is primarily intended to inform funding agencies, educators and institutions interested in developing academic pathways that will enable and expand research in the P&O field. This initiative will foster advanced scientific and research education in P&O and build the academic and scientific research capacity of the profession.

Two strategic planning conferences were held to identify the challenges that currently limit research in P&O. These conferences were attended by leading clinicians and representatives from universities and research centers currently involved in P&O education (Appendix I). Participants presented on various aspects of P&O education and research, including: overviews of current educational and research programs both in the U.S. and abroad; the role of various organizations in P&O education; lessons learned from unsuccessful attempts to create P&O education programs; the experiences of other allied health fields in raising academic standards and creating new educational programs; the role of Evidence-Based Practice in clinical care; and the barriers to pursuing advanced academic degrees (Appendix II). These presentations were used to facilitate discussion among the participants. The outcome of these conferences was this strategic plan and the associated recommendations for the development of advanced academic pathways to foster scientific research within the P&O profession.

To understand these recommendations, it is crucial to recognize the distinction between advanced academic degrees and advanced practice degrees. Advanced academic degrees, which are the focus of this strategic plan, prepare the graduate for scholarship and scientific research that will increase the knowledge base of the field. In contrast, advanced practice degrees provide vocational training that prepares the graduate to provide clinical services. This strategic plan and these recommendations do not address the question of whether or not advanced practice degrees are appropriate, which is an independent consideration from the need to raise the academic level of the profession.

Recommendations

Participants in these Strategic Planning conferences concluded that the following resources are required to meet the needs of the P&O profession for training scientific and research leaders:

1. Institution or Program Grants

These funds would provide institutions with the financial resources to support advanced research degrees relevant to the field of P&O. These grants may be similar to the NIH Institutional Research Training Grants or the Department of Education RSA Training Program Special Capacity Building Grants. These grants should be available to schools that are currently providing entry-level P&O education (and therefore already have expertise) to assist in developing or refining advanced degree programs relevant to the field of P&O. In developing or facilitating access to advanced research degree programs, these grants should encourage strong interdisciplinary links with departments/fields such as biomedical engineering, epidemiology, surgery, psychology, economics, public policy, etc.

2. Student Training Grants

These funds would provide financial support directly to individuals undertaking advanced research degrees relevant to the field of P&O. Such funds would minimize the financial barrier posed by tuition and loss of income experienced when returning to school. Funds should cover tuition and provide a stipend during the time an individual is pursuing an advanced research degree. These funds should be specifically allocated to individuals pursuing research relevant to the P&O field. Funding may be made available in the form of Pre-doctoral Training Grants. A potential avenue for disbursement may be the American Academy of Orthotists and Prosthetists (AAOP), the P&O professional organization dedicated to promoting professionalism and advancing the standards of patient care through education, literature, research, advocacy and collaboration. The AAOP would be well positioned to provide oversight, assuring that the funds are used specifically to advance research and scientific goals relevant to the P&O field.

3. Career development awards for current P&O faculty

Funding should be provided to enable current P&O faculty to pursue advanced degrees. These funds could be used directly to provide sabbaticals, tuition and stipends, and indirectly to provide relief from teaching and clinical work. Current faculty members are skilled individuals who should be encouraged to obtain advanced research degrees. The K24 NIH Mid-Career Investigator Award in Patient-Oriented Research (National Institute of Child Health and Development) is an example of this type of funding mechanism that could be emulated.

4. Funding to expand the level of research education within the P&O field

Funds should be made available to institutions that currently provide entry-level P&O education to assist in improving the research curriculum of these programs. These funds would provide the resources required to train entry-level students to be better consumers of existing research and users of Evidence-Based Practice.

These funds could also be used to provide research mentors for P&O residents working on their mandatory research projects. At present, the residency research program lacks input from experienced researchers and relies on clinical preceptors to provide residents with guidance and feedback regarding their research requirement. This is less than ideal since many preceptors are experienced clinicians but not necessarily experienced investigators.

These funds could also be used to educate current practitioners to better understand research. Such resources would allow for the development and provision of continuing professional education focused on teaching current practitioners how to become more research savvy, to understand the difference between research and marketing, and to become better consumers of research. This type of course could be developed by the AAOP or by one of the current P&O educational programs.

To avoid confusion between vocational and research degrees, it is strongly recommended that P&O programs should follow the nomenclature suggested by the Council of Graduate Schools. Only academic programs should award the designations MS, MA, PhD & ScD. Advanced practice degrees (which are not the focus of this strategic plan) should award MPO and DPO designations.

