

Integration of Genetics and Genomics Elements in a Graduate Nurse Practitioner Program: A Curriculum Quality Improvement Project

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Purpose

- To advance genetic and genomic learning outcomes among graduate nurse practitioner students at the University of South Florida (USF)
- To design and implement a genetics/genomics education module consistent with the *Essential Genetic and Genomic Competencies for Nurses with Graduate Degrees* published by the American Nurses Association (ANA) and the International Society for Nurses in Genetics (ISONG)
- To compare and contrast pre- and post-test scores on an objective, reliable, and validated instrument, the Genomic Nursing Concept Inventory® (GNCI®)

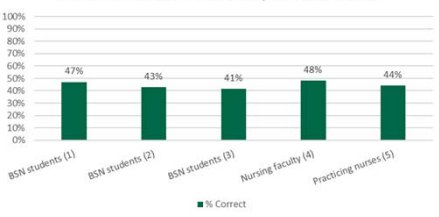
Background

- An understanding of genetics/genomics concepts is increasingly relevant to primary care and other non-genetics specialties
- Risk for patient harm exists when health care professionals are not sufficiently trained in genetics, including adverse psychosocial effects, screening and testing errors, misinterpretation of results, medical mismanagement, and inappropriate use of health care resources
- Essential nursing genetics and genomics competencies have been well defined but not well disseminated, and have not been well integrated into graduate level nursing curricula
- Nurses across educational levels and professional roles are lacking knowledge, skills, and abilities regarding genetics and genomics
- Inadequate education of health care providers plays a significant role in the challenge of integrating genetics and genomics into clinical care

Nursing Genetics/Genomics Competencies

- American Association of Colleges of Nursing
The Essentials of Baccalaureate Education for Professional Nursing Practice (2008)
- A liberal education as the basis for nursing practice includes the life sciences (e.g. biology and genetics)
 - Genetics and genomics impact health policy
 - Health promotion and clinical prevention include assessment of genetic/genomic and family history based risk factors
 - Nurses should be prepared to work with patients who require genetic technologies and treatments
 - Genetics and genomics relate to prevention, screening, diagnostics, prognostics, selection of treatment, and monitoring of treatment effectiveness
 - Specific knowledge/skills include pharmacogenomics and pedigree construction with standardized symbols and terminology
- The Essentials of Master's Education in Nursing* (2011)
- Master's prepared nurses incorporate genetic/genomic evidence in providing advanced nursing care to individuals, families, and communities
 - Master's prepared nurses synthesize many elements of health, including genetics and genomics risk assessment, to deliver evidence-based care for vulnerable populations
 - Master's prepared nurses possess a high level of understanding of evolving trends in health care such as genetics and genomics
- The Essentials of Doctoral Education for Advanced Nursing Practice* (2006):
- Genomics is one of the sciences that provides the foundation for nursing practice
- American Nurses Association
Essentials of Genetic and Genomic Nursing: Competencies, Curricula Guidelines, and Outcome Indicators (Essentials) (2008)
- 25 minimum genetic and genomic competencies expected of every registered nurse regardless of academic preparation, practice setting, role, or specialty
 - Professional Responsibilities: incorporation of genetic and genomic knowledge and skills
 - Professional Practice: integration and application of genetic/genomic knowledge to nursing assessments, identification of risk factors and resources, referral activities, and provision of education, care, and support
- American Nurses Association and International Society of Nurses in Genetics
Essential Genetic and Genomic Competencies for Nurses with Graduate Degrees (Graduate Essentials) (2012)
- 38 competencies that build on the original *Essentials* document and assume that nurses pursuing graduate degrees have already achieved those competencies
 - Apply to all nurses prepared at the master's or doctoral level, including clinical nurse specialists, nurse practitioners, nurse educators, nurse administrators, and nurse scientists
 - Categories: risk assessment and interpretation, genetic education, counseling, testing, and results interpretation, clinical management, ethical, legal, and social implications, professional role, leadership, and research

