

Impact of Public Health Nurse Training on their Perception to Provide Hypertension and Diabetes Care to Patients in their Communities

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ABSTRACT

Purpose: To evaluate the impact of protocol training by a medical school and public health department on nurses' perceptions to deliver care to patients with hypertension and diabetes.

Methods: Training was delivered using the Georgia Diabetes and Hypertension Nurse protocols for public health nurses. A survey was developed and distributed post training to participants. The training included lectures, workshops, case discussions, simulation, and physical examination practice on standardized patients. Participants were asked about perceptions, both before and after training completion regarding frequency in changing practice and confidence in treating hypertension and diabetes for six items.

Results: Perceived levels of confidence for all questionnaire items after training were significantly higher than before the training for both hypertension and diabetes. Perceived practice frequency levels for hypertension were significant with more frequency for all items. Frequency levels for diabetes increased and perceived practice frequency levels before and after the training differed by degree attainment.

Conclusion: Public health nurses showed increases in perceived confidence and frequency of performing patient care for diabetic and hypertensive patients. Those practicing under the protocol can carry out the full range of care activities needed for managing chronic disease, they have the potential to expand the availability, in rural and other underserved areas.

Keywords: Diabetes, hypertension, public health nurses, chronic diseases management, training

INTRODUCTION

Diabetes, especially Type II diabetes, and hypertension cost the U.S. more than 243 billion dollars per year in avoidable health care costs and are a leading cause of avoidable hospitalizations (Center for Disease Control [CDC] Chronic Disease Calculator, 2016 and Chronic Disease Overview, 2018). Diabetes and hypertension are often comorbidities (Epstein & Sowers, 1992) and have common risk factors including diet, lack of physical activity, tobacco use and secondhand smoke exposure, and lack of access to primary care.

Diabetes and hypertension impact a higher percentage of the total population in southern states, such as Georgia, where in 2015, the percent of GA adults diagnosed with diabetes was 11.3%, as compared with 9.9% nationally (CDC Diabetes Belt, National Institute of Health, n.d). In 2015, the percent of GA adults diagnosed with hypertension was 36.2%, as compared with 30.9% nationally (BRFSS, 2015).

The two conditions disproportionately burden low income, rural, uninsured, and African-American populations. Within Georgia and nationally, the prevalence of both conditions is

increasing, and the rate of associated hospitalizations also continues to climb (Patel, Baumler & Venkat Naraya, 2015). As a result, both diabetes and hypertension have been recognized as key priorities in the Georgia Department of Public Health (Georgia DPH) strategic plan as well as Georgia's State Health Improvement Plan.

As one means to address the burden of diabetes and hypertension, DPH undertook an initiative to expand local health department offerings of diabetes and hypertension diagnosis and management services in predominantly rural, multi-county public health districts across the State where the burden of diabetes and hypertension are high (e.g. South Health District, East Central Health District), (DPH Public Health Districts, 2017). Because access to physicians or higher-level healthcare providers who have prescribing privileges is limited in many of these areas, DPH's expansion relied on the use of specially trained public health nurses to deliver the necessary diagnostic and management services (HPSA, 2017). Using this team based approach, it was hoped that access to care and improved outcomes would result as have been reported to other settings (Hupke, 2014).

Under Georgia state law, registered nurses employed by DPH or a county board of health may perform certain delegated medical acts under a physician-supervised protocol (Georgia Code Title 43, 2010). In 2015, current evidence-based protocols were developed by a multidisciplinary team within DPH in cooperation with district public health leaders to enable local health department nurses to carry out these services (DPH Nurse Protocol, 2016).

Recognizing the complexity of the protocols, in 2016, DPH's state office partnered with Medical College of Georgia (MCG) at Augusta University and a local public health physician leader to design and implement a multi-day, intensive innovative training program for public health nurses to prepare them to implement the protocols. Nurse managers and nurses engaged in clinical service delivery from selected health districts traveled to Augusta to participate in a one-time training that included both didactic information regarding the conditions as well as case-based simulations with mock patient exams. The training was led by a public health physician leader and supported by nurse leaders who facilitated patient simulations.