Outcomes

These recommendations are expected to result in the following outcomes:

1. Creation of an environment that fosters self-sustaining research efforts and produces peer-reviewed P&O research that advances Evidence-Based Practice. There should be five P&O national scientific centers that foster the multidisciplinary, academic advancement of science relevant to P&O. This network of academic P&O centers will lead to a ten-fold increase in peer review publications with certified prosthetists and orthotists who are lead authors or co-authors.
2. A ten-fold increase in the number of P&O faculty with scientific training at the Master's and doctoral level. There are currently 42 core P&O faculty members nationally, but only 20 have full-time appointments. Only 16 of the 42 P&O faculty currently have earned graduate degrees.
3. A ten-fold increase in the number of clinical providers with improved scientific/research training and knowledge.
4. A ten-fold increase in the number of certified practitioners with the skills to accurately evaluate the literature and understand the goals and role of Evidence-Based Practice.

The overall result of advanced education and research within P&O will be higher quality, more effective health care that is of better value to society.

What is the current academic level in Prosthetics and Orthotics?

The current established pathways for P&O education and training include a minimum entry level of a baccalaureate degree, incorporating or followed by a phase of professional P&O curriculum (e.g. Post-Baccalaureate certificate) and a 12-month formalized residency program in each discipline

(prosthetics and/or orthotics). After completion of the educational and residency requirements, a student is eligible to take the national certification examination. The American Board for Certification in Orthotics and Prosthetics (ABC) is the national certifying and accrediting body for the P&O profession. The ABC program provides professional recognition to orthotists and prosthetists that meet educational and residency requirements and pass the examinations. The practitioner examinations consist of three separate modules that measure different knowledge and skill domains. Of the ten states that currently have licensure laws for the practice of P&O, each have adopted this educational pathway and successful passing of at least a portion of the ABC exam process as a means to demonstrate minimum competency to practice.

Entry-level Prosthetic & Orthotic Education

The goal of entry-level P&O education is to prepare individuals to provide clinical services and to be consumers of research. The International Society for Prosthetics and Orthotics (ISPO) recommends formal education that is equivalent to the baccalaureate degree as the minimum requirement to become an independent P&O patient care practitioner.

Although it is possible to identify many individuals providing adequate P&O clinical services without an advanced degree, this doesn't preclude the benefit of advanced degrees in elevating the profession and improving patient services. An entry-level advanced practice degree such as a Master's in P&O may not necessarily provide additional tangible, vocational skills but adds breadth and depth to the material studied and knowledge gained, imparting a deeper understanding of the profession and increasing the professionalism of those entering P&O clinical practice. A Master's level program may not be required to learn the "how?" of P&O practice, but it would enhance the equally important "why?" and therefore be a worthwhile option for some practitioners. As noted in the Introduction, the requirements for entry-level vocational education (including practice degrees) are an independent consideration that is outside the scope of this strategic plan and these recommendations.

Within the current U.S. education system, qualified entry-level (practice) programs need to meet educational standards set by the accrediting body of the profession, the National Commission on Orthotics and Prosthetics Education (NCOPE). NCOPE works in cooperation with the Commission on Accreditation of Allied Health Education Programs (CAAHEP) for primary education accreditation (Colleges/Universities). CAAHEP is the largest allied health accreditation system in the U.S., governing the educational standards of 18 allied health disciplines including P&O. The Council for Higher Education Accreditation (CHEA) recognizes both CAAHEP and NCOPE. There are currently seven institutions with active CAAHEP accredited entry-level P&O programs, as summarized in Table 1.

Institution	Type of program	Faculty	
		Full-Time	Part-Time
California State University at Dominguez Hills (Aliso Viejo, CA)	Baccalaureate Degree in P&O and Post-Baccalaureate Certificate in Prosthetics	2	4
University of Texas Southwestern (Dallas, TX)	Baccalaureate Degree in P&O	6	-
University of Washington (Seattle, WA)	Baccalaureate Degree in P&O	4	-
Century College Practitioner Program (White Bear Lake, MN)	Post-Baccalaureate Certificate in P&O and technician training	5	-
Newington Certificate Program (Newington, CT)	Post-Baccalaureate Certificates in P&O	-	8
Northwestern University (Chicago, IL)	Post-Baccalaureate Certificates in P&O	4	4
Georgia Institute of Technology (Atlanta, GA)	Master of Science in P&O	1	4

Table 1 Current active CAAHEP accredited entry-level P&O programs.

