Teaching Internal Medicine Residents about Genetics: One Topic at a Time - Breast Cancer

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Background

- The field of medicine is experiencing rapid changes in genetics and genomics information.
- While medical school curricula all include some component of genetics education, the content may vary from one school to another, leaving Internal Medicine (IM) residents with different skills and knowledge.
- Patients would stand to benefit if physicians were trained to recognize the role of genetic and genomics that contribute to the management of commonly encountered primary care diseases such as diabetes mellitus, acute coronary syndrome, and certain cancers.

Purpose

- To identify baseline genetics knowledge of Internal Medicine (IM) Residents at The George Washington University.
- To determine the effectiveness of a 20-minute presentation to teach basic genetics concepts and specific guidelines for breast cancer diagnosis and treatment.

Methods

- We performed a literature review of currently available information on genetics curriculum for IM residents and residency programs in other specialties**.**
- A total of 30 articles were reviewed, only 12 of which had any link related to genetics education and IM.
- No standardized curriculum in genetics for IM residents currently exists.
- However, we did identify a proposed curriculum in genetics for IM[1].
- There has also been research in education about genetics in other residencies including Pediatrics, Obstetrics and Gynecology, Psychiatry and Surgery.
- A 20-minute PowerPoint presentation was developed to present basic genetics concepts as well as specific information about breast cancer screening guidelines when a significant family history of breast and ovarian related cancer syndrome arises.
- The presentation was delivered to IM residents and medical students at GWU during Grand Rounds.
- Participants were asked to denote what year level they were on the assessment forms.
- Pairings were tracked using paired numbers on the forms.
- Pre-test and post-test scores were compared using student's paired t-test.
- The assessment form included four questions related to confidence in certain domains (differential diagnosis, risk assessment, screening guidelines, and implications of genetics testing).
- Items were scored using a Likert Scale (1 through 6).
- Three questions related to breast cancer diagnosis and screening were included. Item 1 asked participants to identify conditions related to BRCA1/2; item 2 asked them to identify the mechanism of normally functioning BRCA; and item 3 was scenarios related to screening guidelines (see figure 1 for full questionnaire).

Results

- We received a total of 29 pre-test questionnaires and 27 post-test questionnaires.
- The questionnaires were completed by internal medicine residents and medical students.
- A paired t-test was performed on the paired 27 completed pre and post-tests. *The p-level was set at <0.05 for significance.*
- Table 1. presents the *p-level* for the confidence questions.
- Table 2. presents the *p-level* for the quiz.
- Graph 1. compares the average confidence levels for each item on the pre and post-tests.
- Graph 2. compares the average score on the quiz between pre and post.
- Figure 2. is a sample of the breakdown of confidence scores for item 4 (implications of genetic testing).

Figure 1. Questionnaire

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Please circle one:
Student/PGY1/PGY2/PGY3/Other

Genetics Questionnaire

Please rate your confidence on the following questions. Use the following scale from 1 (Novice) to 6 (Master).

- How confident are you including a genetic condition for any differential diagnosis?
  1 2 3 4 5 6
- For a patient without a personal history of breast cancer, how confident are you in assessing her risk of developing invasive breast cancer in the next five years?
  1 2 3 4 5 6
- How confident are you in implementing United States Preventative Services Task Force (USPSTF) screening guidelines to identify a strong family history of breast cancer and the subsequent need for a genetic counselor referral?
  1 2 3 4 5 6
- How confident are you in your ability to explain the implications of genetic testing to a patient and their family members?
  1 2 3 4 5 6

1) Which of the following is a BRCA related cancer? **Circle all that apply**.
   a. Colon
   b. Melanoma
   c. Pancreatic
   d. Prostate
   e. Endometrial
   f. Stomach
   g. Peritoneal
   h. Thyroid

2) What is the mechanism of a normally functioning **BRCA 1** gene? **Circle only one**.
   a. Gatekeeper
   b. Oncogene
   c. Gatekeeper and Proto-Oncogene
   d. Gatekeeper and Caretaker
   e. Caretaker

