

## Education Research in Physical Therapy: Visions of the Possible

Gail M. Jensen, Terrence Nordstrom, Richard L. Segal, Christine McCallum, Cecilia Graham, Bruce Greenfield

G.M. Jensen, PT, PhD, FAPTA, Department of Physical Therapy, School of Pharmacy and Health Professions, Creighton University, 2500 California Plaza, Omaha, NE 68178 (USA). Address all correspondence to Dr Jensen at: [gailjensen@creighton.edu](mailto:gailjensen@creighton.edu).

T. Nordstrom, PT, EdD, FAPTA, Department of Physical Therapy, Samuel Merritt University, Oakland, California.

R.L. Segal, PT, PhD, FAPTA, Department of Health Professions, Medical University of South Carolina, Charleston, South Carolina.

C. McCallum, PT, PhD, Physical Therapy Program, Division of Health Sciences, Walsh University, North Canton, Ohio.

C. Graham, PT, PhD, Department of Physical Therapy, University of Alabama at Birmingham, Birmingham, Alabama.

B. Greenfield, PT, PhD, Department of Rehabilitation Medicine, Emory University, Atlanta, Georgia.

[Jensen GM, Nordstrom T, Segal RL, et al. Education research in physical therapy: visions of the possible. *Phys Ther*. 2016;96:1874–1884.]

© 2016 American Physical Therapy Association

Published Ahead of Print:  
June 16, 2016  
Accepted: June 12, 2016  
Submitted: March 5, 2016

Education research has been labeled the “hardest science” of all, given the challenges of teaching and learning in an environment encompassing a mixture of social interactions, events, and problems coupled with a persistent belief that education depends more on common sense than on disciplined knowledge and skill. The American Educational Research Association specifies that education research—as a scientific field of study—examines teaching and learning processes that shape educational outcomes across settings and that a learning process takes place throughout a person’s life. The complexity of learning and learning environments requires not only a diverse array of research methods but also a community of education researchers committed to exploring critical questions in the education of physical therapists. Although basic science research and clinical research in physical therapy have continued to expand through growth in the numbers of funded physical therapist researchers, the profession still lacks a robust and vibrant community of education researchers. In this perspective article, the American Council of Academic Physical Therapy Task Force on Education Research proposes a compelling rationale for building a much-needed foundation for education research in physical therapy, including a set of recommendations for immediate action.



Post a Rapid Response to  
this article at:  
[ptjournal.apta.org](http://ptjournal.apta.org)

Although growth in basic science and clinical research as well as knowledge creation in the profession of physical therapy is ongoing, the development of robust growth in education research appears to be more challenging. In her final editorial, Craik expounds on the continued growth of research and evidence in the profession, as seen over the last 10 years in *Physical Therapy*:

PTJ's research reports, perspectives, and other published papers suggest an exponential growth in evidence, with a push by collaborative teams that are conducting research to help define best practice, identify underlying mechanisms, and highlight the utility of tracking meaningful outcome measures.<sup>1(p1603)</sup>

In contrast, consider a 2015 editorial in the *Journal of Physical Therapy Education*:

The editors of *JOPT* and our colleagues contributing to this editorial believe that the quantity and quality of education research produced in physical therapy is not at the level needed to face the upcoming complexities of higher education and practice.<sup>2(p3)</sup>

Similarly, leaders in medical education continue to argue for increased emphasis and funding for education research.<sup>3,4</sup> Cooke<sup>4</sup> asserts that given how much is spent on medical education, particularly graduate medical education, it is striking how little is invested in research to generate theories and provide evidence about what works and what does not work. Furthermore, she claims that if one-tenth of 1% of the \$15 billion that is spent annually for residency education were spent on medical education research, the result would be annual funding of \$20 million.<sup>4</sup>

We believe that there is an urgent need to engage in a discerning dialogue about how to best promote education research in the profession. The purpose of this perspective article is to provide the profession with a compelling rationale for facilitating education research in physical therapy and the intentional development of a community of education researchers for the profession. The pur-

pose encompasses 4 components: (1) a summary of historical education research in the profession, (2) shared challenges in education research, (3) models and infrastructures for education research, and (4) recommendations for the development of a robust education research program for the profession.

## Education Research: The Past

Physical therapy has a long tradition and commitment to enhancing the quality of professional education for physical therapists through understanding and application of educational practices, frameworks, and structures, as reflected in several McMillan Lectures.<sup>5-11</sup> Some of the earliest funded work in education (1955-1967) was a series of educational institutes for physical therapy teachers.<sup>11</sup> These institutes led to the 1967 *Handbook for Physical Therapy Teachers*,<sup>12</sup> a compilation of contemporary materials based on the latest educational theory and pedagogical concepts.

Throughout the growth and evolution of educational programs, physical therapist educational faculty continued to focus on the basic educational structures for program development, such as articles focused on curriculum, faculty development activities, and the setting of educational standards.<sup>13</sup> Perhaps the largest and most well-known education research in the profession was the study of physical therapist education done in the late 1960s by Catherine Worthingham.<sup>14-19</sup> This multiphase, federally funded investigation studied trends in physical therapy patient care, entry-level education, the clinical environment, requests for prescription or referral, graduate outcomes, and a final analysis that placed the findings in a broader context of patient care and the health care system. In 1970, Worthingham<sup>19</sup> argued for an expanded examination of the profession, a stronger focus on what society needed from the profession, a better connection between academic and clinical components of the program, and more team collaboration.

The creation of the *Journal of Physical Therapy Education* in 1987 by the Education Section of the American Physical

Therapy Association (APTA) represents a milestone in the development and maturation of the educational community.<sup>20</sup> In a 2003 article, Domholdt et al<sup>13</sup> analyzed the contributions to the *Journal of Physical Therapy Education* across its first 16 years. Nearly 63% of the published articles were classified as research, descriptive research was the most common type, the most frequent research sample was program students, and fewer than 15% of the research articles had a research sample across multiple programs. Although there is evidence of the growth of education research contributions in physical therapy since that 2003 article, published studies often focused on problems or activities within one program or were products of graduate education dissertation research.<sup>21</sup> In her McMillan Lecture, Jensen described the need to develop education research through the use of creative, collaborative approaches:

We have a very difficult time seeing the need for and value and power of aggregate data in educational research for the profession. Here we need to learn from our colleagues engaged in clinical and basic science research. Although it is very difficult to find funding for educational research, it also does not require large sums of money. But it does take will, collaboration, careful planning, and persistence.<sup>21(p1687)</sup>

Since 1993, the profession has engaged in several initiatives aimed at generating a clinical research agenda as a way to communicate to a broader community of stakeholders the important areas of research in the profession.<sup>22,23</sup> The Revised Research Agenda for Physical Therapy<sup>23</sup> broadened the agenda beyond clinical research to include the category "education/professional development." The questions posed in the 2011 agenda are broad in scope and are largely focused on professional development (Fig. 1).