METHODS

The training was delivered in 2016 and 2017 and was developed using the Georgia Diabetes and Hypertension Nurse protocols. Components of the training included lectures, workshops, case discussions, simulation, and physical examination practice on standardized patients in the Augusta University Interdisciplinary Simulation Center in Augusta, GA. Epidemiology, risk factors, disease process, and appropriate pharmacologic and non-pharmacologic management strategies were covered during the training sessions by MCG faculty members. The training was focused on the common presentations of hypertension and type 2 diabetes. More complex patients, including those requiring insulin were excluded from the protocol. Trained public health nurses were assessed through quizzes on clinical vignettes and an Objective Structured Clinical Examination (OSCE) using standardized patient cases. While the program was designed for BSN trained nurses, nurses without the academic background also participated.

To evaluate the impact of the training on clinical practice, a follow-up survey was developed and distributed nine-to-twelve months after the training. The survey was distributed to the 95 participants who attended the training between April and August of 2016. The email request included a Qualtrics® survey link.

Participants were asked about their perceptions of hypertension and diabetes both before and after completing the training. The six items used for both hypertension and diabetes included: taking an appropriate medical history, performing an appropriate physical exam, ordering appropriate lab tests, recommending behavior change, using appropriate medications, and referring to an appropriate specialist. The survey contains two subscales: respondents'

frequency in changing their practice and their confidence in performing the six items above. The frequency Likert-type scale included "never", "rarely", "sometimes", and "often", while the confidence items scale included "not confident at all", "a little confidence", "confident", and "very confident". Data on participants' demographic characteristics, level of education, and public health district were also collected.

All statistical analysis was performed using SAS 9.4 and statistical significance was assessed using an alpha level of 0.05. Descriptive statistics determined changes in perception for all variables. Questionnaire responses from before and after the training were analyzed by educational degree type controlling for age, race, and public health district, to examine differences in hypertension and diabetes practice frequency and confidence. Repeated measures of non-parametric mixed models were used. The method of estimation used was the minimum variance quadratic unbiased estimation of covariance parameters. An unstructured covariance structure was assumed. Denominator degrees of freedom were calculated using the Kenward-Roger method.

In each model, fixed main effects included age group, race, public health district, degree type, and measurement time. The two-factor interaction between degree type and measurement time was also included and the F-test for this interaction, determined using the Brunner, Domhof, and Langer method, is the statistical test of interest (Brunner, Domhof, & Langer, 2002). If the test for the two-factor interaction is statistically significant this will indicate that the changes due to the training are different due to the participant's level of education. If the test for the two-factor interaction was not statistically significant, the interaction effect was removed and the model was reduced to a main effects model. Post hoc pairwise comparisons were performed using a Bonferroni adjustment to the overall alpha level to control for the number of pairwise comparisons performed.

RESULTS

Of 95 participants invited to participate in the survey, 55 completed the evaluation (58 %). Respondents represented eight of Georgia's eighteen public health districts. Participants also were of varying ages and levels of nursing training. Most participants were 50-59 years (40.7%), followed by 40-49 years (29.6). The age ranges of 30-39 and 60-69 each had 13% of participants, and the least common range was 20-29 (3.7%). The educational attainment of participants included 17 (31.5%) with an Associate's Degree or Other indicated, 24 (44.4%) with a bachelor's degree and 13 (24%) with a Master's or Doctoral degree. However, participants were less diverse than the State of Georgia overall. Ninety-two percent identified their race as white and 7.4% identified as African-American or selected "other".

Hypertension

Statistically significant differences between perceived frequency before and after the training were found for performing the appropriate physical exam, ordering appropriate lab tests, and ordering blood pressure medication (Table 1). For each of these measures median “before” levels of frequency were significantly lower than median “after” levels of frequency. Statistically significant differences between before and after perceptions were seen for all confidence items. Levels of perceived confidence for all questionnaire items were significantly lower before the training than after (Table 1). For both frequency and confidence, all two-factor interactions between degree and perceived changes before and after the training were not statistically significant indicating no difference in median hypertension practice frequency or confidence.

Diabetes

The results for diabetes frequency (Table 1) were statistically significant for the two-factor interaction with degree attainment for all diabetes practice frequency items except recommending behavior change.

