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Physician Assistant Genomic Competencies

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Abstract

Genomic discoveries are increasingly being applied to the clinical care of patients. All physician assistants (PAs) need to acquire competency in genomics to provide the best possible care for patients within the scope of their practice. In this article, we present an updated version of PA genomic competencies and learning outcomes in a framework that is consistent with current medical education guidelines and the collaborative nature of PAs in interprofessional health care teams.

INTRODUCTION

In 2007, the *Journal of Physician Assistant Education* published “Establishing Essential Physician Assistant Clinical Competencies Guidelines for Genetics and Genomics.”¹ In subsequent years, the field of clinical genomics has grown dramatically, advancing health care professionals’ understanding of the role of genetics in health maintenance, risk assessment and modification, and disease management. Medical education, in parallel, is transforming rapidly, with increasing emphasis on competency-based education and patient-centeredness with a greater focus on outcomes. With the velocity of continual change in both areas, the physician assistant (PA) profession must focus on lifelong learning within a basic framework that will allow ready application of new genomic evidence as it applies to patient care, thereby improving genetic literacy² in the PA profession and consequently improving patient outcomes.

DISCUSSION

In 2005, the 4 PA professional organizations—the American Academy of PAs, the Accreditation Review Commission on Education for the Physician Assistant, the National

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Commission on Certification of Physician Assistants, and the Physician Assistant Education Association—adopted the 6-domain professional competency structure that the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Medical Specialties (ABMS) established for US residency training to guide PA training and continuing medical education.³ The 6 domains of PA professional competency are patient care, medical knowledge for practice, interpersonal and communication skills, practice-based learning and improvement, professionalism, and systems-based practice. Because the ACGME and ABMS have added 2 domains—interprofessional and personal professional development—since the PA competencies were last revised in 2012, we have chosen to incorporate interprofessional collaboration in the revised PA genomic competencies (Table 1). We did not add personal professional development, because relevant domain activities are covered under the domain professionalism.

Korf et al (2014)⁴ published a framework for the “development of genomics practice competencies that may serve as a starting point for formulation of competencies for physicians in various medical disciplines.” Their Competencies Working Group identified 5 entrustable professional activities (EPAs) and mapped ACGME core competencies to help guide residency training. The UK National Health Service developed an online educational pathway for nongenetics health care professionals that helps them develop awareness of how genomics is used to support clinical practice, identify genomic susceptibility to disease, prevent genomic-based adverse drug reactions in patients, personalize cancer and infectious disease diagnosis and treatment, and communicate with patients about genomic information (including obtaining proper consent), and genomic functions similar to Korf’s described EPAs.⁵ A review of the 2007 PA genomic competencies, with detailed lists of knowledge, attitudes, and skills, made it clear that reframing was needed, with true overarching genomic competencies. Not only would these competencies help specify what PAs should be able to do relative to genomics in clinical practice, they would also capture PA provider activities in the future without becoming quickly outdated. Restructuring this framework also would allow for continued collaborative medical education for students and providers—a necessity given the emphasis on interprofessional education as team-based medicine is achieving recognition for optimizing patient care.

Given the shortage of medical providers, as well as the economic pressures inherent in medical practice, the prevailing attitude among health care providers regarding the need for practical applications for genetic and genomic advances is predictable and desirable as new genomic discoveries are increasingly being translated into patient care.^{6–10} This viewpoint is shaped also by varying degrees of genetic literacy within the diverse population of health care providers. A special report of the US Department of Health and Human Services (HHS) Secretary’s Advisory Committee on Genetics, Health, and Society in 2011 found “inadequate genetics education of health care professionals as a significant factor limiting the integration of genetics into clinical care.”¹¹ The first recommendation of the HHS report is the improvement of medical education across medical, nursing, and pharmacy curricula to increase genetic literacy. Agreement is widespread in the health care community that genetics and genomics are relevant to clinical practice, and that one step toward achieving effective genetic education for health care professionals is the establishment of expected competencies.¹² In 2006, the Accreditation Review Commission on Education for the

Physician Assistant (ARC-PA) presciently presented a new Standard acknowledging the advent of the era of medical genomics and molecular medicine. Currently, this Standard, B2.02e, states, “The program curriculum must include instruction in the following areas of applied medical sciences and their application in clinical practice... e) the genetic and molecular mechanisms of health and disease.”¹³ Although the ARC-PA Standard may seem broad, it has encompassed the astonishing growth in molecular research and the application of such research to clinical medicine over the past decade. PA educators need to continue to address enhanced instruction in medical genetics and molecular biology to better prepare their graduates for the era of medical genomics. The revised PA genomic competencies presented in Table 1 reflect the anticipated and necessary changes to PA education. Moreover, they support the collaborative nature of the PA’s role to provide patients with optimal, practical, and clinically relevant care within an interprofessional network.