In 2006, the APTA Board of Directors approved education research questions in ranked priority order.<sup>24</sup> That document contained 134 questions that resulted from a 2003 APTA consensus conference and subsequent surveys. Although that list was certainly broad, it

---

## Education Research in Physical Therapy

---

1. Evaluate the effect of physical therapist postprofessional specialty training on clinical decision making and patient/client outcomes.
2. Determine the best methods to foster career development and leadership in physical therapy.
3. Determine the optimal criteria for board certification.
4. Evaluate the effect of clinical education models on clinical outcomes, passing rates on the National Physical Therapy Examination, and employment settings after graduation.
5. Determine the impact of professional-level physical therapist education on professional behaviors.
6. Assess the effectiveness of models of professional education on clinical performance.
7. Determine the relationship between student cultural competency and clinical decision making.
8. Evaluate the effectiveness of different methods used to improve cultural competence.
9. Develop and evaluate the most effective methods for facilitating physical therapist acquisition and use of available information resources for evidence-based practice.
10. Evaluate the skills needed by practitioners to provide optimal patient/client care, patient/client advocacy, and cost-effective care.

### Figure 1.

Education/professional development items from the 2011 Research Agenda for Physical Therapy.<sup>23</sup>

---

did not appear to have resulted in an intentional, shared research agenda for education researchers in physical therapy.

In a 2015 editorial, Gwyer and Hack<sup>25</sup> issued challenges to education researchers and to APTA education components to develop a robust research agenda focused on preparation for practice, the educational enterprise, and research endeavors for the profession. In a subsequent editorial, Gwyer et al<sup>2</sup> suggested that, although the generation of a research agenda is an important element for promoting education research in the profession, more attention must be paid to the changes confronted by education researchers in the complex interface between education and practice.

Similarly, education researchers are confronted with the nature of the teaching and learning environment. The most recent definition of education research from the American Educational Research Association demonstrates the centrality of learning and understanding the learning process in all of its complexity:

Education research is the scientific field of study that examines education and learning processes and the human attributes, interactions, organizations, and institutions that shape educational outcomes. Scholarship in the field seeks to describe, understand, and explain how learning takes place throughout a person's life and how formal and informal contexts of education affect all forms of learning.<sup>26</sup>

Leaders in the education research community currently are emphasizing both rigor and realism through efforts to link research and practice and to start with the urgent problems confronting education in the learning environment.<sup>27-32</sup> These problems should be addressed by investigations emerging from sustained research and practice partnerships that have strong financial, professional, and institutional support.<sup>33,34</sup>

### Challenges for Developing Physical Therapist Education Research

The development of robust physical therapist education research involves a myr-

riad of overlapping issues and challenges (Table). We suggest that these challenges can be categorized into 4 broad domains: (1) conceptual framing of education research in physical therapy, (2) community of education researchers, (3) data analysis, and (4) funding and infrastructure for education research.

### Conceptual Framing of Education Research in Physical Therapy

We believe that understanding the contextual nature of professional and postprofessional education and the importance of the interrelationships between teaching and learning across the continuum from student to practitioner requires strong conceptual framing of education research in physical therapy. Wartman<sup>35</sup> argued that weak development of the theory and science that underlie medical education was the most important barrier to making progress in education research. The same may be true for education research in physical therapy.

Although good research in physical therapist education is being produced, much of it is idiosyncratic, consisting of case studies and descriptive studies limited to a single institution or program.<sup>13,21,36</sup> What is lacking in this research is a strong theoretical grounding in education research that provides a foundation in theoretical concepts that transcend physical therapy and are shared more broadly. Education itself is not a discipline but a field of study, and the use and application of theories from other disciplines can provide insight and meaning.<sup>29</sup> For example, learning theories from cognitive and developmental psychology are extremely helpful in understanding critical teaching and learning issues in the development of clinical reasoning skills.<sup>37,38</sup> Theories should not be used simply as justification for what people are doing but should be used as a source of testable hypotheses.<sup>39</sup>

Education researchers in physical therapy and the health professions in general do not have a shared understanding of the key domains and theoretical context of teaching, learning, evaluation of performance, and outcomes. Thus, those domains, which serve as the program-

**Table.**  
Building Capacity for Education Research in Physical Therapy: Challenges, Aspirations and Recommendations<sup>a</sup>

Topic	Challenges	Aspirational Goals	Recommendations
Conceptual framing of education research in physical therapy	<p>Current education research in physical therapy is predominantly single-site studies that often lack strong theoretical grounding</p> <p>Lack of a shared understanding of the key domains and theoretical context of teaching, learning, evaluation of performance, and outcomes that can ground programmatic lines of education research</p> <p>Lack of uniform standards for learner progression and performance outcomes, which now contributes to variations in quality across education programs</p>	<p>Develop deeper and broader understanding of the theoretical underpinnings of teaching, learning, and outcomes</p> <p>Develop longitudinal examination of the development of professional competence and learner performance linked to practice expectations across a career</p> <p>Raise the level of quality of education research and develop larger, well-designed studies</p>	<p>Develop a robust, longitudinal set of professional competencies</p> <p>Identify key education research questions as part of this effort</p> <p>Develop for the profession a national, shared agenda that is conceptually grounded in key domains</p>
Education researchers	<p>Variations in doctoral preparation as education researchers</p> <p>Insufficient number and quality of educators engaged in education research</p> <p>Lack of a career ladder for education researchers</p> <p>Lack of intentional mentoring</p>	<p>Opportunities for mentoring and a career path for education researchers</p> <p>Create a robust community of scholars/education researchers who can collaborate on important, complex research questions</p>	<p>Convene a task force to examine different models across health professions and make recommendations</p> <p>Work with the ACAPT and APTA's Education Section to develop structures for career ladders</p> <p>Implement a mentoring support system and create models similar to those used in clinical research</p>
Academic analytics/"big data"	<p>Lack of unified data sets that represent key metrics for the profession</p>	<p>Develop a standard database for the profession</p> <p>Develop for the profession a unified public image similar to those for other health professions (eg, medicine and dentistry)</p>	<p>Establish a work plan for identifying and implementing key academic metrics</p> <p>The ACAPT and APTA should jointly sponsor the development and maintenance of a data warehouse</p>
Funding/infrastructure	<p>Lack of funding for education research</p> <p>Lack of funds for training education researchers</p>	<p>Develop sources of funding for education research</p> <p>Establish funding to support the development of education researchers</p>	<p>Convene a group of key stakeholders (eg, ACAPT, APTA's Education Section and Research Section, and Foundation for Physical Therapy) to develop a strategy for funding</p> <p>The Foundation for Physical Therapy should identify strategies that could be implemented to develop education researchers and support education research</p> <p>Plan and implement a conference similar to Gordon Research Conferences for education researchers in the profession</p>