The Need for Training Scientists and Academic Leaders in Prosthetics and Orthotics

Advanced academic degrees are needed to train scientists and academic leaders in P&O. There are several primary factors contributing to this need:

1. There is limited Evidence-Based Practice within P&O stemming primarily from the small amount of high quality P&O research currently available. This affects our ability to objectively judge the efficacy and quality of patient care within P&O. Evidence-Based Practice is the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients”ⁱ. The use of an evidence-based approach in clinical practice is intended to close the gap between what is known and what is done.
2. There are few P&O faculty with advanced academic degrees currently teaching within U.S. P&O programs. This affects the academic credibility of P&O programs, limits the career development and advancement of P&O faculty, and hinders the teaching and mentoring capabilities of P&O education programs, especially with respect to advanced academic degrees. There are currently 42 P&O faculty teaching in eight entry-level P&O education programs in the U.S. Of these 50% have part-time appointments, 40% have a Master's degree, and 10% have doctoral degrees.ⁱⁱ
3. There are currently few clinically trained prosthetists or orthotists (P&Os) with advanced academic degrees such as the PhD, and many of those earned their PhD outside the U.S. Currently, only universities in Australia, Scotland and Hong Kong have developed academic doctoral degree pathways with a P&O focus. Those few P&Os who have earned higher

academic qualifications within the U.S. have done so in programs that do not necessarily have a P&O focus or provide mentoring or resources for P&O research projects. These individuals face many challenges in charting their own individual path in the pursuit of an advanced academic degree relevant to the field of P&O.

4. Contribution by P&Os to scientific investigations is limited, resulting in research that is often lacking in clinical relevance and applicability, thus limiting the transfer of knowledge into clinical practice.

Increasing the educational and scientific foundations in P&O would have many benefits for the profession and for the patients who require these services. These beneficial outcomes would include:

- Increased Research Capability: Having individuals with advanced academic degrees increases research capability within the field. This is important for P&O, as there is currently a very limited body of research evidence about P&O practices. Having P&Os more actively involved in research would help ensure that the results are clinically applicable.

There is an urgent need for outcomes research to establish Evidenced Based Practice within P&O. Evidence-Based Practice is necessary to ensure the efficacy of treatment, to improve the quality of patient care, and to provide a sound rationale to health care providers and reimbursement agencies for the provision of particular treatment and care. Increasing research capability would allow the P&O profession to increase its base of knowledge so that advancements in technology can be effectively applied to clinical practice.

- Coping with Increasing Professional Responsibility: The practice of medicine and rehabilitation has changed over the years with specialization becoming increasingly commonplace as medical knowledge continues to expand. Orthopedists, vascular surgeons, general surgeons, family physicians, pediatricians and allied health professionals are increasing their reliance on P&Os for consultation and prescription recommendations. This trend is spurred by the continuing advances in P&O technology and the proliferation of new treatment techniques that make it increasingly impossible for health professionals outside of P&O to keep current in prescription rationales for patients requiring this care. A much higher level of professional responsibility will be expected of P&Os in the future as these trends continue. The educational foundation and science of P&O must increase to parallel the clinical responsibilities of P&O practitioners.
- Establishing Legitimacy and Parity with other Allied Health Professions: It is interesting to note that other health professions, including physical therapy (PT) and occupational therapy (OT), have developed entry-level vocational practice degrees at the Master's and Doctoral level. This raises issues regarding the P&O profession's perceived legitimacy and parity with other Allied Health professions. Advanced degrees (academic, practice degrees, or both) would help in establishing parity with other allied health professions.

Increased academic standing would help focus P&O professionals on comprehensive patient care, rather than the traditional device-oriented perspective of the P&O field. The current reimbursement scheme for prosthetists and orthotists does not include services that aren't directly related to the fabrication and provision of a device (such as patient evaluation, gait

training, etc.). Consequently, the field of P&O has tended to focus on the delivery of devices more than patient services per se.

Increasing the number of P&O professionals with advanced degrees would facilitate a paradigm shift within the field, emphasizing the importance of self-directed, life-long learning and creating a culture that values advanced education and scientific research. Such a focus will lead to improved patient care within P&O and the resulting parity with other health professionals will improve the coordination of care with other disciplines.

In summary, increasing the number of individuals with advanced degrees relevant to P&O will:

- Rapidly increase the knowledge base and science of P&O;
- Contribute to the education of the profession, providing academic leaders in P&O;
- Enhance the transfer of knowledge from research to clinical practice;
- Help create a culture within P&O that values science over marketing and expects clinicians to consume and apply research;
- Contribute to research and development in the industry;
- Result in the provision of improved patient services and care;
- Increase the credibility and parity of the P&O profession within the health care realm.

