

# Introducing a New Competency Into Nursing Practice

**Kathleen A. Calzone, PhD, RN, APNG, FAAN; Jean Jenkins, PhD, RN, FAAN; Stacey Culp, PhD; Sarah Caskey, MS; and Laurie Badzek, LLM, JD, MS, RN, FAAN**

As science advances, new competencies must be integrated into nursing practice to ensure the provision of safe, responsible, and accountable care. This article utilizes a model for integrating a new complex competency into nursing practice, using genomics as the exemplar competency. Nurses working at 23 Magnet® Recognition Program hospitals participated in a 1-year new competency integration effort. The aim of the study was to evaluate nursing workforce attitudes, receptivity, confidence, competency, knowledge, and practices regarding genomics. Results were analyzed using descriptive statistical techniques. Respondents were 7,798 licensed registered nurses. The majority (89%) said it was very or somewhat important for nurses to become more educated in the genetics of common diseases. Overall, the respondents felt genomics was important, but a genomic nursing competency deficit affecting all nurses regardless of academic preparation or role was observed. The study findings provide essential information to help guide the integration of a new competency into nursing practice.

With scientific advances, new competencies must be integrated into nursing practice to ensure the provision of safe, responsible, accountable care. Frequently, such integration requires a large scale effort because of the profession's size and diversity: more than 3.2 million licensed nurses, of which 2.9 million are actively practicing (Health Resources and Services Administration [HRSA], 2010). As new concepts become associated with nursing practice, new competencies evolve as a result of research, education, and praxis. The primary aim of this research project is to improve the capacity of institutions to integrate a competency into nursing health care delivery. A detailed understanding of the beliefs, knowledge, and practices of a diverse population of nurses is essential to planning interventions associated with introducing a new competency. In this study, genomics was selected as the exemplar competency for integration evaluation. Genomics is an established core competency for all registered nurses (RNs) regardless of academic preparation, clinical role, or specialty (Consensus Panel on Genetic/Genomic Nursing Competencies, 2009). Personalizing health care through the use of genomics is associated with improving patient quality, safety, and health outcomes, all priorities for nursing regulation.

Genomics represents an especially complex competency to diffuse. Competency hinges on knowledge of the innovation, yet the majority of health care providers and faculty have limited or no educational background in genomics (Calzone, Jenkins, Culp, Bonham, & Badzek, 2013; Haga, Burke, Ginsburg, Mills, & Agans, 2012; Jenkins & Calzone, 2012; Skirton, O'Connor, & Humphreys, 2012). This limitation directly influences the ability of health care workers to comprehend the relative advantage

in health care quality, safety, and outcomes offered by genomics and the relevance to their practice. Furthermore, genomics' compatibility with existing values and experiences can be influenced by misperceptions, such as genetic determinism, fear of misuse, or the misperception that genomic applications are limited to single gene disorders that impact small numbers of patients cared for by genomic specialists (Korf, 2012). Additionally, many genomic applications, such as selecting medications and dosages and avoiding adverse drug events, are unrecognized (Manolio et al., 2013).

Genomics is the study of how genetic variation impacts health and includes risk identification, disease screening, prevention, diagnosis, prognostics, and therapeutic decision making (Green, Guyer; National Human Genome Research Institute, 2011). The improvement in health outcomes as a result of genomic information can be seen with diseases for which the adoption of genomics has been translated into practice. For example, predisposition genetic testing, tumor profiling, targeted therapies, and pharmacogenomics are personalizing care for cancer patients while improving quality, safety, and outcomes (McDermott, Downing, & Stratton, 2011). Genomic discoveries that provide evidence of clinical utility continue to emerge for all health conditions, including common complex ones (Korf & Rehms, 2013). This broad application of genomics challenges the health care community to be knowledgeable about genomics, a science in which most providers have limited competency.

## Theoretical Framework

Several theoretical frameworks can be used to study the integration of a complex competency into practice. The theoretical framework chosen to guide this project was Rogers' Diffusion of Innovations (DOI) (Rogers, 2003). Genomics, as a new complex competency, meets the definition of an innovation according to DOI because it represents an idea, practice, or object with the perception of newness (Calzone et al., 2012). Though genomics is not new, Rogers (2003) argues that newness is also a function of knowledge, persuasion, or adoption.