<sup>a</sup> ACAPT=American Council of Academic Physical Therapy, APTA=American Physical Therapy Association.

matic lines of education research, are not well supported by a deep understanding of theory among the community of education researchers; this situation makes advancement of understanding of the education of physical therapists difficult.

As external stakeholders (ie, federal and state funders, accreditors, and the pub-

lic) raise the bar for what is expected from universities in terms of graduate outcomes, what should follow are research agendas that address consensus-based educational outcomes and learners' progression to those outcomes. Through specialized accreditation, physical therapist education programs are required to identify outcomes expected

from their programs and their graduates.<sup>40</sup> However, those expected outcomes vary across programs because there are no uniform or consistent guidelines for how to set those expected outcomes, nor have widely accepted outcomes been adopted in the professional education community. A recent study identified some "unspoken consensus"

1. Gather a history and perform a physical examination
2. Prioritize a differential diagnosis following a clinical encounter
3. Recommend and interpret common diagnostic and screening tests
4. Enter and discuss orders and prescriptions
5. Document a clinical encounter in the patient record
6. Provide an oral presentation of a clinical encounter
7. Form clinical questions and retrieve evidence to advance patient care
8. Give or receive a patient handover to transition care responsibility
9. Collaborate as a member of an interprofessional team
10. Recognize a patient requiring urgent or emergent care and initiate evaluation and management
11. Obtain informed consent for tests and/or procedures
12. Perform general procedures of a physician
13. Identify system failures and contribute to a culture of safety and improvement

### Figure 2.

Behaviors expected in entrustable professional activities for entering residency.<sup>42</sup>

---

on commonalities across program outcomes among physical therapist education programs.<sup>41</sup>

The outcomes of medical education are receiving much attention from the Association of American Medical Colleges (AAMC). The AAMC developed a longitudinal framework identifying 13 “entrustable” professional activities (EPAs) that all residents should be expected to perform, without supervision, at day 1 of the residency (Fig. 2). These EPAs are units of work and must be observable performance activities. A learner’s performance of these EPAs is linked to the larger domains of competence and abilities of the learner, which include patient care, knowledge for practice, interpersonal and communication skills, professionalism, practice-based learning and improvement, system-based practice, and personal and professional development.<sup>42,43</sup>

Another component of structuring a learner continuum in medical education is the identification of performance levels (milestones) for given competencies in residency programs.<sup>44,45</sup> The study of residency education in physical therapy

by Furze et al<sup>46</sup> provided additional details on how the AAMC work may apply to physical therapy. Currently, 10 institutions are engaged in a 5-year pilot education research project examining the implementation of EPAs in medical education.<sup>47</sup> This intensive effort to design outcomes for learners in medical education is grounded in a seamless continuum of education, clinical training, and practice that results in a focused agenda for education research.<sup>45,48</sup>

In addition to learner outcomes, the AAMC has worked with admissions and student affairs experts in medical education to identify 15 core competencies that entering medical students should possess. The core domains of these competencies include interpersonal competencies, intrapersonal competencies, thinking and reasoning competencies, and science competencies.<sup>49</sup>

Educators must have a comprehensive and deep understanding of learning and performance in the act of practice that forms the basis for the outcomes of professional education.<sup>42-45</sup> The development of consensus-based expected outcomes that drive stan-

dards and guidelines for educational practice and research could provide an important structure for education research throughout health professions education.<sup>43,46,50</sup>

Translating the outcomes of professional and postprofessional education to patient outcomes is an even greater challenge, but doing so is important nonetheless, as Collins<sup>51</sup> argued regarding medical education. The physical therapy profession is beginning to explore the link between postprofessional education and patient outcomes. The first published study to address the impact of residency or fellowship training on patient outcomes found differences in patient outcomes between therapists who had undergone fellowship training and those who had undergone residency training or did not have any postprofessional education.<sup>52</sup> These professionally driven outcomes could be the guiding force behind collaborative research agendas.

### Community of Education Researchers

Education researchers in physical therapy are also challenged by quantity and support for research at individual and institutional levels. High-quality education research requires researchers who possess the knowledge and skills to develop effective collaborative processes for performing the type of large-scale studies that can influence education practice. However, because of limited numbers of postdoctorally trained education researchers in the profession, a lack of structured mentorship programs for education researchers, and limited training funds, the profession is deficient in the development of leaders in education research. A reason may be the great variation across US doctoral programs in education.<sup>53</sup> The strongest graduate schools of education that offer doctor of philosophy programs are those with a diverse faculty, combining scholarship with strong theoretical grounding in education and the social sciences.<sup>53,54</sup>

The scholarly work of education researchers must be recognized in the promotion and tenure guidelines at every higher-education institution housing a professional education program in

physical therapy, regardless of the type of institution in which the physical therapist education program is located. An emphasis on external grant funding in promotion and tenure guidelines at top-tier research universities presents a challenge at those institutions. With few leading education researchers, shifting promotion guidelines at those universities may be difficult. Although such pressure on funding is less likely to exist at other institutions at which physical therapist education programs are located, such institutions likely need to address the shortage of faculty, hiring guidelines that could result in more faculty whose doctoral preparation is the doctor of physical therapy degree, and the relatively smaller number of full-time faculty in the program.

In addition to the aforementioned problems, the paucity of experienced education researchers in the profession leads to difficulty in establishing mentoring relationships for aspiring education researchers and difficulty in connecting with peers across multiple institutions. This challenge is more difficult with regard to study of the teaching and learning that occurs in practice.<sup>21,36,38</sup> Portney<sup>36</sup> lamented the shortage of qualified faculty in physical therapist education and questioned the time that young faculty members have for teaching and research. She suggested the need for balance in teaching and research for aggregate core faculty members, particularly those who pursue the scholarship of teaching and learning.