GNCI® Formative Performance, Previous Studies

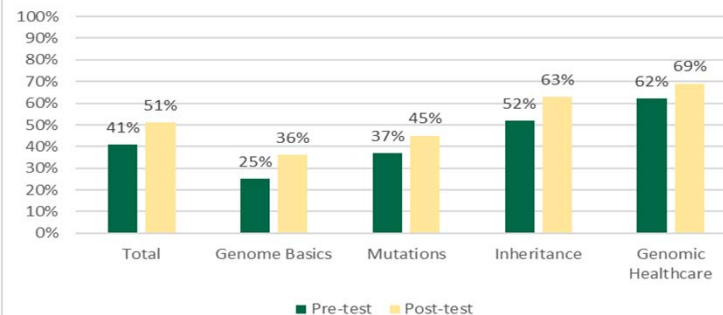


Findings/Results

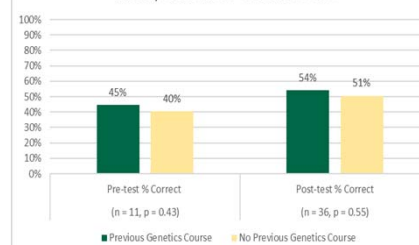
USF NP Students <i>n</i> = 47	Pre-test	Post-test	<i>p</i> two-tail	<i>t</i>
Total scores				
Mean (SD)	12.81 (3.66)	15.91 (4.36)	0.00*	-6.48
Mean % correct	41%	51%		
Minimum	5	7		
Maximum	21	23		
Genome Basics				
Mean (SD)	3.21 (1.90)	4.70 (1.99)	0.00*	-5.99
Mean % correct	25%	36%		
Minimum	0	1		
Maximum	8	9		
Mutations				
Mean (SD)	1.11 (0.89)	1.34 (0.84)	0.09	-1.76
Mean % correct	37%	45%		
Minimum	0	0		
Maximum	3	3		
Inheritance				
Mean (SD)	4.17 (1.66)	5.06 (1.87)	0.00*	-3.46
Mean % correct	52%	63%		
Minimum	0	2		
Maximum	7	8		
Genomic Healthcare				
Mean (SD)	4.32 (1.35)	4.81 (1.28)	0.01*	-2.58
Mean % correct	62%	69%		
Minimum	1	2		
Maximum	7	7		

* Significance based on $p < 0.05$

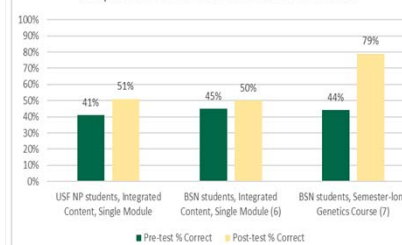
GNCI® Pre-test and Post-test Scores



History of Previous Genetics Course



Comparison Pre-test and Post-test GNCI® Scores



(1) Ward, Haberman, & Barbosa-Leiker, 2014; (2) Ward, French, Barbosa-Leiker, & Iverson, 2016; (3) Ward, Purath, & Barbosa-Leiker, 2016; (4) Rea & Ward, 2016; (5) McCabe, Ward, & Ricciardi, 2016; (6) Munroe & Loerzel, 2016; (7) Ward, 2013

Methods

- Project Design: Small-scale pilot of an educational module consistent with the ANA's and ISONG's *Essential Genetic and Genomic Competencies for Nurses with Graduate Degrees*, with knowledge assessment using a pre- and post-test design
- Setting: Module and assessments were implemented within the USF College of Nursing Advanced Diagnostics and Procedures course (NGR6064C) Spring 2018 semester
- Sampling Strategy: Participants were recruited from a convenience sample of graduate level nurse practitioner (NP) students. Eligible students were 18+ years of age and present for the live session of NGR6064C during which the educational module was presented. Students were excluded if they chose not to participate or if they did not complete both the pre- and post-test assessments.
- Data Analysis: Using Microsoft® Excel 2016, data was analyzed using descriptive statistics and t-tests with tests of significance

Limitations

- Convenience sample used for this project may not be representative of graduate level nurse practitioner students in other educational programs
- Comparison data regarding GNCI® performance in graduate level nursing student and practicing nurse practitioner populations is lacking
- Post-test was offered immediately following presentation of the educational module, so scores were likely influenced by the recency of the material
- Participation was not associated with any grade, extra credit, or other external motivator, so it is possible students did not give their full efforts
- GNCI® limitations
 - Based on the original *Essentials* rather than the *Graduate Essentials*, however the *Graduate Essentials* build on the original *Essentials* and assume that nurses pursuing graduate degrees have already achieved those competencies
 - Some items consistently perform poorly
 - No assessment of the ethical, legal, and social implications (ELSI) associated with genetics and genomics

Discussion & Future Implications

- Total GNCI® scores changed from $M = 12.81$ ($SD = 3.66$) before the educational module to $M = 15.91$ ($SD = 4.36$) after the educational module. This change was statistically significant, ($t(46) = -6.48, p = 0.00$). The scores changed in the positive direction, indicating a gain in knowledge.
- Implementation of a single educational module contributed to knowledge gains, but more genetics/genomics curricular content is needed to further increase knowledge
- Across roles and levels of education, nurses, nursing students, and nursing faculty with greater exposure to genetics and genomics curricular content and/or continuing education perform notably better on the GNCI®
- Challenges to including more genetics/genomics curricular content include time constraints, decisions on how to include the material (integrated content, stand-alone course, simulations, etc.), and limited faculty knowledge of and confidence in the subject matter
- Poorest performing subscale was Genome Basics, suggesting an inadequate understanding of basic concepts which could lead to errors in patient care
- Scores were higher on application based items versus basic knowledge items, so future instruction may be more effective when combined with simulations and case studies

Acknowledgements

Many thanks go to Dr. Sharlene Smith and Dr. Melanie Michael for their guidance, mentorship, and unwavering support of this project, to Dr. Elizabeth Remo-Platt and Dr. Andrea Efre for their permission to implement this project within their NGR6064C course, and to the students who participated in this project.