The major stages of DOI include knowledge; persuasion consisting of the advantage, compatibility, complexity, trialability, and observability of the innovation; adoption decision; implementation; and confirmation. Rates of innovation adoption are influenced by several factors, including communication channels used for dissemination; time; and the social system consisting of the health care community in which the competency is being introduced. Individual adopter characteristics, including individual innovativeness, prior experience with the innovation, perceived need, and normative values of the social system, also influence adoption rates.

The framework for nursing genomic competencies is well established (Consensus Panel on Genetic/Genomic Nursing Competencies, 2009; Greco, Tinley, & Seibert, 2012). Given the complexity of genomics, dissemination of a large-scale competency integration effort must be informed by evidence regarding the aspects that influence diffusion and can inform intervention efforts.

## Materials and Methods

This longitudinal study provided a cross-sectional analysis of baseline data from RNs employed at 23 American Nurses Credentialing Center designated Magnet<sup>®</sup> Recognition Program hospitals. The institutions were in 17 states, representing all regions of the United States and included one rural, three children's, one Veterans Administration, and one psychiatric hospital as well as one cancer center. The number of RNs employed per institution ranged from 80 to 3,000 at the time of the baseline survey.

The survey was administered at each institution between July and October 2012 and was open for completion at each institution for 28 total days. Each institution had a minimum recruitment strategy of using e-mail notification of survey availability at baseline and sending periodic reminders. Institutions could implement additional strategies to increase survey response; strategies were varied and included offering incentives (with local institutional review board [IRB] approval), walking rounds, advertising, supervisor encouragement, and intranet postings. All participating hospitals reported similar survey burden challenges, with 100% reporting having conducted an institution-wide nursing survey in the past 6 months.

## Survey on Competency Integration

The baseline data were obtained as part of a research project designed to establish and assess the outcomes of a year-long intervention to improve the capacity to integrate a new competency, genomics, into nursing practice. The aim of the baseline assessment was to evaluate institutional nursing workforce attitudes, receptivity, confidence, competency, knowledge, and practices regarding genomics.

### Eligibility

Eligibility criteria for survey participation included being an RN actively employed by a participating institution at the time of survey administration. RNs from all levels of academic preparation and roles were eligible. Non-RNs were excluded.

### Regulatory Approval

The West Virginia University (WVU) IRB reviewed and approved the study. The National Institutes of Health (NIH) Office of Human Subjects Research established a reliance agreement between the WVU IRB and the NIH for the project. Additional institution-specific regulatory requirements varied. Some institutions agreed to rely on the WVU-IRB approval because the local IRB considered the study exempt from the Code of Federal Regulations (45 CFR 46) given the anonymous nature of the survey collection and minimal risk. However, some institutions needed institutional IRB review.

### Instrument

The instrument utilized for this study, the Genetic/Genomic Nursing Practice Survey (GGNPS), measures constructs from Rogers DOI (Rogers, 2003). The GGNPS assesses attitudes, receptivity, the nursing practice social system, confidence, competency/knowledge, and decision/adoption of genomics as well as routine demographics. Instrument validation was performed using structural equation modeling, which found the instrument items aligned well with the DOI domains (Jenkins, Woolford, Stevens, Kahn, & McBride, 2010). Instrument item format included multiple-choice, dichotomous yes/no, and Likert-scale questions on the genomics of common diseases and family history. The instrument, which was administered online, is open access and available at <http://onlinelibrary.wiley.com/doi/10.1111/j.1547-5069.2012.01475.x/supinfo>. The focus on the genomics of common diseases and family history applies to the practice of all nurses regardless of setting or role and avoids the disparities associated with access or cost of genomic technologies.

To assess the use of race in clinical practice, the Genetic Variation Knowledge Assessment Index (GKAI) and the Racial Attributes in Clinical Evaluation scales were used (Bonham, Sellers, & Woolford, 2013). Two questions from the GKAI were reported in this article; the rest of the data from these instruments will be reported separately.