The leaders of all programs must be prepared to mentor and support education researchers, including connecting them with the broader community of education researchers in the profession and across health professions within the institution as well as advocating for meaningful standards for promotion, tenure, and hiring.

### Data Analysis

A major challenge confronted by education researchers is the availability of large data sets providing meaningful data for large-scale studies and hypothesis generation. Jensen<sup>21</sup> and Portney<sup>36</sup> both mentioned the need to develop mechanisms

that generate research that is more data driven, uses shared methods across multiple sites (allowing for an aggregate data set), and involves larger samples. However, to accomplish this goal, a theory or model of education research from the viewpoint of the physical therapy profession, along with consistent methodologies, needs to be developed. Without such a model, educational data may be disparate, scattered, and largely disconnected, making the creation of large and homogeneous data sets from which to draw inferences difficult.

The Commission on Accreditation in Physical Therapy Education collects and reports program and faculty demographic data annually.<sup>55</sup> The American Council of Academic Physical Therapy (ACAPT) and its research-intensive physical therapist consortium are developing databases for use in comparisons and as benchmarks aimed at promoting excellence in physical therapist education. Although each effort may result in helpful data, neither is sufficient to create data sets that would support education research. Learning analytics that use data from learning management systems are emerging as a potential source of data that can inform education research, but the utility of the data is under debate.<sup>56</sup>

### Funding and Infrastructure for Education Research

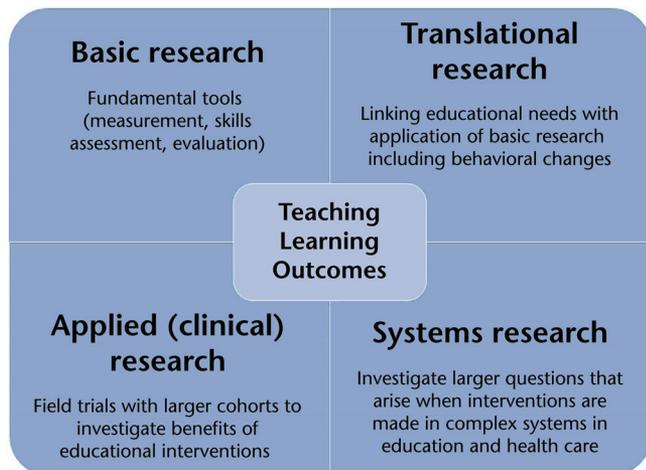
In her Mary McMillan Lecture, Snyder-Mackler<sup>57</sup> argued that regardless of how well a physical therapist researcher is trained, she will not be successful in developing a funded research agenda if she lacks the infrastructure and institutional support to carry on research. The lack of funding and infrastructure to support education research is a challenge throughout education and the health professions<sup>58</sup>—within institutions, within each of the health professions, and across all of the health professions. The lack of funding places education researchers at a distinct disadvantage compared with colleagues who seek funding in the sciences. Much of the education research that is being done is supported by faculty voluntary time and resources. In most programs, there is no centralized force to build and sustain a physical therapist education research

enterprise; this situation creates challenges for people who want to develop collaborative education research agendas that respond to professional needs. Regardless of whether supported within a single institution, throughout a profession, or on a national basis, financial support for education research is critical.

### Successful Models and Infrastructure for Education Research

We believe that examination of models and infrastructures that have been proposed or used within institutions, professions, or nationally is instructive for framing potential recommendations to address challenges in the physical therapy profession. Wartman<sup>35</sup> argued that health professions education lacks the solid research and development needed to create the infrastructure and support systems necessary for the full scientific advance of the field. Wartman<sup>35</sup> and Wartman and O'Sullivan<sup>58</sup> proposed a national center for health professions education research. The proposed center would be interprofessional in nature and encompass the education of all health professionals, a critical factor given the importance of reaching the "triple aims" (ie, improving quality of care, improving health of populations, and decreasing costs through efficiency) in health care.<sup>59</sup> These authors proposed 4 research divisions organized from a "bench-to-bedside" approach: basic research, translational research, applied research, and systems research. This type of framework would follow best science practices and could be modeled on the features of the National Institutes of Health and housed within the National Institutes of Health or as an independent agency within the Public Health Service. Such a model would help education researchers envision areas of research that extend beyond the local problems in one program or setting (Fig. 3) to a more comprehensive, systems approach.

Like Cooke,<sup>4</sup> Wartman<sup>35</sup> suggested that 0.5% to 1.0% of the funds from current federal expenditures on health education would be sufficient to fund the center. Although the concept and proposed structure for a national center for health professions education research received



**Figure 3.** Framework for a bench-to-bedside approach to education research for the health professions.<sup>35</sup> Adapted from Wartman SA. Revisiting the idea of a national center for health professions education research. *Acad Med.* 2004;79:910–917.<sup>35</sup>

attention in medical education as a result of the 1989 (Wartman and O’Sullivan<sup>58</sup>) and 2004 (Wartman<sup>35</sup>) articles, there has been no progress at the federal level. The challenge is whether the health professions education community would advocate for such a center as a high priority and whether the various members of that broad community could create a united voice for the required advocacy effort.

The continued challenge is how to ensure that interprofessional education and education research efforts are egalitarian across health professions and not heavily leveraged toward medicine and nursing. The physical therapist education community will need to decide what role it would play in any such effort, including a leadership role, or to what extent the model of a national center could be applied within the profession.

Founded in 2012, the Global Forum on Innovation in Health Professional Education is an ongoing activity of the National Academies of Sciences, Engineering, and Medicine, with 46 sponsoring members representing 18 disciplines from 9 countries—including the AAMC, American Academy of Nursing, and ACAPT. The Global Forum highlights issues confronting health professions education; for example, in a recently published report,<sup>59</sup> the Global Forum stressed the importance of interprofessional collabor-

ative research for strengthening evidence in interprofessional education and collaborative practice. This group and the network connections established among its members could become an important avenue for supporting health professions education research in the United States and globally.<sup>59</sup>

Although Wartman’s aspirational proposal for a national center provided a future vision for such a community of practice,<sup>58</sup> there are current models that support education research in the health professions. An examination of those models provides a basis for determining the future direction for education research within the profession and interprofessionally. Teaching academies are one model that can provide a pathway to educational innovation while supporting education research within a particular institution.<sup>35,60</sup> Irby et al<sup>61</sup> described the teaching academy at the University of California, San Francisco, School of Medicine. The university’s investment has resulted in a teaching scholars program, an office of education research and development, an academy of medical educators, a fellowship in medical education, visible leadership for education research, an explicit focus on collaborative research between clinicians and faculty education researchers, and aggressive pursuit of extramural funding for

education research from foundations and governmental agencies.

