

Developing Instruction in Genetics and Genomics: A Workshop for PA Educators

Workshop Facilitators

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Goals

Preliminary results of a recent survey of PA educators have found the two of the main barriers to enhancing the teaching of genetics are lack of resources and time to develop resources. (1) This workshop is designed to assist faculty to discover opportunities for increased inclusion of genetics, genomic medicine, family history and other related instruction within already established PA curricula. It is offered as opportunity for faculty to to share knowledge, resources and creative approaches to curriculum development with colleagues. The session activities and efforts may suggest educational strategies that can assist with PA programs' adherence to the recent the ARC-PA standard (B2.02), which requires "instruction in the professional phase of the program [that] must include instruction in ... the genetic and molecular mechanisms of health and disease."(2)

The goal of this workshop is to provide physician assistant educators with examples of on-line genetic and genomic medicine cases from two resources (Genetests and the National Coalition of Health Professional Education in Genetics). These cases may serve as teaching tools or as templates for future case development at participant home programs. Following the demonstration, workshop participants, in small groups, will create lists of clinical topics that include genetic and/or genomic medicine teaching points. They will then discuss opportunities for developing or modifying clinical instruction in order to expand education in and the application of genetic and genomic medicine principles within individual PA program curricula.

Objectives

At the conclusion of this session, participants will be able to:

1. describe an approach to creating genomic case-based curriculum;
2. identify opportunities for inclusion of elements from demonstrated websites within PA program curricula;
3. identify topics and clinical problems which may be developed or modified to incorporate "the genetic and molecular mechanisms of health and disease" (ARC-PA);
4. using the case models from demonstrated on-line resources, working in small groups, develop learning objectives for and create an outline for a clinical case that incorporates "the genetic and/or molecular mechanisms of health and disease."

Workshop Agenda (1 hour)

Participants should form multidisciplinary and inter-Program groups of faculty, academic coordinators, clinical coordinators, and others at each table.

Workshop Introduction by Facilitators (10-15 minutes)

- Review of workshop goals, learning objectives and agenda
- Demonstration of selected on-line cases:
 - Genetests—Genetic Tools: Genetics Through a Primary Care Lens
<http://www.genetests.org/servlet/access?id=INSERTID&key=INSERTKEY&fcn=y&filename=/tools/index.html>
 - NCHPEG at <http://pa.nchpeg.org/>.

Workshop Activities

Small Group Activity (20-25 minutes)

Each roundtable group will select a spokesperson and recorder to facilitate and document the group's activities. Workshop facilitators will visit tables to assist with each table's group work.

1. Each member of the work group is invited to describe an example of instruction in the professional phase of his/her program that includes education in the genetic and molecular mechanisms of health and disease.
2. As a group, list clinical problems that have a basis in the genetic and/or molecular basis of health and disease and that are appropriate within a PA program's core curriculum. (Facilitators will provide reference materials (3, 4, 6) at each table to help initiate these discussions, if needed.)
3. As a group, discuss educational methodologies that may be used to incorporate additional instruction in genetic and molecular basis of health and disease for some of the clinical problems you have identified.
4. As a group, select a clinical problem that would be amenable for development as a clinical case discussion, similar to those demonstrated earlier in the workshop.
5. As a group, develop one or two learning objectives and outline a lesson plan for incorporating genetic and molecular principles and teaching points for the clinical problem you have selected. (Facilitators will share examples of learning objectives (4) from their own curricula, if needed).

Large Group Activity (15-20 minutes)

To conclude the workshop, facilitators will next convene a large group activity that includes reports from each work group. Each table's spokesperson will list and briefly discuss the clinical problem(s) the group identified as (a) potential target(s) for additional instruction in genetics and molecular biology. He/she will then briefly outline the case discussion plan developed by the group. Workshop participants will be encouraged to consider incorporating these and other genetic and molecular biology concepts within their home program curricula to assist with adherence to the ARC-PA standards.

Please Note: A table of on-line genetic education, teaching and clinical resources that we have found useful in our teaching and clinical practice is included below.