The PA education community has been fortunate to be involved with and supported by the National Human Genome Research Institute (NHGRI) for many years, including involvement in the development of the first PA genomic competencies. The authors of this article have been part of the PA community’s advisory group to the Genetics/Genomics Competency Center (G2C2). G2C2 was created in 2010 by the Genomic Healthcare Branch of NHGRI to provide a collection of online materials both for the health professional classroom and for self-directed learning in genetics and genomics by practicing health care professionals. Nurses, PAs, genetic counselors, pharmacists, and, most recently, physicians have assembled educational materials covering a range of genomic skill areas specific to and shared between these professions. The revised PA genomic competencies are proposed to provide a framework for PA practice-based learning and improvement, and correspond likewise to PA-vetted G2C2 materials. These materials are mapped to PA genomic competencies on the G2C2 Web site (<http://www.g-2-c-2.org>). Our goal is not only to provide a framework for a well-educated PA workforce, but also to initiate the sharing of valid and useful genomic resources among PA professionals to ensure competence in the face of exciting and dynamic developments in the field of clinical genomics. See Table 2 for several examples of valid resources housed at the G2C2 collection for PAs. The PA competencies presented in this article have been further delineated into specific learning outcomes, which again have been culled to reflect actual and, we propose, future PA practice.

CONCLUSIONS

The goal of PA education is simple: to train PAs so that they can integrate relevant information into the diagnosis and treatment of their patients for safe and effective care. Revising the PA genomic competencies to reflect the dynamic nature of clinical genomics, aligning it more closely with frameworks established in current medical education across numerous disciplines, and linking the genomic competencies to resources that enables us to improve PA genetic literacy will allow PAs to provide up-to-date, professional care for their patients. As PAs’ facility and expertise in genomics rise, the level of care they provide to patients will be personalized and exceed current levels of care. We are seeing clinical applications used currently in oncology, cardiology, pharmacogenomics, infectious disease, and other arenas—the future of genomic medicine is here and *not* a distant reality. PAs must

be prepared—or risk becoming the rate-limiting step in the network of interprofessionals ready to transform patient care.

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Table 1**Physician Assistant Genomic Competencies and Learning Outcomes**

Competency	Learning Outcome
A. Patient care	1 Gather family history information and construct a multigenerational pedigree. <ul style="list-style-type: none"> Identify available tools to aid in the construction of a multigenerational pedigree. Demonstrate the ability to elicit a complete 3-generation family health history. Ensure that the history includes behavioral and environmental risk factors. Appreciate how family genetic history may influence health education for both individuals and families.
	2 Identify patients who would benefit from referral to genetics professionals. <ul style="list-style-type: none"> Describe the various types of inheritance patterns and mechanisms by which genetic disease may occur. Recognize the breadth of data involved in making a genetic diagnosis, including physical examination, personal and family medical history, and laboratory tests, which may include genetic testing. Understand that patients may present with a genetic condition for which there is no family history. Use family history information to perform genetic risk assessment and to make appropriate health management recommendations. Know when and how to refer patients to genetics professionals.
	3 Distinguish between genetic screening and genetic testing. <ul style="list-style-type: none"> Differentiate between the various types of screens and diagnostic genetic tests. Recognize that genetic tests can include examination of DNA, chromosomes, and proteins. Discuss genetic interventions and resources relevant to one's area of practice. Describe the benefits, limitations, and risks of each screen and test. Demonstrate awareness that the local population may affect the prevalence of genetic conditions.
	4 Incorporate genetic tests into patient management. <ul style="list-style-type: none"> Determine whether a genetic test is warranted and whether it will inform clinical management. Explain to the patient the purpose of the genetic test, the manner in which the test will be performed, the timeline for obtaining results, possible outcomes, and potential implications for the patient and family members. Obtain informed consent from patients before ordering genetic tests and agree on the method that will be used to inform them of the results. Adhere to and apply consensus guidelines with respect to testing children, asymptomatic individuals, and adults with incapacity. Coordinate activities with the genetic testing laboratory, including adherence to established protocols for testing and exchange of appropriate information and documentation.