Faculty development is a critical aspect of supporting education research as faculty members enter a new community of “like-minded people who share a passion for teaching.”<sup>60(p421)</sup> O’Sullivan and Irby<sup>60</sup> argued that such faculty development programs provide faculty members with the opportunity to create a sense of community or “teaching commons,” not only to advance the faculty members’ abilities as teachers and scholars but also to advocate for the importance of the teaching mission, to address the need for education research that advances that mission, and to strengthen the relationship among critical communities of practice—the classroom, laboratory, and clinic—where teaching and learning occur in the context of practice. Other emerging models suggest possibilities for supporting education research across institutions. The AAMC sponsors the Medical Education Research Certificate program, which prepares education researchers to participate in education research as a member of a collaborative team and to be informed consumers of medical education research.<sup>62</sup>

## Recommendations for the Physical Therapy Profession

We have highlighted both shared challenges for education researchers across fields and specific challenges for physical therapy. We now examine how these challenges also provide opportunities for continued work, aspirational goals, and possible actions (Table). We propose the following recommendations for education research in physical therapy.

### Recommendation 1: Develop Conceptual Framing and a Vision for Physical Therapist Education Research

A deep and broadly held understanding of the theoretical underpinnings of teaching, learning, and the outcomes of professional and postprofessional education must be achieved by all stakeholders. For example, learning theories from cognitive science and psychology can be a rich resource for education research in physical therapy.<sup>21,37,38,63</sup> These theoretical underpinnings should frame the crit-

ical task facing the profession, which is to develop a robust, longitudinal set of learner performance-based outcomes that span the continuum of professional education through the postprofessional level.

The AAMC's approach of engaging in intentional pilot work with selected institutions that are implementing EPAs provides an opportunity to move this important work forward while studying the implementation, developing assessment tools, and providing evidence for the next steps of implementation.<sup>47</sup> This kind of model is something that could be developed and implemented in physical therapy professional education. The AAMC work in developing a pathway for learner progression and expectations of performance from entry into residency is grounded in medical education research and is guided by some of the best education researchers in medical education.<sup>42-45</sup>

The physical therapy profession needs to engage in a similar effort for physical therapist education; this endeavor should combine the efforts of the ACAPT and APTA's Education Section with those of the community of education researchers to result in clear, practice-based requirements at the key transition points in the training of physical therapists. For postprofessional education, the ACAPT, APTA, and American Board of Physical Therapy Residency and Fellowship Education should partner to extend that work for practicing physical therapists.

In October 2014, the ACAPT conducted a clinical education summit that involved key stakeholders in physical therapist education. Three key recommendations addressed competencies that extended from professional education through readiness to enter practice.<sup>50</sup> It is critical to begin work on those recommendations because they are essential to advancing education research.

Leaders in the American Educational Research Association have emphasized the need to develop structured, supported, and sustained research-practice partnerships that focus on urgent problems of practice.<sup>33,34</sup> A national educa-

tion research agenda can be collaboratively developed under the auspices of the key stakeholders, such as the APTA, ACAPT, and APTA's Education Section and Research Section. Emerging findings from the National Study of Excellence and Innovation in Physical Therapist Education highlight the interdependence of or nexus between academic and clinical communities as a critical element of excellence and innovation.<sup>64,65</sup> Many unexplored areas of teaching and learning in academic and clinical education need to be investigated; therefore, the development of a national shared research agenda grounded in the urgent problems of practice is timely. For example, there is continued dialogue in the profession about the development of clinical reasoning abilities and how residency education can focus on that learning goal. What evidence about learner development of clinical reasoning abilities is available? What teaching and learning strategies work best? What is successful learner development in entry-level education? Is evidence-based practice addressed in teaching and learning across academic and clinical settings?

### Recommendation 2: Develop the Community of Scholars for Physical Therapist Education Research

Physical therapist education researchers must engage in the broader community of interest of education researchers in general and in the health professions in particular. The need to develop a strong, interconnected community of education researchers is a challenge throughout health professions education and education in general, not just physical therapist education.<sup>66</sup>

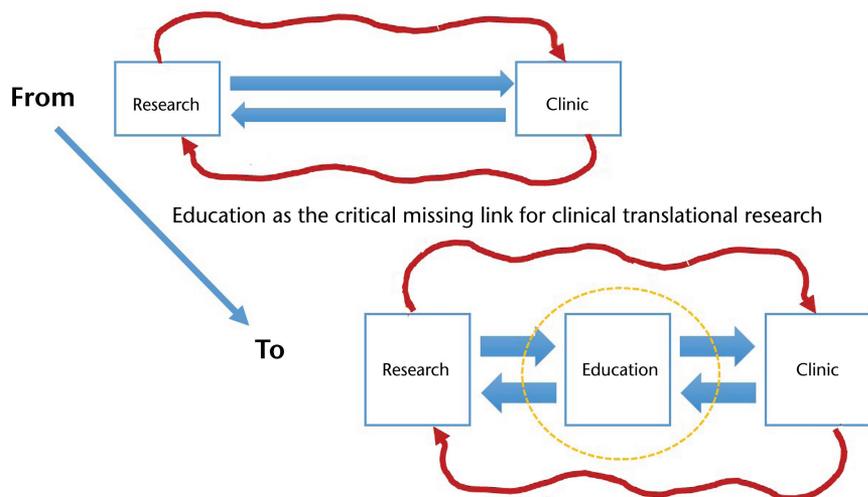
The American Educational Research Association is the primary organization representing the broadest possible community of education researchers, including a division focused on professional education. The AAMC and the American Dental Education Association have MedEdPORTAL,<sup>67</sup> which is a robust, free publication service that shares specific education interventions. MedEdPORTAL could serve as a means for the dissemination of work on teaching and learning in physical therapy and could provide a

mechanism through which the APTA, ACAPT, or both could establish stronger networks of education researchers with other health professions associations.

Mentoring future education researchers in the profession needs to begin during professional education. Physical therapist programs must explicitly include evidence from education research in their courses, in their curricular design, and in their pedagogical choices. The scholarly work of education researchers must be recognized in the promotion and tenure guidelines at every higher-education institution housing a professional education program in physical therapy, regardless of the type of institution in which the physical therapist education program is located. The leaders of such programs must be prepared to mentor and support those education researchers, including connecting them with the broader community of education researchers in the profession and across health professions.