References

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2. Accreditation Standards for Physician Assistant Education. 3rd ed. with Clarification 9/06. Standard B2.01. Available at: <http://arc-pa.org/Standards/3rded itionwithclarifyingchanges906.pdf>. Accessibility Verified September 9, 2007.
3. Engstrom, J, Sefton, M, Matheson, J, Healy, K, Genetic competencies essential for health care professionals in primary care, *Journal of Midwifery & Women's Health*, 2005; 50(3):177-183.
4. Rackover, M, Goldgar, C, Healy, K, Genetic and Molecular Mechanisms of Health and Disease, *The Journal of Physician Assistant Education*. 2006; 17(1): 43-47. Available at: <http://www.paeaonline.org/perspective/1067.pdf>. Accessibility verified September 9, 2007.
5. Goldgar, C., Clarke, K., Wolpert, C., Healy, K., Malouf, E., Harvey, E. *Genetics in the Physician Assistant's Practice* (<http://pa.nchpeg.org/>). Program is provided by the National Coalition for Professional Education in Genetics (NCHPEG). Case-based on-line interactive continuing medical education (CME) approved by the American Academy of Physician Assistants. June 2007. Accessibility Verified September 9, 2007.

6. Rackover, M.A., Goldgar, C., Wolpert, C., Healy, K., Feiger, J., Jenkins, J. Establishing Essential Physician Assistant Clinical Competencies Guidelines for Genetics and Genomics, *Journal of Physician Assistant Education*; 2007; 18(2): 47-48.
<http://www.paeaonline.org/perspective/06079.pdf>. Accessibility Verified September 9, 2007.

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Genetics Resources on the Web for PA Faculty, Students and Clinicians		
CATEGORY	DESCRIPTION	AFFILIATION/ COST
EDUCATIONAL RESOURCES		
Basic Genetics		
Genetics and Molecular Medicine http://www.ama-assn.org/ama/pub/category/1799.html	Designed to help clinicians stay abreast of genetic developments. Potpourri of resources, both educational and clinical.	Free. AMA sponsored.
*Genetics & Your Practice http://www.marchofdimes.com/gyponline/index.bm2	Customized for those working with the following patient types: preconception/prenatal, infant/children, and adolescent/adult. Gives practical information/resources to assist in integrating genetics into patient care. Users can earn CME Credits by completing the interactive case study at the end of each module.	Free. Requires registration. March of Dimes sponsored. Grant supported Robert Wood Johnson Foundation.
CDC National Office of Public Health Genomics: Genomics in Your Practice http://www.cdc.gov/genomics/phpractice.htm	Provides current information on the impact of human genetic research and gene discoveries on disease prevention and health promotion. Includes weekly updates of news stories, scientific literature, announcements, events, and public health perspectives on advances in human genetics.	Free. Center for Disease Control (CDC).
GeneTests Illustrated Genetics Glossary http://www.genetests.org/servlet/access?qry=ALLTERMS&db=genestar&fcn=term&gtreport2=true&id=888891&key=IXMXGL2eKQUle	Context-sensitive illustrated glossary defining > 225 medical genetics terms (>70 terms are illustrated); linked to relevant cases in GeneTests educational materials.	Free online. NIH funded

Genetic Cases		
Genetics in the Physician Assistant's Practice http://pa.nchpeg.org/	Case-based on-line interactive continuing medical education (CME) designed by and for PAs. Approved by the American Academy of Physician Assistants. June 2007.	National Coalition for Professional Education in Genetics (NCHPEG)
Genetics Case Studies for Medical Students http://cim.usuhs.mil/genetics/cases.html	This web page is designed to provide an educational experience in Medical Genetics using 12 Case Studies. A self quiz follows.	Uniformed Services University.
Genetics Through a Primary Care Lens http://www.genetests.org/servlet/access?id=INSERTID&key=INSERTKEY&fcn=y&filename=/tools/index.html	Genetics Through a Primary Care Lens; Materials for teaching genetics in primary care settings from GeneTests. Developed for physicians, other healthcare providers, and researchers.	Free online. NIH funded
Genetics & Your Practice http://www.marchofdimes.com/gyponline/index.bm2	Cases are provided throughout the sections of this resource.	Free. MOD sponsored. User must register.
National Office of Public Health Genomics's HuGENet™ Case Studies Series http://www.cdc.gov/genomics/hugenet/casestudies.htm#case	Cases (7) provided to train health professionals in practical application of human genome epidemiology (HuGE), which translates gene discoveries to disease prevention by integrating population-based data on gene-disease relationships and interventions.	Free. Sponsored by National Office of Public Health Genomics (NOPHG)
Pedigree-related		
US Surgeon General's Family History Initiative http://www.hhs.gov/familyhistory/respacehealth.html	Provides resource packet developed to help Health Professionals educate the public about the importance of family health history, includes forms, a couple of case studies and resources in English and Spanish.	US Dept. of Health & Human Services. Free online.
American Medical Association—Family History Tools http://www.ama-assn.org/ama/pub/category/2380.html	Contains: Prenatal, Pediatric, and Adult Family History Questionnaires, (pdf downloadable). Also provides a pdf pocket guide that provides instructions and examples for patients on how to generate a simple pedigree.	Free. AMA sponsored.