The result of advanced education and research within P&O will be higher quality, more effective health care that is of better value to society.

Scope of Advanced Academic Degrees

It is critical to understand that advanced academic degrees are neither intended to replace entry-level practice degrees nor to directly address the projected shortage of P&O practitioners.ⁱⁱⁱ The provision of pathways for advanced academic education within P&O will not make the pursuit of entry-level, practice-based education more difficult. Since the focus of advanced academic degrees is to train individuals to be independent research scientists and educators, it will not create 'super clinicians' or replace the valuable role of experienced clinicians in the development of the P&O profession and the delivery of high quality patient care.

Development of pathways for advanced academic education relevant to P&O is not intended to result in the doctoral degree being the only educational qualification within P&O. In fact, only a small cadre of individuals with advanced academic degrees will be needed to create academic synergy within the P&O profession, in view of the relatively small size of the profession and the limited number of academic institutions with P&O focused programs.

Defining Academic Pathways and Degree Nomenclature

There are many different levels of advanced education and degree nomenclature is often inconsistent, leading to confusion as to the nature of a specific designation. This is of particular concern in fields with both practice and academic degrees, because the former provide vocational training while the latter focus on research training.

The Council of Graduate Schools (CGS) has attempted to define and standardize degree nomenclature.^{iv} These guidelines help to minimize confusion as to whether a degree is academic (research) or practice based. For example, the field of Education, in keeping with these guidelines, has developed well-defined nomenclature that clearly distinguishes between academic and practice degrees:

- Master of Education (MEd) is a practice degree.
- Doctor of Education (EdD) is a practice degree (generally pursued by school principals, curriculum designers, school superintendents).
- Master of Science (MS) in Education or a Master of Art (MA) in Education are academic degrees.
- Doctor of Philosophy (PhD) in Education is an academic degree.

To avoid misunderstanding, it is strongly recommended that P&O programs follow the nomenclature suggested by the Council of Graduate Schools.

There are two differing educational pathways within P&O. (Please note that some of the following pathways are not currently available within the U.S.):

1. Professional/clinically based vocational education, including entry-level practice degrees.

Examples would include:

- Non-baccalaureate education
 - w Technical training (e.g. P&O technician courses)
 - w Experiential training
- Baccalaureate degrees
- Post-Baccalaureate Certificates
- Post-Baccalaureate Master's that is a practice degree (following the CGS guidelines such a degree would be designated an MPO)
- Post-Baccalaureate Doctorate that is a practice degree (following the CGS guidelines such a degree would be designated an DPO)

2. Academic/research based degrees pursued subsequent to baccalaureate education:

- Master of Science (MS)
- Doctor of Philosophy (PhD)
- Doctor of Science (ScD)

This strategic plan is intended to increase the availability of the second type of education, advanced academic/research degrees.

Types of Research Degrees

A Master of Science (MS) is a research degree that results in thesis work that is publishable in peer-reviewed journals. It provides individuals with research training. An MS can, in and of itself, be a terminal degree or can lead to a PhD. However, not every MS degree fulfills the requirements for entry into all doctoral programs. Academic institutions differ in the requirements for entry into various degree programs.