The change in diabetes perceived practice frequency levels before and after the training differed by level of degree

attainment. For taking an appropriate medical history, only those with a bachelor’s degree showed an increase in median frequency levels from before to after training ($p=0.0013$). For performing an appropriate physical exam, those with a bachelor’s degree ($p=0.0015$) and those with a Master’s or doctorate ($p<0.0001$) showed increased frequency levels from pre- to post-test. For ordering appropriate lab tests, only those with a Master’s/doctorate ($p=0.0019$) had a significant increase in median frequency levels. For prescribing diabetes medications, participants with a bachelor’s degree ($p=0.0045$) and those with a Master’s/doctorate ($p<0.0001$) showed increased perceived frequency levels from before to after the training. For referring to an appropriate specialist, only those with a Master’s/doctorate ($p=0.0064$) had a significant increase in median frequency levels.

Perceived levels of confidence for all questionnaire items after training were significantly higher than before the training. Confidence level differences were seen for all confidence questionnaire items and were statistically significant (Table 1). All two-factor interactions between degree and changes before and after the training were not statistically significant indicating no difference in median diabetes confidence.

Table 1

Repeated measures non-parametric mixed model results to compare nurses’ perceptions of changes between before the training and after

Outcome	HTN				Diabetes			
	Frequency		Confidence		Frequency		Confidence	
	F-value	F-value	p-value	F-value	p-value	p-value	F-value	p-value
Taking appropriate medical history	2.05	0.1521	12.27	0.0005*	5.79	0.0161*	13.08	0.0003*
Performing appropriate physical exam	6.83	0.0090*	37.82	<0.0001*	18.40	<0.0001*	21.41	<0.0001*
Ordering appropriate lab tests	5.89	0.0152*	16.61	<0.0001*	4.06	0.0439*	15.53	<0.0001*
Recommending behavior change	0.83	0.3634	4.50	0.0378*	1.40	0.2369	6.69	0.0097*
Ordering appropriate medications	7.83	0.0070*	36.86	<0.0001*	26.36	<0.0001*	48.01	<0.0001*
Referring to appropriate specialist	2.65	0.1034	16.42	<0.0001*	3.72	0.0537	19.51	<0.0001*

DISCUSSION

This partnership between a public, academic health center and a state department of public health successfully trained nurses in the care of patients with diabetes and hypertension. The two-day training workshops incorporated lectures, case discussions, and standardized patient simulations. Participants were surveyed both before the training and then again nine-to-twelve months after completion of the training to ask respondents to report their perceived frequency of performing relevant patient care and their confidence in six aspects of patient care. The response rate of 58% was satisfactory for a post-training evaluation.

Overall, confidence and perceived frequency of performance increased for both hypertension and diabetes items. Regarding hypertension, confidence in performing all six care skills increased, while perceived frequency of performing care increased in three of the six skills. Perceived frequency of performing some skills, such as taking a history and recommending behavior change, did not change after training. There were no effects between the educational level of the nurses and their confidence or perceived frequency measures. For diabetes, confidence increased for all six items, while perceived frequency of performance increased for nurses with higher education levels. This may reflect differences in clinical experience, with nurses having advanced training being more willing to evaluate and manage patients with diabetes.

This study provides evidence of training impact on nurses' perceptions to deliver care to patients with hypertension and diabetes. It is limited by a small sample size and by use of self-perception rather than direct measurement of practice changes. Future work should include objective assessment of practice patterns and clinical outcomes for treated patients.

PUBLIC HEALTH IMPLICATIONS

As chronic disease has become the predominant driver of morbidity and mortality in the United States, the healthcare workforce has proved insufficient to meet all the resulting health needs. One aspect of increasing national capacity to care for the increasing chronic disease population is for all providers to practice to the maximum of their scope of practice. This training sought to prepare nurses to manage patients with hypertension and diabetes, two extremely common, expensive, and important chronic conditions.

Nurses who completed this training showed increases in their perceived confidence and frequency of performing patient care for diabetic and hypertensive patients. Importantly, the training was delivered to an educationally-diverse group of nurses, including registered nurses (RN's). While advanced practice nurses have long been important parts of the care team for chronic disease, RN's typically do not fill this role due to scope of practice limitations. Because public health RN's practicing under protocol in Georgia can carry out the full range of care activities needed for managing chronic disease, they have

the potential to significantly expand the availability of care for this population, especially in rural and other underserved areas. However, as the evaluation results here show, there may be a need for additional training for RN's charged with carrying out the implementation of complex protocols.