<p>Genetics & Your Practice http://www.marchofdimes.com/gyponline/index.bm2</p>	<p>Contains: adult, pediatric, and prenatal family history questionnaires. Also contains toolkits that include pdf or PDA downloadable format, pedigree drawing, pedigree analysis, inheritance patterns, red flags, and risk assessment examples</p>	<p>Free. MOD sponsored. User must register.</p>
<p>Pedigree Drawing Programs</p>		
<p>U.S. Surgeon General's Family History Initiative http://www.hhs.gov/familyhistory/</p>	<p>A web-enabled tool (newly updated) that organizes family history information for patients to bring to their clinicians (and save on their own computers).</p>	<p>Free.</p>
<p>Smart Draw http://www.smartdraw.com/specials/genealogy.asp?id=24226</p>	<p>A program for drawing organizational charts but can be used to organize a pedigree.</p>	<p>Free 30-day trial \$198</p>
<p>Misbach Enterprises http://misbach.org/pdfcharts/</p>	<p>Has free charts that can be downloaded and printed off. It also offers a free program that can be used to organize a pedigree on a web site.</p>	<p>Free. Misbach Enterprises</p>
<p>PowerPoint</p>	<p>Has chart-drawing capability.</p>	<p>Software program.</p>
<p>Genetics and Ethics</p>		
<p>http://www.genethics.ca/ http://www.ethicsweb.ca/</p>	<p>A Canadian site that is part of a large website on ethical issues. Might be useful for a couple of courses</p>	<p>Free.</p>
<p>Genetic Testing, Discrimination and Privacy http://www.gene-watch.org/programs/privacy.html</p>	<p>Fosters public debate about the social, ethical and environmental implications of genetic technologies.</p>	<p>Free. Council for Responsible Genetics (CRG)</p>

<p>Genetics & Your Practice http://www.marchofdimes.com/gyponline/index.bm2</p>	<p>Financial, Ethical, Legal and Social Issues (FELSI) issues are integrated into Genetic & Your Practice Online. WHO guidelines were used to develop an index of FELSI information on the site.</p>	<p>Free. MOD sponsored. User must register.</p>
<p>Genetics Through a Primary Care Lens http://www.genetests.org/servlet/access?id=8888892&key=NSCfIO0grmDxM&fcn=y&fw=mMcz&filename=/tools/elsi/ELSI.html</p>	<p>Resource containing descriptions of ethical obligations of health care providers as well as case materials for illustrating these issues.</p>	<p>Free online. NIH funded</p>
Genetic Testing		
<p>Genetics Through a Primary Care Lens http://www.genetests.org/servlet/access?id=8888892&key=NSCfIO0grmDxM&fcn=y&fw=LDKS&filename=/tools/concepts/usingTests.html</p>	<p>Provides examples of different types of genetic tests (both diagnostic and screening) linked to cases illustrating the tests.</p>	<p>Free online. NIH funded.</p>
<p>Genetics & Your Practice http://www.marchofdimes.com/gyponline/index.bm2</p>	<p>Contains toolkits that include pdf or PDA downloadable format for algorithms for genetic testing, checklists for information to collect, analysis and interpretation of common genetic tests and much more.</p>	<p>Free. MOD sponsored. User must register.</p>
<p>Human Genome Project—Genetic Testing http://www.ornl.gov/sci/techresources/Human_Genome/medicine/genetest.shtml</p>	<p>Module on genetic testing including pros and cons of gene testing, diseases for which gene tests are available, insurance coverage, testing recommendations, and further genetic testing resources.</p>	<p>U.S. Dept of Energy and the National Institutes of Health.</p>
<p>National Cancer Institute Understanding Cancer Series: Gene Testing http://www.cancer.gov/cancertopics/UnderstandingCancer/genetesting</p>	<p>Tutorial that illustrates what genes are, explains how mutations occur and are identified within genes, and discusses the benefits and limitations of gene testing for cancer and other disorders.</p>	<p>Free. National Cancer Institute.</p>