Competency	Learning Outcome	
	<ul style="list-style-type: none"> Understand and interpret the laboratory report in the context of the care of the patient and family. 	
	<p>5</p> <p>Discuss the range of genetic and genomic-based approaches to the treatment of disease.</p> <ul style="list-style-type: none"> Apply the principles of pharmacogenetics and pharmacogenomics in the clinical management of patients. Manage patients with genetic risk factors or conditions, using accepted guidelines. Educate patients about the purpose, benefits, limitations, and risks of interventions. Develop, with the patient, a management plan that includes genetic and genomic determinants of health. 	
B. Medical knowledge for practice	<p>1</p> <p>Describe the cellular and molecular mechanisms underlying human inheritance.</p> <ul style="list-style-type: none"> Describe the structure, function, and replication of DNA. Understand how genes direct the production of proteins. Explain the chromosomal basis of inheritance. Recognize the different types of Mendelian and non-Mendelian inheritance. <p>2</p> <p>Define the role of genetic variation in health and disease.</p> <ul style="list-style-type: none"> Describe the major forms of genetic variation. Understand how alterations in DNA and chromosomes affect gene function and contribute to disease. Recognize that both genetic and environmental factors play important roles in most common diseases. Discuss the role of genetic changes in the pathophysiology of diseases. Describe the use of molecular, biochemical, and chromosomal tests in the diagnosis of genetic disorders. 	
C. Interpersonal and communication skills	<p>1</p> <p>When communicating genetic information to patients, consider personal factors that may influence their understanding and response.</p> <ul style="list-style-type: none"> Demonstrate awareness of the effect of genetic diagnoses on patients and their families. Demonstrate sensitivity and responsiveness to patient diversity including effects of gender, age, culture, language, family values, health beliefs, health literacy, religion, disabilities, sexual orientation, and socioeconomic status and effects on response to genetic information throughout the course of management. Gauge individuals' current level of understanding of the genetic condition and their expectations regarding the implications for themselves and their families. Communicate the concept of genetic risk in a manner that the patient can understand. <p>2</p> <p>Explain the role of genetics professionals in the patient care plan.</p> <ul style="list-style-type: none"> Communicate the roles of genetics professionals in the patient care plan. Describe the referral process and the plan for follow-up with the patient and genetics professionals. <p>3</p> <p>Promote informed decision making for patients, and provide nondirective counseling.</p> <ul style="list-style-type: none"> Communicate the patient's right to autonomous decision making and confidentiality. 	

Competency	Learning Outcome	
	<ul style="list-style-type: none"> • Ensure that the needs of those who are unable to give informed consent in relation to accessing genetic information are addressed. • Educate patients about the potential effects of genetic information for themselves and their families. 	
	<p>4 Offer appropriate psychological and social support to patients and families affected by a genetic condition.</p> <ul style="list-style-type: none"> • Discuss with the patient the range of available professional and community support services. • Demonstrate an awareness of the importance of the social and psychological impact of a genetic condition on patients and their families, dependents, and employers. • Make appropriate referrals to genetic support groups, community groups, or other resources that can benefit the patient and the family. 	
D. Practice-based learning and improvement	1	<p>Use information technology to obtain current and credible information about genetics for oneself, patients, and colleagues.</p> <ul style="list-style-type: none"> • Locate, appraise, and assimilate reliable genetic and genomic resources and clinical practice guidelines. • Integrate genetic findings into the patient care plan and update as necessary. • Identify culturally and linguistically appropriate resources available to assist patients seeking genetic and genomic information and service. • Acquire skills that enable critical analysis of research and scientific developments.
E. Professionalism	1	<p>Examine on a regular basis one's competence in genetics and genomics as pertinent to one's practice setting.</p> <ul style="list-style-type: none"> • Recognize the level of genetic knowledge and skills required in one's practice. • Determine the limitations of one's genetic knowledge and expertise and the need to upgrade knowledge and skills at frequent intervals. • Recognize the potential for genetic information to contribute to the development of new approaches for the prevention, diagnosis, and treatment of disease. • Ensure any genetic information given to a patient is within one's scope of practice, responsibility, knowledge, and experience.
	2	<p>Discuss financial, ethical, legal, and social issues related to genetic testing and recording of genetic information.</p> <ul style="list-style-type: none"> • Consult interprofessional ethical resources when trying to resolve ethical dilemmas. • Use autonomy, beneficence, nonmaleficence, and justice when deliberating genetic and genomic issues. • Provide appropriate documentation and advocate for patients regarding the influence of insurance or other methods of reimbursement for genetic services. • Be aware of current local, state, and federal laws affecting the privacy and confidentiality of genetic information. • Recognize the dilemmas posed by confidentiality when a patient's relatives are found to be at risk for a genetic condition.