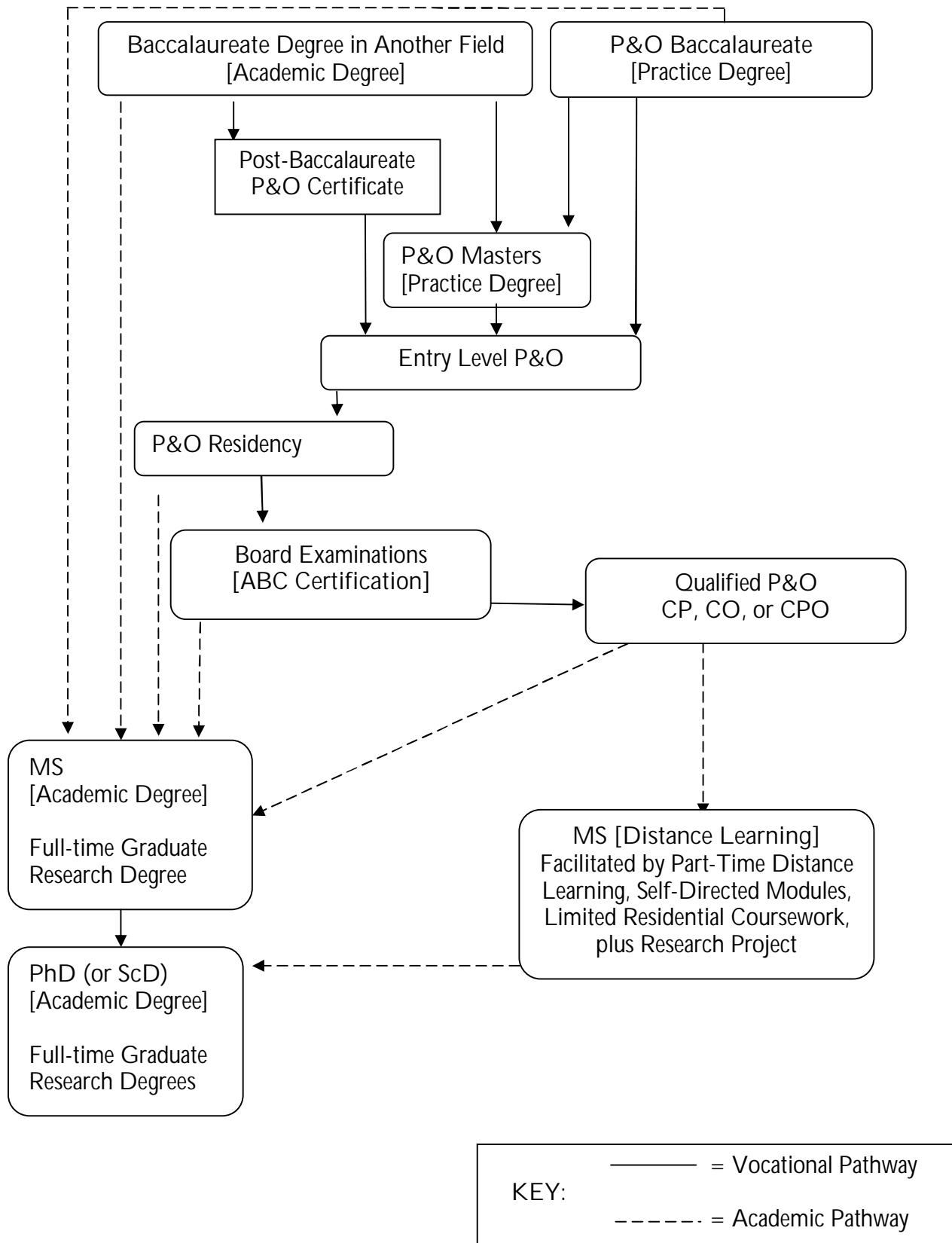
A Doctor of Philosophy (PhD) or Doctor of Science (ScD) trains individuals to become independent researchers. The ScD degree probably provides a more accurate description of advanced P&O education, but the PhD is more widely recognized. At the completion of the PhD or ScD, individuals should have demonstrated the ability to design and conduct research that is published in peer-reviewed journals appropriate to the field. These individuals may also have some experience in grant writing, leading towards the ability to seek independent funding. The role of Post-Doctoral training is for individuals to master the skills required for independent research, including grant writing.

Proposed Academic Pathways Relevant to Prosthetics & Orthotics

Two primary advanced, research-oriented educational pathways are envisioned that are or should be available to prosthetists and orthotists (Figure 1). These pathways provide opportunities for prosthetists and orthotists with various entry-level P&O degrees and varying amounts of clinical experience to pursue an advanced degree. Individuals may have a Certificate in P&O, a Baccalaureate degree in P&O or a Master's in P&O (advanced practice degree) or may be experienced clinicians with acceptable credentials.

Individuals may pursue further education either prior to completing residency and ABC certification or after, although it is believed that a year of clinical experience through residency would be beneficial prior to pursuing advanced academic degrees. Clinical experience informs the individual more fully as to the scope of the P&O profession and the contributions to be made to clinical practice by research.

Figure 1: Pathways to Graduate Training for a Prosthetist Orthotist



The flow chart in Figure 1 delineates the current and potential advanced education pathways relevant to P&O. The left hand pathway (MS/PhD degrees) are not exclusive to P&Os and are full-time research degrees (focused on P&O projects) that could be in programs for established academic disciplines such as biomechanics, biomedical engineering, neuroscience, public health, rehabilitation sciences, etc. These MS/PhD degrees include a significant research project and dissertation. This pathway is currently available in many programs in the U.S. and abroad. However, very few institutions have the capacity to mentor/advise on relevant P&O research topics.