The ACAPT can take a lead role, much as the AAMC has done, in developing resources and initiatives to support the development of a stronger community of education researchers in the profession. The intentional development of networks of physical therapist education researchers investigating shared urgent problems of practice and learning could be an important step forward as well. The key stakeholders in physical therapist education, such as the ACAPT, APTA's Education Section, and the Commission on Accreditation in Physical Therapy Education, could collaborate with other professions to advance exemplary policies and practices that value education research in the promotion and tenure process.

With regard to mentoring future investigators, perhaps education research should be considered similar to basic science and clinical research. Education research would benefit from institutional and national training infrastructures, such as K-type awards and grant writing workshops, as well as funding through institutional seed grants and renewable, federally funded, investigator-initiated grants. Moreover, education research could help integrate clinical and basic



**Figure 4.** Critical role of education in the translation of research findings to clinical practice.

science research, professional education, and the implementation of research in patient care by facilitating professional and postgraduate students becoming the “foot soldiers” for the implementation of evidence. Collaborating with clinical and basic science researchers to translate research through students may also increase funding opportunities for education researchers and basic science researchers. At present, the translation of research findings to clinical practice essentially bypasses professional education programs and continuing education offered by educators, particularly translation supported by National Institutes of Health-funded Clinical Translation Science Awards.

We believe that changing the paradigm as shown in Figure 4 could make a huge difference. The translation of research findings to clinical practice is a foundational element of clinical knowledge. Education is the essential ingredient of teaching and learning in academic and clinical settings. Education is also a critical component in clinical translational research.<sup>68</sup> This connection cannot happen without intentional effort to communicate and collaborate across clinical researchers and education researchers.

**Recommendation 3: Build a Data Repository for the Profession**

An adequate infrastructure to support education research in physical therapy

should be developed and maintained for the profession. A robust data repository, including demographic data about physical therapist education programs, agreed-upon outcomes of physical therapist education, and workforce supply and demand data, is needed. An education data warehouse could be a transformative tool for education research, but it must be grounded in standardized outcomes.<sup>69</sup> The Research on Medical Education Outcomes (ROME) Registry, established in 2008, is an educational registry patterned after patient registries.<sup>70</sup> This registry is a longitudinal database consisting of educational, performance, quality improvement, and clinical practice data.<sup>70</sup> The registry includes medical outcomes for care provided by residents and medical students, and 72 studies using registry data have been done. The ACAPT and APTA could jointly sponsor the development and maintenance of a data repository and ensure that it is accessible to educators and policy makers.

Data are only useful if they are analyzed and the results are broadly disseminated and used to advance excellence. A clear agenda for advocacy to promote education research is needed within the physical therapy community in particular and within health professions in general.<sup>69</sup> The ACAPT and APTA’s Education Section are the logical association entities to provide that advocacy within physical

therapy. A national center for education research in the health professions, similar to that proposed by Wartman,<sup>35</sup> could be the umbrella under which that advocacy occurs for all health professions education. Meanwhile, existing health professions associations will need to engage in collaborative work on the federal and state levels to advocate for the shared needs and interests of the health professions community.

**Recommendation 4: Creative Innovative Funding Structures**

Although national initiatives to achieve sufficient funding for education research in the health professions are essential, specific efforts within particular professions also are important. The Foundation for Physical Therapy has played a critical role in advancing clinical and basic science research in physical therapy. The Foundation recently announced a grant of \$2.5 million to Brown University to establish the Center on Health Services Training and Research over the next 5 years.<sup>71</sup>

Key stakeholders, such as the ACAPT, APTA’s Education Section and Research Section, and the Foundation for Physical Therapy, could collaborate to develop a strategy for funding education research. Efforts to fund a center for education research could yield substantial dividends for the profession, much as have efforts to support clinical research and health services research. The Foundation also could include immediate, smaller-scale changes in how it promotes education research in its current priorities. For example, it could specifically award Promotion of Doctoral Studies Scholarships to doctoral students whose field of study is professional and postprofessional physical therapist education. Given that the current pathway for education research may not commonly lead to greater national funding, the Foundation can clarify that, for education research, the metric for success can be a broader dissemination of findings throughout the physical therapist education community.

The APTA’s sections could collaborate and pool funding to investigate important education research topics, such as

the development of clinical reasoning skills and a pilot study of the implementation of structured competencies by a small number of institutions. Finally, the Foundation could include education researchers in its various decision-making entities, including its board.

The APTA Research Section hosted several research retreats attended by many leading clinical and basic science researchers; these retreats were similar to Gordon Research Conferences. The purpose of Gordon Research Conferences is to “provide a valuable means of disseminating information and ideas in a way that cannot be achieved through the usual channels of communication—publications and presentations at large scientific meetings.”<sup>72</sup> A series of such conferences might provide some consensus or direction on achieving many important action items identified in the Table, such as developing a robust, longitudinal set of professional performance requirements; examining different models across health professions and making recommendations; establishing a work plan for identifying and implementing key academic metrics; and convening a group of key stakeholders (eg, ACAPT, APTA’s Education Section and Research Section, and Foundation for Physical Therapy) to develop a strategy for funding education research.

## Conclusion: The Way Forward

We believe that now is the time for action to advance education research in the profession. This journey will not be easy and will require explicit planning, collaboration within and across professions, and intentional strategies to move forward. The integration of research, education, and clinical practice is critical to the survival of the profession, and education is an essential link in this integration (Fig. 4).

This article emerged from an ACAPT task force charged with discussing how the profession could move forward in developing an education research agenda. We identified the major challenges and areas that are critical to making transformative change in education research for physical therapy. There is an urgent need to

address challenges to education research with intentional actions. The profession has a moral obligation to prepare clinicians, educators, and future researchers to meet the health care needs of clients, society, and the communities in which people live.

All authors provided concept/idea/project design, writing, and consultation (including review of manuscript before submission). Dr Jensen provided project management and administrative support.