The partners engaged in this collaboration intend to continue to offer the training to Georgia's public health nurses and to improve the training, as well as develop a refresher training, over time. Additional data on the efficacy of the training and the use of nurse protocols for the diagnosis and management of diabetes and hypertension may help to support efforts to seek additional resources to expand the activities in Georgia and in other rural states.

Statement of Authors' Contributions

Drs. Sacksteder LaClair and Wood were responsible for study and survey design, data collection, data analysis, IRB; they participated in writing the paper to include methods and results sections. Drs. Goggans, O'Connor, Martin and Wallach conceptualized and conducted the training. All contributed to manuscript preparation.

References

- Brunner, E., Domhof, S., & Langer, F. (2002). Nonparametric analysis of longitudinal data in factorial experiments. New York: John Wiley.
- CDC identifies diabetes belt. (n.d.). Centers for Disease Control. Retrieved from <https://www.cdc.gov/diabetes/pdfs/data/diabetesbelt.pdf>
- Chronic disease cost calculator version 2. (2016). [Calculator Diabetes and Hypertension April 3, 2018]. *Chronic Disease Calculator for Diabetes and Hypertension*. Retrieved from <https://www.cdc.gov/chronicdisease/calculator/index.html>.
- Chronic diseases and their common risk factors. (n.d.). World Health Organization. Retrieved from http://www.who.int/chp/chronic_disease_report/media/Factsheet1.pdf.
- Chronic disease overview. (2018). *Chronic Disease Prevention and Health Promotion*. Retrieved from <https://www.cdc.gov/chronicdisease/overview/index.htm>.
- Epstein, M., & Sowers, J. R. (1992). Diabetes mellitus and hypertension. *Hypertension*, 19(5), 403-418.
- Georgia Code Title 43 (2010). Professions and Businesses Chapter 34 - Physicians, Acupuncture, Physicians Assistants, Cancer and Glaucoma Treatment, Respiratory Care, Clinical Perfusionists, and Orthotics and Prosthetics Practice Article 2 - Medical Practice § 43-34-23 - Delegation of Authority to Nurse or Physicians Assistants.
- Georgia high blood pressure. (2015). [Graph illustration Georgia Hypertension May 21, 2018]. *The Behavioral Risk Factor Surveillance System (BRFSS)*. Retrieved from <https://www.cdc.gov/brfss/brfssprevalence>. Accessed May 21, 2018.

- Hupke C. (2014). *Team-Based Care: Optimizing Primary Care for Patients and Providers*. Institute for Healthcare Improvement. Retrieved from <http://www.ihl.org/communities/blogs/team-based-care-optimizing-primary-care-for-patients-and-providers->.
- Patel, S.A., Baumler, I., Narayan Venkat, K.M. (2017). *County-level diabetes and hypertension hospitalizations in Georgia: An analysis of burdens and trends*. Retrieved from <https://dph.georgia.gov/sites/dph.georgia.gov/files/Communications/County-Level%20Data-Diabetes%20and%20Hypertension%20in%20Georgia.pdf>.
- Primary care health professional shortage areas (HPSA) State of Georgia.(2017). https://dch.georgia.gov/sites/dch.georgia.gov/files/related_files/document/GA_HPSA_2017-11.pdf.
- Public health districts. (2017) Georgia Department of Public Health. <https://dph.georgia.gov/public-health-districts>
- A Safe and healthy Georgia: 2016-2019 Strategic Plan. Georgia Department of Public Health. <https://dph.georgia.gov/sites/dph.georgia.gov/files/FINAL%20GA%20DPH%20Strategic%20Plan%202016-2019.pdf>.
- State health improvement plan: 2016–2021. Georgia Department of Public Health. <https://dph.georgia.gov/sites/dph.georgia.gov/files/GADPH%20SHIP%202017%20FINAL.PDF>.
- Standard nurse protocol for diabetes mellitus in adults. (2016). Georgia Department of Public Health. https://dph.georgia.gov/sites/dph.georgia.gov/files/related_files/site_page/17%200%20Diabetes%2012-22-15.pdf.
- Stroke belt initiative. (n.d.).National Heart, Lung, and Blood Institute, National Institute of Health. https://www.nhlbi.nih.gov/files/docs/resources/heart/sb_spec.pdf.

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