The right hand pathway (MS degree via distance learning) applies more specifically to practicing P&Os and allows advanced study without leaving clinical practice for extended periods of time. This proposed degree would be largely coursework with a smaller emphasis on a research project. The coursework would focus on aspects of research methodology and Evidence-Based Practice. This degree could continue into the PhD pathway; however, it is more likely to be a terminal degree with the individual remaining in clinical practice with the potential to provide enhanced clinical leadership. Such an outcome would raise the level of understanding and importance of research in the P&O profession and encourage the use of Evidence-Based Practice.

Efforts should be directed at establishing advanced degree programs at existing P&O schools to facilitate the education of a small number of individuals with both practice degrees and advanced academic degrees. At some institutions this will require the design and approval of new programs. Other institutions may not require designing a new curriculum because pathways may already exist that can be identified and amended to accomplish this goal. Individuals interested in becoming independent researchers need to pursue a PhD in order to seek funding as a Principal Investigator since that is usually the minimum requirement for funding agencies.

It is recognized that there may be opportunities for hybrid degrees, which are advanced degrees (Post-Baccalaureate) that include entry-level practice and academic/research training. Such a hybrid degree would require a research project and thesis in order to fulfill the requirements of an advanced academic/research degree.

It is also recognized that there may be a need to establish opportunities for Advanced Clinical Training (ACT) that does not lead to the completion of an advanced degree. For example, it may be useful to establish pathways for clinicians or researchers who wish to educate themselves further in a sub-specialty or specific clinical topics. Both hybrid degrees and opportunities for ACT are valid educational alternatives but they do not meet the need for producing research and scientific leaders for the P&O profession.

The Optimal Environment for Advanced Academic Degrees Relevant to Prosthetics & Orthotics

The environment in which advanced P&O education takes place is an important consideration when identifying institutions with the potential to provide advanced academic degrees relevant to P&O. In particular, the advantages and disadvantages of different size institutions and whether or not they have experience providing P&O education should be considered, as should their proximity to P&O clinical services and scientific research infrastructure. P&O programs in less well-established institutions are potentially fragile since the resources and expertise needed to provide P&O education and research opportunities are limited in these settings.

The advantages of large, well-established institutions include:

- Access to research laboratories, both for the student's educational experience and for attracting quality faculty.
- Less reliance on revenue generated by the P&O program. Revenue generated by a P&O program may be more critical at a small school with fewer financial resources from which to draw.
- Increased likelihood of sustaining a critical mass of students. The credibility of an established setting helps to attract potential students.
- Infrastructure present in a large setting might include a medical school, large hospital, access to cadavers, research labs, etc.

Institutional funding will be required to facilitate the development of academic pathways. This would provide institutions with the financial resources to support advanced research degrees relevant to the field of P&O and to create an environment that fosters self-sustaining research efforts and produces peer-reviewed P&O research that advances Evidence-Based Practice. With adequate resources, a ten-fold increase in the number of peer reviewed publications with certified prosthetists and orthotists who are lead authors or co-authors can be achieved.

These institutional grants may be similar to the NIH Institutional Research Training Grants or the Department of Education RSA Training Program Special Capacity Building Grants. These funds should be available to schools that are currently providing entry-level P&O education, and therefore already have expertise in P&O education, to assist in developing or refining advanced degrees relevant to the field of P&O. These grants should encourage strong interdisciplinary links with departments/fields such as biomedical engineering, epidemiology, surgery, psychology, economics and public policy. These grants would allow programs to increase the number of P&O faculty so that there is sufficient manpower to develop advanced degree programs, as well as to continue staffing entry-level educational programs.

<p>It is recommended that Institution or Program Grants be made available to existing P&O educational programs for the development or enhancement of advanced research degrees relevant to P&O.</p>

Barriers to Advanced Academic Degrees

There are multiple barriers to the pursuit of advanced academic degrees. Primary obstacles include the limited availability and lack of awareness of educational pathways within which individuals may pursue advanced academic degrees relevant to P&O. The significant financial burdens incurred pursuing post-graduate studies are also impediments. Obtaining advanced education requires a substantial commitment of time, financial and personal resources.

In addition, there are practical prerequisites (such as clinical experience) and educational prerequisites that must be met for acceptance into a graduate program. There may also be difficulties in identifying a qualified academic advisor with an interest in P&O and with expertise in the research topic selected.

There are currently very few clinically trained P&Os who have earned advanced academic degrees such as the PhD. Pursuing advanced education poses financial challenges given the current cost of

tuition, re-location expenses where they are incurred, and loss of income if coming from clinical practice.

It is quite difficult for current P&O practitioners to take substantial time away from clinical practice to pursue further studies.