DOI: 10.2522/ptj.20160159

## References

- 1 Craik R. PTJ has no silo [editorial]. *Phys Ther.* 2015;95:1602-1604.
- 2 Gwyer J, Hack L, Jensen GM, et al. Future directions for educational research in physical therapy [editorial]. *J Phys Ther Educ.* 2015;29:3-4.
- 3 Carlisle J. Funding medical education research: opportunities and issues. *Acad Med.* 2004;79:918-924.
- 4 Cooke M. A more ambitious agenda for medical education research. *J Grad Med Educ.* 2013;5:201-202.
- 5 Rothstein J. Thirty-Second Mary McMillan Lecture: Journeys beyond the horizon. *Phys Ther.* 2001;81:1817-1829.
- 6 Worthingham CA. Second Mary McMillan Lecture: Complementary functions and responsibilities in an emerging profession. *Phys Ther.* 1965;45:935-939.
- 7 Kaiser H. Fifth Mary McMillan Lecture: Today’s tomorrow. *Phys Ther.* 1991;71:407-414.
- 8 Daniels L. Ninth Mary McMillan Lecture: Tomorrow now—the master’s degree for physical therapy education. *Phys Ther.* 1974;54:463-473.
- 9 Hislop H. Tenth Mary McMillan Lecture: The not-so-impossible dream. *Phys Ther.* 1975;55:1069-1080.
- 10 Johnson GR. Twentieth Mary McMillan Lecture: Great expectations—a force in growth and change. *Phys Ther.* 1985;65:1690-1695.
- 11 Pinkston D. Twenty-First Mary McMillan Lecture. *Phys Ther.* 1986;66:1739-1746.
- 12 *Handbook for Physical Therapy Teachers.* New York, NY: American Physical Therapy Association; 1967.
- 13 Domholdt E, Siefert J, Graham C, Ritzline P. Journal of physical therapy education: birth to 16 years. *J Phys Ther Educ.* 2003;17:70-79.
- 14 Worthingham CA. The environment for basic physical therapy education—1965-1966: the academic or theoretical phase. *Phys Ther.* 1968;48:935-962.
- 15 Worthingham CA. The clinical environment for basic physical therapy education 1965-1966, I: facilities. *Phys Ther.* 1968;48:1195-1215.
- 16 Worthingham CA. The clinical environment for basic physical therapy education 1965-1966, II: staff. *Phys Ther.* 1968;48:1353-1382.
- 17 Worthingham CA. The 1961 and 1965 graduates of the physical therapy schools, I: 1961 graduates; II: 1965 graduates. *Phys Ther.* 1969;49:476-499.
- 18 Worthingham CA. Study of basic physical therapy education, V: request (prescription or referral) for physical therapy. *Phys Ther.* 1970;50:989-1031.
- 19 Worthingham CA. Study of basic physical therapy education, VI: findings of the study in relation to trends in patient care and education. *Phys Ther.* 1970;50:1315-1332.
- 20 Feitelberg S. The meaning and challenge of a journal. *J Phys Ther Educ.* 1987;1:3.
- 21 Jensen GM. Forth-Second Mary McMillan Lecture: Learning—what matters most. *Phys Ther.* 2011;91:1674-1689.
- 22 American Physical Therapy Association. Clinical Research Agenda for Physical Therapy. *Phys Ther.* 2000;80:499-513.
- 23 Goldstein MS, Scalzitti DA, Craik RL, et al. The Revised Research Agenda for Physical Therapy. *Phys Ther.* 2011;91:165-174.
- 24 American Physical Therapy Association. APTA education strategic plan (2006-2020). Available at: [https://www.apta.org/uploadedFiles/APTAorg/About\\_Us/Policies/BOD/Plans/APTAEducationStrategicPlan.pdf](https://www.apta.org/uploadedFiles/APTAorg/About_Us/Policies/BOD/Plans/APTAEducationStrategicPlan.pdf). Accessed July 8, 2016.
- 25 Gwyer J, Hack LM. A challenge [editorial]. *J Phys Ther Educ.* 2015;29:4-5.
- 26 American Educational Research Association. What is education research? Available at: <http://www.aera.net/AboutAERA/What-is-Education-Research>. Accessed July 8, 2016.
- 27 Berliner D. Educational research: the hardest science of all. *Educ Res.* 2002;31:18-20.
- 28 Ball D. What makes education research “educational”? *Educ Res.* 2007;36:529-540.
- 29 Shulman L. Disciplines of inquiry in education. In: Shulman L, ed. *The Wisdom of Practice: Essays on Teaching, Learning and Learning to Teach.* San Francisco, CA: Jossey-Bass; 2004:279-307.
- 30 Norman G. Sample sizes, scoops and educational science. *Adv Health Sci Educ Theory Pract.* 2010;15:621-624.
- 31 Albanese M, Mejicano G, Gruppen L. Perspective: competency-based medical education—a defense against the four horsemen of the medical education apocalypse. *Acad Med.* 2008;83:1132-1139.
- 32 Regeher G. It’s not rocket science: rethinking our metaphors for research in health professions education. *Med Educ.* 2010;44:31-39.
- 33 Snow CE. Rigor and realism: doing educational science in the real world. *Educ Res.* 2015;44:460-466.
- 34 Bryk A. Accelerating how we learn to improve. *Educ Res.* 2015;44:467-477.