Other Genetic Education Resources		
<p>National Human Genome Research Institute http://www.genome.gov/Education/ http://www.ornl.gov/sci/techresources/Human_Genome/education/education.shtml http://www.ornl.gov/sci/techresources/Human_Genome/links3.shtml</p>	<p>All of these are part of the Human Genome Project Human Genome Project Educational Resources Human Genome Project Information (Links to the Genetic World)</p>	<p>Free. NHGRI, etc.</p>
<p>Genetic Educational Material Data Bank http://www.gemdatabase.org/gemdatabase/DetailedSearch.asp</p>	<p>GEM Database is a searchable listing of public health genetics policy documents and clinical genetics educational materials.</p>	<p>Sponsored by the HRSA, Maternal and Child Health Bureau (MCHB).</p>
CLINICIAN RESOURCES		
<p>GeneTests/GeneReviews http://www.genetests.org/ http://www.genereviews.org</p>	<p><i>Gene Tests</i> provides worldwide testing laboratory and clinic directories, and teaching tools. <i>GeneReviews</i> provides current, expert-authored, peer-reviewed, disease-specific reviews describing the application of genetic testing to the diagnosis, management, and genetic counseling of patients and families with hereditary disorders.</p>	<p>One-time registration process is required. Free online. NIH funded</p>
<p>Genetic Resources on the Web http://www.geneticsresources.org/</p>	<p>A site and search engine optimizing the use of the web to provide health professionals and the public with high quality information related to human genetics, with a particular focus on genetic medicine and health.</p>	<p>NCHPEG/NHGRI and hosted by RSi Communications. Free online.</p>
<p>Online Mendelian Inheritance in Man™ (OMIM) http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=OMIM</p>	<p>OMIM is a catalog of human genes and genetic disorders, with links to literature references, sequence records, maps, and related databases. Search engine parallels PubMed Database.</p>	<p>Developed by National Center for Biotechnology Information.</p>

<p>AMA Risk Assessment for Hereditary Cancer Syndromes-A Physician's Guide to Clinical Genetic Testing and Medical Management http://www.ama-assn.org/cgi-bin/cme/heronc.cgi</p>	<p>A CME monograph (order print copies from the AMA at the link provided). Designed to assist physicians and other health care professionals in the recognition of familial cancer patterns suggestive of an inherited cancer syndrome, utilize genetic risk assessment, counseling, and genetic testing in at risk patients, and utilize the results of testing in determining a patient's risk for hereditary cancer. Note: non-physicians may earn a certificate of completion.</p>	<p>AMA sponsored.</p>
<p>Referral for Genetic Services http://app1.health.state.pa.us/fhc/(q1fv1g5542y4gd45h2om3e55)/ModuleOutline.aspx</p>	<p>Online training module for what patient issues may require genetic referral.</p>	<p>Pennsylvania State Health Department, 2001</p>
<p>National Society of Genetic Counselors (NSGC) http://www.nsgc.org/resourcelink.cfm</p>	<p>NSGC website can help locate a genetic counselor in regional areas with search criteria.</p>	<p>Sponsored by NSGC.</p>
<p>Genetic Health http://www.genetichealth.com/</p>	<p>Provides consumers and health care providers with educational information and software tools to help them understand and assess genetic risk of common diseases such as: Alzheimer's, Breast Cancer, Colon Cancer, Diabetes, Heart Disease, Hemochromatosis, and Ovarian Cancer.</p>	<p>Free online. Non-profit.</p>
<p>Foundation for Genetic Education and Counseling (FGEC) http://www.fgec.org/resources.html</p>	<p>Small site that concentrates on mental illness and the genetic link (bipolar illness, schizophrenia).</p>	<p>Free. Non-profit FGEC sponsored.</p>
<p>Genetics in Clinical Practice: A Team Approach Available on-line from Dartmouth http://iml.dartmouth.edu/education/cme/Genetics/ CD can be ordered from: http://www.acmg.net/AM/Template.cfm?Section=ACMG_Products&Template=/CM/ContentDisplay.cfm&ContentID=2022</p>	<p>A cooperative project of the CDC and Dartmouth Medical College. This genetics program is intended for health care providers who have an interest in genetic testing. The program includes interactive cases in a virtual clinic that focus on simulated patients who are at risk or have four different diseases (hemochromatosis, cystic fibrosis, colorectal cancer, and Fragile X Syndrome).</p>	<p>On-line version is free. CDs available from the American College of Medical Genetics (\$25)</p>