TABLE 1

**Demographics of the Study Sample**

Demographic Variable	N (%)
<i>Gender (n = 5,206)</i>	
Male	329 (6.3%)
Female	4,877 (93.7%)
<i>Race (n = 5,054)</i>	
White	4,275 (84.6%)
Asian	384 (7.6%)
Black/African American	335 (6.6%)
American Indian/Alaska Native	26 (0.5%)
Native Hawaiian/Pacific Island	34 (0.7%)
<i>Consider themselves Hispanic or Latino (n = 5,184)</i>	
Yes	231 (4.5%)
No	4,953 (95.5%)
<i>Highest level of nursing education (n = 5,218)</i>	
Diploma	324 (6.2%)
Associate degree	1,062 (20.4%)
Baccalaureate degree	3,068 (58.8%)
Master's degree	731 (14.0%)
Doctorate degree	33 (0.6%)
<i>Primary role (n = 4,977)</i>	
Staff nurse	3,639 (73.1%)
Head nurse	288 (5.8%)
Educator	230 (4.6%)
Supervisor	232 (4.7%)
Nurse practitioner	185 (3.7%)
Clinical nurse specialist	110 (2.2%)
Director/assistant director	109 (2.2%)
Case manager	96 (1.9%)
Consultant	47 (0.9%)
Researcher	41 (0.8%)
<i>Percentage of time spent seeing patients (n = 5,003)</i>	
Mean	74.1%
Range	0–100%
Demographic Variable	Years
<i>Number of years worked in nursing (n = 5,176)</i>	
Mean	17.7
Range	1–50
<i>Age (n = 4,776)</i>	
Mean	44.9
Range	21–73

**Data Analysis**

Cross-sectional analysis of the baseline data was performed using IBM® SPSS® for Windows, Version 21. Frequencies for survey items were calculated. Relationships between categorical survey items were assessed using Chi-squared tests. For the purpose of obtaining an objective knowledge measurement, 12 knowledge questions representative of core genomics concepts were selected. Each of the 12 questions was transformed into a correct or incorrect response for analysis. The knowledge score was the total

number of correct responses out of 12. The knowledge score questions assessed family history, the nurse's role in genomics, the value of family history in health care decision making, genomics of common diseases, and basic genetic concepts. The total knowledge score was restricted to only those respondents who answered all 12 questions. A Chi-squared test was performed to assess the relationships among total knowledge score, specific knowledge score items, role of the nurse, and highest level of nursing education. The level of significance was  $\alpha = 0.05$ , and all tests of statistical significance were two-tailed.

**Survey Results**

From the 23 participating hospitals, 27,613 RNs were eligible to take the survey, and data were obtained on 7,842 nurses. Of those, seven licensed practical nurses and five nonnurses were excluded because they did not meet the eligibility criterion of being an RN. Additionally, 32 respondents did not designate an institutional affiliation and were excluded, leaving 7,798 RNs for analysis.

Response rates varied among hospitals, ranging from 17% to 63%. Hospital size ranged from 80 to 3,000 RNs per institution. The response rate from all hospitals combined was 28%; most hospitals achieved a response rate greater than 20%.

Table 1 summarizes the demographics of survey participants. Most were female (93.7%,  $n = 4,877/5,206$ ) and white (84.6%,  $n = 4,275/5,054$ ) and held baccalaureate degrees (58.8%,  $n = 3,068/5,218$ ), which is consistent with Magnet demographics. Respondents were largely staff nurses (73.1%,  $n = 3,639/4,977$ ); they were experienced (mean 17.7 years working in nursing); and they spent most of their time seeing patients (mean 74.1%).

**Attitudes and Receptivity**

The operational definitions of the Attitudes and Receptivity domain included the perceived importance, advantages, and disadvantages of integrating genomics into practice; the complexity of integrating family history into practice; and the perception of the value of family history in patient care and personal practice (Calzone et al., 2012).