- 35 Wartman SA. Revisiting the idea of a national center for health professions education research. *Acad Med.* 2004;79:910-917.
- 36 Portney L. 17th Annual Pauline Cerasoli Lecture: Choosing a disruptive path toward tomorrow. *J Phys Ther Educ.* 2014;28:4-14.
- 37 Hafler J, ed. *Extraordinary Learning in the Workplace.* New York, NY: Springer; 2011.
- 38 Mostrom E. 16th Annual Pauline Cerasoli Lecture: Life lessons—teaching for learning that lasts. *J Phys Ther Educ.* 2013;27:4-11.
- 39 Norman G. How bad is medical education research anyway [editorial]? *Adv Health Sci Educ Theory Pract.* 2007;12:1-5.
- 40 Commission on Accreditation in Physical Therapy Education. Standards and required elements for accreditation of physical therapist education programs. Available at: [http://www.capteonline.org/uploadedFiles/CAPTEorg/About\\_CAPTE/Resources/Accreditation\\_Handbook/CAPTE\\_PTStandardsEvidence.pdf](http://www.capteonline.org/uploadedFiles/CAPTEorg/About_CAPTE/Resources/Accreditation_Handbook/CAPTE_PTStandardsEvidence.pdf). Revised November 11, 2015. Accessed July 8, 2016.
- 41 Grignon TP, Henley E, Lee KM, et al. Expected graduate outcomes in US physical therapist programs: a qualitative study. *J Phys Ther Educ.* 2014;28:48-57.
- 42 Association of American Medical Colleges. Core entrustable professional activities for entering residency: curriculum developers' guide. Available at: <http://members.aamc.org/eweb/upload/Core%20EPA%20Curriculum%20Dev%20Guide.pdf>. Accessed July 8, 2016.
- 43 ten Cate O, Billett S. Competency-based medical education: origins, perspectives and possibilities. *Med Educ.* 2014;48:325-332.
- 44 Norman G, Norcini J, Bordage G. Competency-based education: milestones or millstones. *J Grad Med Educ.* 2014;48:1-6.
- 45 Carraccio C, Englander R, Van Melle E, et al. Advancing competency-based medical education: a charter for clinician-educators. *Acad Med.* 2016;91:645-649.
- 46 Furze JA, Tichenor CJ, Fisher BE, et al. Physical therapy residency and fellowship education: reflections on the past, present, and future. *Phys Ther.* 2016;96:949-960.
- 47 Association of American Medical Colleges. The core entrustable professional activities for entering residency. Available at: <https://www.aamc.org/initiatives/coreepas/>. Accessed July 8, 2016.
- 48 Billet S. Securing intersubjectivity through interprofessional workplace learning experiences. *J Interprof Care.* 2014;28:206-211.
- 49 Association of American Medical Colleges. Core competencies for entering medical students. Available at: <https://www.aamc.org/initiatives/admissionsinitiative/competencies/>. Accessed July 8, 2016.
- 50 American Council of Academic Physical Therapy. Clinical education summit: summit report and recommendations. Available at: <http://www.acapt.org/docs/default-source/pdfs/clinical-education-summit-2014-final-report-1.pdf>. Accessed July 8, 2016.
- 51 Collins J. Medical education research: challenges and opportunities. *Radiology.* 2006;240:639-647.
- 52 Rodeghero J, Wang YC, Flynn T, et al. The impact of physical therapy residency or fellowship education on clinical outcomes for patients with musculoskeletal conditions. *J Orthop Sports Phys Ther.* 2015;45:86-96.
- 53 Richardson V. Stewards of a field, stewards of an enterprise: the doctorate in education. In: Golde C, Walker G, eds. *Envisioning the Future of Doctoral Education: Preparing Stewards of the Discipline.* San Francisco, CA: Jossey-Bass; 2006:251-267.
- 54 Caparao RM, Thompson B. The educational researcher defined: what will future researchers be trained to do? *J Educ Res.* 2008;101:247-253.
- 55 Commission on Accreditation in Physical Therapy Education. Aggregate program data: 2014-15 physical therapist education programs fact sheets. Available at: [http://www.capteonline.org/uploadedFiles/CAPTEorg/About\\_CAPTE/Resources/Aggregate\\_Program\\_Data/AggregateProgramData\\_PTPrograms.pdf](http://www.capteonline.org/uploadedFiles/CAPTEorg/About_CAPTE/Resources/Aggregate_Program_Data/AggregateProgramData_PTPrograms.pdf). Accessed July 8, 2016.
- 56 Young JR. This chart shows the promise and limits of 'learning analytics.' In: *The Chronicle of Higher Education.* Available at: <http://chronicle.com/article/This-Chart-Shows-the-Promise/234573>. Published January 4, 2016. Accessed July 8, 2016.
- 57 Snyder-Mackler L. Forty-Sixth Mary McMillan Lecture: Not eureka. *Phys Ther.* 2015;95:1446-1556.
- 58 Wartman SA, O'Sullivan PS. The case for a national center for health professions education research. *Acad Med.* 1989;64:295-299.
- 59 National Academy of Sciences Health and Medicine Division. Measuring the impact of interprofessional education (IPE) on collaborative practice and patient outcomes. Available at: <http://iom.nationalacademies.org/Reports/2015/Impact-of-IPE.aspx>. Released April 22, 2015. Accessed July 8, 2016.
- 60 O'Sullivan PS, Irby DM. Reframing research on faculty development. *Acad Med.* 2011;84:421-428.
- 61 Irby D, Hodgson C, Muller J. Promoting research in medical education at the University of California, San Francisco, School of Medicine. *Acad Med.* 2004;79:981-984.
- 62 Association of American Medical Colleges. Medical Education Research Certificate (MERC) program. Available at: <https://www.aamc.org/members/gea/merc>. Accessed July 8, 2016.
- 63 Custers E. Medical education and cognitive continuum theory: an alternative perspective on problem solving and clinical reasoning. *Acad Med.* 2013;88:1074-1080.
- 64 Jensen GM, Mostrom E, Gwyer J, et al. Learning for practice: early, integrated workplace experiences matter. Paper presented at: American Educational Research Association Annual Meeting; April 16-20, 2015; Chicago, Illinois. Available at: <http://www.aera.net/Publications/OnlinePaperRepository/AERAOnlinePaperRepository/tabid/12720/Owner/40524/Default.aspx>. Accessed July 8, 2016.
- 65 Mostrom E, Jensen GM, Nordstrom T, et al. Learning through practice: navigating complexity, care, and competence. Paper presented at: American Educational Research Association Annual Meeting; April 16-20, 2015; Chicago, Illinois. Available at: <http://www.aera.net/Publications/OnlinePaperRepository/AERAOnlinePaperRepository/tabid/12720/Owner/75479/>. Accessed July 8, 2016.
- 66 O'Sullivan PS, Stoddard HA, Kalishman S. Collaborative research in medical education: a discussion of theory and practice. *Med Educ.* 2010;44:1175-1184.
- 67 American Association of Medical Colleges. Peer reviewed publications. Available at: <https://www.mededportal.org>. Accessed July 8, 2016.
- 68 Barrett J, Yates L, McColl G. Medical teachers conceptualize a distinctive form of clinical knowledge. *Adv Health Sci Educ Theory Pract.* 2015;20:355-369.
- 69 Triola M, Pusic M. The education data warehouse: a transformative tool for health education research. *J Grad Med Educ.* 2012;4:113-115.
- 70 Gillespie C, Zabar S, Altshuler L, et al. The Research on Medical Education Outcomes (ROME) Registry: addressing ethical and practical challenges of using "bigger," longitudinal educational data. *Acad Med.* 2016;91:690-695.
- 71 Foundation for Physical Therapy. Center of excellence. Available at: <http://www.foundation4pt.org/explore-our-impact/center-of-excellence-2/>. Accessed July 8, 2016.
- 72 Gordon Research Conferences. Available at: <https://www.grc.org/>. Accessed July 8, 2016.