Competency	Learning Outcome	
		<ul style="list-style-type: none"> Discuss examples of misuse of genetic and genomic information and technology.
F. Interprofessional collaboration	1	<p>Seek coordination and collaboration with an interprofessional team of health care providers.</p> <ul style="list-style-type: none"> Facilitate appropriate referral, transfer of information, and plan for follow-up with the patient and genetics professionals. Effectively interact with an interdisciplinary team of health care professionals in the evaluation, diagnosis, and management of patients referred for genetic services. Develop a list of contacts and resources for genetic and genomic referrals.
G. Systems-based practice	1	<p>Identify key aspects of health care systems as they apply to clinical genetics.</p> <ul style="list-style-type: none"> Be able to explain who could have access to a patient's genomic information. Recognize and advocate for families who need assistance in dealing with barriers in the health care system. Show sensitivity to the costs and coverage of clinical care and genomic testing, and take steps to safely minimize costs without compromising quality. Recognize the limits of the system that affects one's professional setting.

Table 2
Genetic and Genomic Resource List for Physician Assistant Educators and Clinicians

Resource Name	Source or Sponsor	Description
Genetic/Genomic Competency Center (G2C2) http://g-2-c-2.org/	National Human Genome Research Institute, National Institutes of Health	<ul style="list-style-type: none"> High-quality educational resources are provided for group instruction or self-directed learning in genetics and genomics by health care educators and practitioners. G2C2 solicits, reviews, and organizes resources through an interdisciplinary collaborative exchange. Competency maps are available for all participating professions, including physician assistant, nurse, genetic counselor, pharmacist, and physician, to facilitate standardized curriculum development. For each competency domain, links to associated competencies and performance indicators take the user to peer-reviewed, relevant resources and their associated Web sites.
Talking Glossary of Genetic Terms http://www.genome.gov/Glossary/	National Human Genome Research Institute, National Institutes of Health	<ul style="list-style-type: none"> Glossary provides definitions for genetic terms as well as descriptions of terms shared by genetic specialists. Many terms include images, animation, and links to related terms. Horizontal menu provides additional resources: <ul style="list-style-type: none"> Under "Health," there are competency and curricular resources for health professionals, including "Genetics 101" and "Genetics, Genomics, and Patient Management" modules. Under "Education," there are myriad teaching and learning resources, including how to construct a family pedigree.
GeneReviews http://www.ncbi.nlm.nih.gov/books/NBK11116/advanced/	National Library of Medicine, National Institutes of Health	<ul style="list-style-type: none"> Resource provides expert-authored, peer-reviewed, regularly updated synopses of known genetic disorders, including descriptions, differential diagnoses, testing issues, and diagnoses of the condition. Current information on genetic test use in diagnosis, management, genetic counseling is offered. Resource provides links to genomic databases, patient resources, PubMed citations, policy statements and guidelines, and state laboratories where testing may be carried out.
Genetics Home Reference http://ghr.nlm.nih.gov/	National Library of Medicine, National Institutes of Health	<ul style="list-style-type: none"> Resource offers consumer-friendly information about the effects of genetic variations on human health. Resource describes more than 1000 health conditions, diseases, and syndromes. A handbook helps the public learn about mutations, inheritance, genetic counseling, genetic testing, genomic research. A medical and genetic glossary is available.

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Resource Name	Source or Sponsor	Description	
		<ul style="list-style-type: none">Resource provides links to reputable genetic resources and organizations.	
Online Mendelian Inheritance in Man http://omim.org/	National Center for Biotechnology Information, Johns Hopkins University	<ul style="list-style-type: none">This comprehensive, authoritative online catalog of human genes and genetic phenotypes is freely available and updated daily.Currently full-text, referenced overviews in OMIM contain information on all known Mendelian disorders and more than 15,000 genes.	
Genetic Testing Registry http://www.ncbi.nlm.nih.gov/gtr/	National Center for Biotechnology Information, Johns Hopkins University	<ul style="list-style-type: none">This central repository for voluntary submission of genetic test information by providers has a goal to advance public health and research into the genetic basis of health and disease. The catalog includes the following:<ul style="list-style-type: none">– The test’s purpose, methodology, validity, and evidence of the test’s usefulness o Laboratory contacts and credentials– Links leading directly to GeneReviews (above)	