Nurses reported the following most frequently cited advantages of integrating the genetics of common diseases into their practice:

- Better decisions about the recommendations for preventive services (68.5%;  $n = 5,343/7,798$ )
- Better treatment decisions (64.7%;  $n = 5,045/7,798$ )
- Improved patient services (64.4%;  $n = 5,019/7,798$ )
- Better adherence to clinical recommendations (50.0%;  $n = 3,897/7,798$ )

The most frequently cited disadvantages of integrating the genetics of common diseases into practice included:

- Need to educate nurses in genetics (47.7%;  $n = 3,717/7,798$ )

TABLE 2

## Influence of Education Level on Attitudes, Confidence, Knowledge, and Practice

Survey Item	Nursing Education Level					p Value (Chi-Square)
	Doctorate Degree (%) N	Master's Degree (%) N	Baccalaureate Degree (%) N	Associate Degree (%) N	Diploma (%) N	
<i>Attitude Domain</i>						
Agreed or strongly agreed that nurses have a role in counseling patients about genetic risks	72.7% n = 24/33	74.5% n = 543/729	57.4% n = 1,748/3,045	52.9% n = 554/1,048	54.5% n = 175/321	p < 0.001
<i>Confidence Domain</i>						
Reported being very or more confident in deciding which family information is needed to tell something about a patient's genetic susceptibility to common diseases	27.3% n = 9/33	21.4% n = 156/730	15.5% n = 475/3,056	15.9% n = 168/1,056	13.3% n = 43/324	p < 0.001
<i>Knowledge Domain</i>						
Reported having heard or read about the genomic nursing competencies	42.4% n = 14/33	13.5% n = 95/702	8.3% n = 246/2,973	7.0% n = 71/1,017	6.7% n = 21/313	p < 0.001
Correctly answered a true-false question about whether the DNA of sequences of two randomly selected healthy individuals of the same sex are 90% to 95% identical	45.5% n = 15/33	28.9% n = 210/726	25.0% n = 760/3,040	18.8% n = 197/1,050	14.2% n = 45/317	p < 0.001
Correctly answered a true-false question about whether most common diseases, such as diabetes or heart disease, are caused by a single gene variant	45.5% n = 15/33	36.1% n = 262/725	27.2% n = 826/3,034	23.8% n = 250/1,050	23.0% n = 73/318	p < 0.001
<i>Decision/Adoption Domain (Practice)</i>						
Reported always or often collecting a family history in the prior 3 months	38.9% n = 7/18	21.1% n = 103/487	12.0% n = 317/2,644	10.4% n = 101/969	10.9% n = 28/257	p < 0.001

- Increase in insurance discrimination (39.0%; n = 3,042/7,798)
- Increase in patient anxiety about risk (38.6%; n = 3,007/7,798)
- Greater burden of responsibilities on nurses (26.4%; n = 2,061/7,798)

The majority felt it was very important or somewhat important that nurses become more educated about the genetics of common diseases (88.8%; n = 6,309/7,108). Most agreed or strongly agreed (70.8%; n = 4,204/5,942) that family history taking should be a key component of nursing care. Nurses also agreed or strongly agreed (58.4%; n = 3,480/5,959) that nurses have a role in counseling patients about genetic risks. Most (63.8%; n = 3,383/5,303) intend to learn more about genetics and would attend a course on their own time (63.4%; n = 3,353/5,292).

Nurses reporting an increase in insurance discrimination as a disadvantage were more likely to not have facilitated a referral to genetic services in the past 3 months (p < 0.001). Nurses

reporting that becoming more educated about the genetics of common diseases was very or somewhat important were more likely to indicate that a family history, including the second and third generations, should be collected on all new patients (p < 0.001).

Higher academic nursing education positively influenced attitudes about genetics. (See Table 2.) Similarly, nurses who attended a genetics course since licensure were more likely to report that becoming more educated about the genetics of common diseases was very important (p < 0.001) and strongly agreed or agreed that nurses have a role in counseling patients about genetic risks (p < 0.001). Staff nurses, head nurses, supervisors, and educators were the least likely to think that becoming more educated about the genetics of common diseases was very important for nurses (p < 0.001).