<p>National Newborn Screening and Genetics Resource Center http://genes-r-us.uthscsa.edu/</p>	<p>This site has information and links about newborn genetic screening tests.</p>	<p>Free. Univ. of Tx Health Science Center (San Antonio) and MCHB.</p>
<p>PATIENT/CONSUMER RESOURCES</p>		
<p>Genetic Alliance http://www.geneticalliance.org</p>	<p>An international coalition comprised of > 600 advocacy, research and healthcare organizations representing millions of individuals with genetic conditions and their interests.</p>	<p>HRSA/Dept of Health and Human Services/Maternal Child Health Administration</p>
<p>Genetics Education Center http://www.kumc.edu/gec/support/index.html</p>	<p>Description of Genetic Conditions, linking with support groups, addresses, and other resources.</p>	<p>Free. University of Kansas Medical Center.</p>
<p>Genetics Home Reference (NLM site) http://www.ghr.nlm.nih.gov/</p>	<p>The National Library of Medicine's web site for consumer information about genetic conditions and the genes or chromosomes responsible for those conditions.</p>	<p>Free. National Library of Medicine.</p>
<p>Compiling your family medical history http://www.mayoclinic.com/invoke.cfm?objectid=385FC65E-F961-49BA-99B799A3A0DAF885</p>	<p>Mayo Clinic provides information on family history and genetic testing plus links for further information for patients.</p>	<p>Free. Mayo Clinic.</p>
<p>Family Voices http://www.familyvoices.org/</p>	<p>Group of families and friends who advocates for health care services and provides information for families with children and youth with special health care needs.</p>	<p>Free online.</p>
<p>Genetic and Rare Diseases Information Center http://rarediseases.info.nih.gov/html/resources/info_ctr.html</p>	<p>Information Center employs experienced information specialists to answer in English or Spanish questions from the general public, including patients and their families, health care professionals, and biomedical researchers.</p>	<p>NHGRI and the Office of Rare Diseases (ORD)</p>

<p>New York Online Access to Health (NOAH) http://www.noah-health.org/en/genetic/</p>	<p>Describes diseases that have a known or suspected genetic origin. Also contains information on basic genetics, genetic disease foundations, and support resources. Also in Spanish.</p>	<p>NY Library Associations, US Dept. of Commerce, March of Dimes-sponsors.</p>
<p>The University of Utah Genetic Science Learning Center http://gslc.genetics.utah.edu/</p>	<p>A Web site created to help people understand how genetics affects their lives and society.</p>	<p>Free online. University of Utah.</p>
<p>Genetics Education Center http://www.kumc.edu/gec/support/index.html</p>	<p>Description of Genetic Conditions, linking with support groups, addresses, and other resources.</p>	<p>Free. University of Kansas Medical Center.</p>
<p>Genetics Home Reference (NLM site) http://www.ghr.nlm.nih.gov/</p>	<p>The National Library of Medicine's web site for consumer information about genetic conditions and the genes or chromosomes responsible for those conditions.</p>	<p>Free. National Library of Medicine.</p>
<p>Compiling your family medical history http://www.mayoclinic.com/invoke.cfm?objectid=385FC65E-F961-49BA-99B799A3A0DAF885</p>	<p>Mayo Clinic provides information on family history and genetic testing plus links for further information for patients.</p>	<p>Free. Mayo Clinic.</p>
<p>Family Voices http://www.familyvoices.org/</p>	<p>Group of families and friends who advocates for health care services and provides information for families with children and youth with special health care needs.</p>	<p>Free online.</p>

All website links active when last accessed 9/13/07.