Financial assistance in the form of fellowships and student training grants would provide the necessary resources for individuals to pursue advanced academic degrees. Such fellowships would assist students with the cost of tuition, re-location expenses and living costs. These funds should be specifically allocated to train individuals to pursue research relevant to the P&O field. Funding may be made available in the form of Pre-doctoral Training Grants. A potential avenue for disbursement may be the American Academy of Orthotists and Prosthetists (AAOP), the P&O professional organization dedicated to promoting professionalism and advancing the standards of patient care through education, literature, research, advocacy and collaboration. The AAOP would be well positioned to provide oversight, assuring that the funds are used specifically to advance research and scientific goals relevant to the P&O field.

It is recommended that Student Training Grants be made available to individuals undertaking advanced research degrees relevant to the field of P&O.

There are few P&O faculty with advanced academic degrees currently teaching within U.S. P&O programs. This affects the academic credibility of P&O programs, limits the career development and advancement of P&O faculty, and hinders the teaching and mentoring capabilities of P&O education programs, especially with respect to advanced academic degrees. Current P&O faculty are skilled individuals who should be encouraged to obtain advanced research degrees. Although pursuit of advanced academic degrees by current P&O faculty would improve the overall academic standing of P&O, the existing teaching commitments of current faculty make this exceedingly difficult.

Funding is required to facilitate advanced education for current P&O faculty. These funds could be used directly to provide sabbaticals, tuition and stipends, and indirectly to provide relief from teaching and clinical responsibilities. The K24 NIH Mid-Career Investigator Award in Patient-Oriented Research (National Institute of Child Health and Development) is an example of this type of funding mechanism. With adequate resources, a ten-fold increase in the number of P&O faculty with scientific/research training at the Master's and Doctoral level could be achieved.

It is recommended that Career Development Awards be made available to P&O faculty undertaking advanced research degrees relevant to the field of P&O.

Bridging the Divide between the Research Laboratory and the Clinic

Contribution to P&O research by clinicians is limited, resulting in research that is often lacking in clinical relevance and applicability, and this limits the transfer of knowledge into clinical practice. There is limited Evidence-Based Practice within P&O stemming primarily from the small amount of high quality P&O research currently available. This affects our ability to judge the efficacy and quality of patient care within P&O.

Having individuals within P&O with advanced academic degrees would help create a culture within the profession that values science over marketing and expects clinicians to consume and apply research. Increasing the level of research exposure within the P&O field would encourage P&Os to pursue advanced academic degrees. To achieve this result, the divide between the research laboratory and the clinic must be bridged. This could be done by:

- Providing opportunities for entry-level students to gain hands-on research experience in research laboratories.
- Providing P&O residents with internships within research centers.
- Providing mentors to guide residents and practitioners with an interest in research.
- Developing mechanisms that enable practitioners with three to ten years clinical experience (i.e. post-professionals) to become involved in research projects.
- Developing mechanisms to involve rehabilitation researchers in P&O programs.

There are currently few mechanisms for communicating research questions developed by clinicians to investigators who carry out the research. Clinicians are good at identifying problems in the field that may lead to good research projects, but how do they get their ideas to investigators in the field? Where do clinicians' ideas for research projects need to be directed? How can effective and mutually satisfying collaborations be created between researchers and clinicians? It is important that P&O clinicians play a role in identifying the project, planning the protocol, interpreting the data, and preparing presentations and publications, and not simply supplying the devices for the research study. There needs to be an established mechanism that brings prosthetists and orthotists together with investigators to identify and work on clinical challenges.

It is necessary to identify research centers around the U.S. that would allow P&O residents and practitioners to participate in research projects. While there is a need for more applied research in P&O, there are few P&O research centers currently in existence. This limits the number of residents and clinicians that may potentially be exposed directly to research and researchers. There are a number of other issues such as funding—who pays the stipend, materials, and laboratory costs involved in a research internship?

At a minimum, there should be a three month stipend for living expenses incurred by the resident or practitioner while away from clinical practice. Having some funding might address the issue of how to encourage practitioners who are interested in participating in research but have limited time and resources. It is possible that pilot data from the resident or practitioner's work could be used to generate proposals for broader research, hence being of value to the research center as well. The reverse is also necessary: identifying clinical centers that would accommodate researchers and enable them to obtain clinical experience in P&O. Stipends for living expenses would facilitate this aspect of researcher training.

The advantage of educating and exposing students, residents and experienced clinicians to P&O research is that such mechanisms could be used to identify those individuals interested in pursuing advanced academic degrees. Exposure to research would also provide clinicians who remain in clinical practice with the skills and confidence to collaborate in research with both P&O researchers and individuals from other disciplines. This process would enhance the transfer of clinical questions to researchers, and knowledge from research to clinical practice. Collaborating with rehabilitation researchers and involving them in P&O programs would improve the quality and clinical applicability of P&O research, by providing a deeper understanding of clinical realities.