TABLE 3

**Total Knowledge Score Items**

Item Number	Item	Correct N (%)	Incorrect N (%)
1	A family history that includes only first-degree relatives, such as parents, siblings, and children, should be taken on every new patient.	964 (18.8%)	4,174 (81.2%)
2	A family history that includes second- and third-degree relatives, such as grandparents, aunts, uncles, and cousins, should be taken for every new patient.	2,746 (53.4%)	2,392 (46.6%)
3	Family history taking should be a key component of nursing care.	3,667 (71.4%)	1,471 (28.6%)
4	There is a role for nurses in counseling patients about genetic risks.	3,028 (58.9%)	2,110 (41.1%)
5	Do you think that genetic risk (e.g., as indicated by family history) has clinical relevance for breast cancer?	5,119 (99.6%)	19 (0.4%)
6	Do you think that genetic risk (e.g., as indicated by family history) has clinical relevance for colon cancer?	5,105 (99.4%)	33 (0.6%)
7	Do you think that genetic risk (e.g., as indicated by family history) has clinical relevance for coronary heart disease?	5,108 (99.4%)	30 (0.6%)
8	Do you think that genetic risk (e.g., as indicated by family history) has clinical relevance for diabetes?	5,107 (99.4%)	31 (0.6%)
9	Do you think that genetic risk (e.g., as indicated by family history) has clinical relevance for ovarian cancer?	5,060 (98.5%)	78 (1.5%)
10	Does family history support clinical decisions (such as administering drugs prescribed)?	3,014 (58.7%)	2,124 (41.3%)
11	The DNA sequences of two randomly selected healthy individuals of the same sex are 90% to 95% identical.	1,204 (23.4%)	3,934 (76.6%)
12	Most common diseases, such as diabetes and heart disease, are caused by a single gene variant.	1,396 (27.2%)	3,742 (72.8%)

**Social System**

The operational definitions of the Social System domain included supervisory support for nurses using genomics and institutional support for genomic continuing education (Calzone et al., 2012). Only 25.3% ( $n = 1,342/5,314$ ) reported they thought their senior staff members see genetics as an important part of the respondents' role. Additionally, 45.5% ( $n = 2,430/5,343$ ) said they could not and 4.0% ( $n = 215/5,343$ ) said they did not know whether they would be able to attend a genetics course during work hours.

**Confidence**

The operational definitions of the Confidence domain included self-reported confidence in discussing genetics with patients; deciding which family history information is relevant to assessing genetic susceptibility; facilitating referral for genetic services; and knowing the availability, risks, benefits, and limitations of genetic testing (Calzone et al., 2012).

As summarized in Table 2, the higher the level of academic preparation in nursing, the greater the nurse's confidence in deciding which family history information is needed to evaluate a person's genetic susceptibility to common diseases. Also, nurses who attended a genetics course since licensure reported greater

confidence when compared with those who had not attended genetic continuing education courses ( $p < 0.001$ ).

**Competency and Knowledge**

The operational definitions of the Competency/Knowledge domain included knowledge of the genomics of common diseases and the family history information needed to evaluate patients' genetic susceptibility (Calzone et al., 2012). The majority of nurses described their genetic knowledge as poor (57.3%;  $n = 3,046/5,312$ ). Most nurses (59.7%;  $n = 4,654/7,798$ ) reported that their limited expertise in genetics caused a limited ability to discuss the genetics of common diseases with individuals.

Ninety-one percent ( $n = 4,774/5,250$ ) indicated that they had not heard nor read about the genomic nursing competencies. However, 52% ( $n = 2,751/5,291$ ) reported that their nursing curriculum included genetics content. Since licensure, 86.8% ( $n = 4,594/5,294$ ) indicated they had not attended any courses that included genetics as a major component. Higher levels of academic preparation positively influenced knowledge about the genomic nursing competencies. Additionally, nurses who had genetics content in their curriculum or reported attending a genetics course since licensure were more likely to report that

they had heard or read about the genomic nursing competencies ( $p < 0.001$ ).

The knowledge score (maximum score, 12) was calculated for the 5,138 nurses who answered all 12 questions. The mean total knowledge score was 8.08/12 with a standard deviation of 1.62. Table 3 provides the proportion of correct and incorrect knowledge score responses. Staff nurses had the lowest mean total knowledge score (7.91; 95% CI, 7.86–7.97). Researchers (9.03; 95% CI, 8.54–9.52) and nurse practitioners/clinical nurse specialists (8.92; 95% CI, 8.74–9.10) had the highest overall mean total knowledge scores. Total knowledge scores were higher among nurses who had higher levels of academic preparation ( $p < 0.001$ ); reported having genetics content in their nursing curriculum ( $p < 0.001$ ); or attended a course that included genetics content since licensure ( $p < 0.001$ ).