3) Which of the following family history scenarios for our 45 year old imaginary patient would indicate that this imaginary patient should be referred to a genetic counselor for a BRCA related workup? **Circle all that apply**.
   a. She has a grandmother diagnosed with breast cancer at age 52.
   b. Her maternal first cousin and maternal great aunt were diagnosed with breast cancer at ages 49 and 71, respectively.
   c. She has a mother with recurrent thyroid cancer.
   d. She has an uncle diagnosed with breast cancer at 87 years of age.
   e. Her father and paternal uncle were diagnosed with aggressive prostate cancer
   f. Her mother was diagnosed with triple negative breast cancer at 58 years old

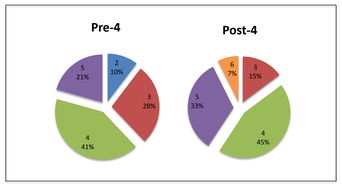
Table 1. *P-level* for Confidence Questions

	p-level
Differential Diagnosis	<0.001
Risk Assessment	<0.001
Screening Guidelines	0.0003
Implications	0.0012

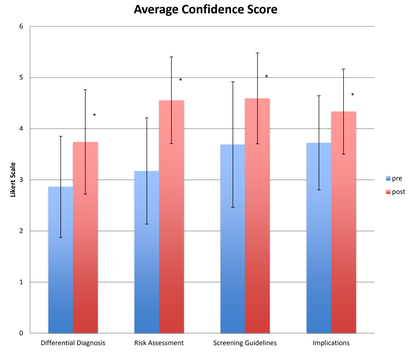
Table 2. *P-level* for Quiz

	p-level
Quiz	<0.001

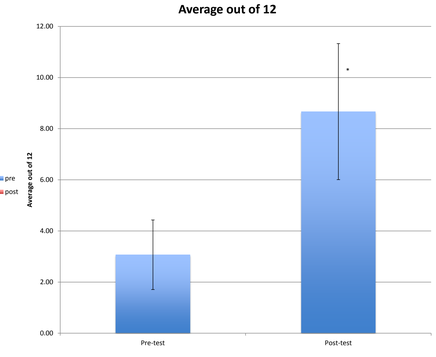
Figure 2. Breakdown of Scores on Likert Scale for Implications Question (example)



Graph 1. Average Confidence Scores (+/- 1 S.D.)



Graph 2. Average scores on Quiz (+/- 1 S.D.)



Discussion

- As compared to the pre-test, confidence scores increased post presentation in all areas: differential diagnosis, risk assessment, screening guidelines, and implications of genetic testing.
- Participants learned how to find a five year risk assessment using the GAIL tool available online.
- They learned the importance of taking a three generation family history for risk assessment and the importance of identifying high risk individuals. On the post-test, most participants were able to identify correctly 3 out of 4 scenarios for genetic councilor referrals (up from 1 out of 4).
- Participants were able to identify 5 out of 7 BRCA related cancers post presentation as compared to 2 out of 7 on the pre-test.
- Prior to the presentation, none of the participants were able to identify the mechanism of the BRCA1 gene, post presentation 23 out of 27 participants were able to correctly identify the mechanism.
- Given these results, it appears that a 20-minute presentation is efficacious in presenting genetics concepts and screening guidelines for breast cancer.
- This could be used as a model for other genetics education for IM residents. Possible topics for monthly presentations could include: colon cancer, ovarian cancer, emphysema, cardiology – long and short QT, blood disorders, pancreatic cancer, neurologic disorders, among others.

Limitations

- Initially, the plan was to use the medical students as a control and compare their results to the residents. Participants were asked to denote what PGY they were in or they were a student. However, only 10 participants actually filled that information in. Therefore, we chose to analyze the data as one group with no control.
- The presentation was compiled and delivered by a fourth year medical student, therefore, it would be difficult to replicate.
- The presentation design was not standardized.

References

1. Riegert-Johnson, D.L., Korf, B.R., Alford, R.L., Broder, M.I., Keats, B.J., Ormond, K.E., … Watson, M.S. (2004). Outline of a medical genetics curriculum for internal medicine residency programs. *Genetics in Medicine: Official Journal of the American College of Medical Genetics, 6*(6), 543-547. doi:00125817-200411000-00015 [pii]