There is a hierarchy of research tasks that range in complexity and depth. Ranking these tasks may facilitate the involvement of individuals in research at various levels depending on their skill set:

- Literature review
- Evidence based literature review (take a clinical question and answer it with the existing literature)
- Single case research design
- Analysis of a series of articles (Meta-analysis)
- Research based on existing database
- Research based on physical measurements

It is important to make funds available to institutions that currently provide entry-level P&O education to assist in improving the research content of entry-level programs. These funds would provide the resources required to expand the level of research exposure of entry-level students, to train them to be better consumers of existing research and to use Evidence-Based Practice.

At present, P&O residents are required by NCOPE to complete a research project as part of their residency. However, the residency research program lacks input from experienced researchers and relies on clinical preceptors to provide residents with guidance and feedback regarding their research requirement. This is less than ideal since many preceptors are experienced clinicians but not necessarily experienced investigators. If funds were available, they could be used by P&O education programs to provide research mentors for P&O residents out in the community working on their residency research project.

Funds could also be used to educate current practitioners to better understand research. Such resources would allow the development and provision of a continuing professional education course to teach current practitioners how to become more research savvy, to understand the difference between research and marketing, and to become better consumers of research. It could provide basic research skills such as critiquing the research literature, understanding Evidence-Based Practice, and translating research findings into clinical practice.

This type of course could be developed by the AAOP or by one of the current P&O educational programs. Such a course might be similar to the existing AAOP Certificate of Professional Development programs, which do not currently cover research topics. These are two-to-four-day courses that teach new skills to certified practitioners.

With adequate resources, a ten fold increase in the number of clinical providers with improved scientific/research training and knowledge and in the number of certified practitioners with the skills to accurately evaluate the literature and understand the goals and role of Evidence-Based Practice should be achieved.

<p>It is recommended that funds be made available to expand the level of research exposure within the P&O field at all levels by improving the research content of entry-level P&O education programs, providing research mentors to P&O residents, creating research internships for residents and clinicians to participate in P&O research projects at existing research centers, and providing continuing professional education aimed specifically at improving the research education of P&O practitioners.</p>

Summary

The Advanced Education & Research Training Initiative [AERTI] is a strategic plan to foster advanced scientific and research education in P&O and to build the academic and scientific research capacity of the profession. The following key recommendations are the cornerstones of this initiative:

1. Institution or Program Grants should be made available to existing P&O educational programs for the development or enhancement of advanced research degrees relevant to P&O.
2. Student Training Grants should be made available to individuals undertaking advanced research degrees relevant to P&O.
3. Career Development Awards should be made available to enable current P&O faculty to pursue advanced research degrees.
4. Research Education Funds should be made available to improve the level of research education for entry-level clinicians, residency students, and experienced P&O practitioners.

Implementation of these recommendations will result in:

- Creation of an environment that fosters self-sustaining research efforts and produces peer-reviewed P&O research that advances Evidence-Based Practice.
- A ten-fold increase in the number of P&O faculty with scientific training at the Master of Science and PhD level.
- A ten-fold increase in the number of clinical providers with improved scientific/research training and knowledge.
- A ten-fold increase in the number of certified practitioners with the skills to accurately evaluate the literature and understand the goals and role of Evidence-Based Practice.

Fostering advanced education and research within the field of Prosthetics and Orthotics is an important undertaking because the infrastructure that this initiative creates will lead to higher quality, more effective health care that is of better value to society.

Appendices

- I. List of Attendees
- II. Speaker Topics and Biographies

Footnotes

ⁱ David L. Sackett, William M. C. Rosenberg, J. A. Muir Gray, R. Brian Haynes, and W. Scott Richardson (1996) "Evidence based medicine: what it is and what it isn't," *BMJ* 312: 71-2

ⁱⁱ Mark L. Edwards, "A Web-Based Assessment for the Need to Develop Graduate Degree Programs in Prosthetics and Orthotics." M.S. thesis, Graduate College of the University of Illinois, Chicago, 2003

ⁱⁱⁱ Caroline C. Nielsen, "Issues Affecting the Future demand for Orthotists and Prosthetists: Update 2002", National Commission on Orthotic and Prosthetic Education, May 2002

^{iv} The Council of Graduate Schools in the United States. "The Master's Degree Program, a Policy Statement". Washington, D.C.: CGS, April 1981.