Two items from the GKAI (Table 3 items 11 and 12) were used to assess specific knowledge of the genomics of common diseases. For both items, the majority of nurses answered incorrectly. Higher levels of academic preparation resulted in a statistically significant difference in correct responses to these questions ( $p < 0.001$ ). However, no statistical difference was found in nurses having genetics content in their nursing curriculum and correctly responding to these questions.

### Decision and Adoption

The operational definition of the Decision/Adoption domain in the instrument included utilization of family history information in the past 3 months, which documents practice integration (Calzone et al., 2012). Only 4.1% ( $n = 204/4,979$ ) reported that they always collected a complete family history in the past 3 months. Furthermore, 92.8% ( $n = 4,563/4,913$ ) indicated that they never or rarely facilitated referrals to genetic services in the past 3 months. The majority (64.9%;  $n = 3,193/4,923$ ) reported that in the past 3 months they never or rarely used family history information when facilitating clinical decisions or recommendations for their patients. Nurse practitioners/clinical nurse specialists were the most likely (31.4%;  $n = 80/255$ ) to report they always or often collected family history in the past 3 months. Staff nurses (11.4%;  $n = 391/3,424$ ), director/assistant director (8.3%;  $n = 2/24$ ), case managers (4.6%;  $n = 3/65$ ), and consultants (3.7%;  $n = 1/27$ ) were the least likely to always or often collect family history.

Education level significantly influenced whether nurses reported always or often completing a family history in the past 3 months. No statistical difference was found between nurses who did or did not report genetic content in their curriculum and the rate of family history collection in the past 3 months. However, nurses who attended a course that included genetics since licensure were more likely to have always or often collected family history ( $p < 0.001$ ).

## Discussion

This baseline assessment of RNs provides data that do inform strategies, such as awareness campaigns, continuing education courses, leadership persuasion, and policy review and development, for facilitating the integration of genomics into practice. Using information collected in baseline assessments is the foundation for the development of most appropriate targets for interventions to integrate a new competency. Baseline assessments in this study show that, overall, most RNs had little to no confidence in key aspects of genomic integration and adoption. The greatest lack of confidence was in the capacity to generate referrals to genetics specialists who are trained to provide assistance and guidance about genetic issues. Many nurses had misperceptions that can be key education targets, such as the concerns that genetics would increase insurance discrimination (39%). What is uncertain is whether the nurses reporting a concern about genetic discrimination know about protections provided by federal legislation in the Genetic Information Non-Discrimination Act (Genetics and Public Policy Center, 2008).

The overall knowledge score was high (mean of 8.08/12), which is slightly lower than knowledge scores seen in the National Nursing Workforce Study (NNWFS) (8.99/12) (Calzone et al., 2013). However, as with the NNWFS, very specific knowledge questions showed considerable opportunity for targeted education to improve competency. Of concern is that more than 50% of nurses do not have confidence that they could access current, reliable information about genetics and common diseases. Thus, even though most nurses are motivated to learn more, they need help identifying reliable resources to improve their competency.

These knowledge deficits are potential barriers to adoption of genomics into practice. Nurses in this study recognized that their limited knowledge diminishes their ability to talk with patients about the genetics of common diseases. Family history is the simplest, cheapest sensitive genetic test that most nurses were not confident performing; most did not know the key elements to collect, such as age at diagnosis of a health condition. Family history was collected by less than 30% of nurses. Nor did nurses feel confident that they could determine which patients would benefit from referral based on collected information. Of those who were seeing patients, the majority (69%) never or rarely assessed a complete family history in the past 3 months, and more than 59% had never or rarely facilitated a referral to genetic services. This study showed even fewer nurses were collecting family history than the NNWFS, in which 60% of nurses reported never or rarely taking a complete family history (Calzone et al., 2013). By contrast, a 1995 study of approximately 1,000 nurses found that 20% to 30% of nurses never performed a family history (Scanlon & Fibison, 1995). Family history remains a critical nursing competency because it is sensitive, informs the health care provider about risks, helps to identify those who may benefit from enhanced interventions, and is useful in establishing a differential diagnosis (Khoury, Feero, & Valdez, 2010).

Why were the knowledge and practice deficits observed in this study so vast when more than 50% of nurses reported that they had genetics content in their curriculum? The limited number of nurses (< 15%) who have attended continuing education that included genetics may be a contributing factor given the rapidly changing genomic knowledge and evidence base. Another possibility is that nurses do not recognize when genetics is included in the curriculum; clearly, higher levels of academic preparation made significant differences in all DOI domains. Several questions should be explored to truly understand this study's findings:

- What is the current capacity of faculty to teach genomics?
- What is the adequacy of genomic curriculum integration?
- What is the genomic competency of students at graduation, which is not fully integrated into licensure examination?
- Is reinforcement of content needed over time to achieve true competency?
- How does a lack of competency in the practice environment influence quality and safety outcomes?

This study does provide some evidence that despite the challenges, continuing education can be effective in expanding competency integration by improving attitudes, confidence, and knowledge and by adopting new practices based on increasing levels of academic preparation.

Focusing on academic education is a priority because universally higher levels of academic education positively influenced attitudes, confidence, knowledge, and adoption. Given that the majority of practicing nurses hold only an associate degree (HRSA, 2010) and the requirement for integration of genomics into nursing education is expected only for baccalaureate and higher degrees (American Association of Colleges of Nursing, 2008, 2011), achieving genomic competency and utilization of genomics in nursing practice will require considerable ongoing intervention.

Rogers' DOI indicates that a critical antecedent to moving toward adoption is the recognition of the advantage of the innovation. Overwhelmingly, nurses in this study felt that genomics is important and expressed intentions to learn more and to do so on their own time. However, gaps that facilitate innovation adoption exist in the practice health care environment. Approximately 75% of nurses reported that senior staff members do not believe that genetics is important to the nurse's role, nor do nurses (46%) believe that continuing genomic education would be supported as a work activity. The contrast between these reports regarding senior staff and the decision made by chief nursing officers to participate in a year-long program designed to improve genomic nursing competency raises several important questions. Who do the nurses identify as senior staff: line managers or senior executive leadership? How effective is messaging about quality and safety competency regarding genomics? Do these nurses have an accurate understanding of the support nursing leadership would provide for genomic continuing education? These ques-

tions are critical intervention targets because perceptions about priorities in the social system—the practice environment—can be a diffusion barrier.

The selection of Magnet hospital nursing programs for this study was strategic because they are expected to be positioned to identify innovative solutions to current competency workforce issues regarding genomics (Abraham, Jerome-D'Emilia, & Begun, 2011). As established leaders in the nursing practice environment, Magnet hospital nurses have the potential to exemplify possible change initiatives, generate outcome evidence associated with change strategies, and lead the way to improving and adding necessary complex nursing competencies and the infrastructure for successful integration. Additionally, a higher proportion of baccalaureate-prepared nurses are employed at Magnet hospitals compared with other health care institutions. In this study, approximately 60% of the respondents were baccalaureate prepared. As such, the population studied does not reflect the national nursing workforce.

## Conclusion

The current context of a rapidly changing health care environment spurred by technology and new discoveries has produced expansion in health care information that impacts public welfare, patient safety, and cost containment. One challenge is how to introduce new competencies related to clinically relevant science into patient care. Introducing a complex competency into the nursing scope of practice has ramifications for institutional systems, policies, and workforce preparation. Understanding the nursing workforce's social system, attitudes, confidence, and knowledge is essential to the design and adoption of new, effective nursing competencies. Expanding nursing competency is critical to expanding the larger system's ability to diffuse new information into practice to improve health outcomes and patient safety.

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search Institute, Genomic Healthcare Branch. **Stacey Culp, PhD**, is a research assistant professor, West Virginia University School of Nursing, Morgantown. **Sarah Caskey, MS**, is a project manager, West Virginia University School of Nursing. **Laurie Badzek, LLM, JD, MS, RN, FAAN**, is a professor and senior author, West Virginia University School of Nursing.

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**Kathleen A. Calzone, PhD, RN, APNG, FAAN**, is a senior nurse specialist, research, National Institutes of Health, National Cancer Institute, Center for Cancer Research, Genetics Branch. **Jean Jenkins, PhD, RN, FAAN**, is a clinical advisor, National Institutes of Health, National Human Genome Re-