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Are Advanced Providers Prepared to Care for the Agricultural Population?

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ABSTRACT

This article concerns a pilot project for continuing education regarding agricultural health. We surveyed nurse practitioners (NPs) and physician assistants (PAs) in a rural state regarding hazardous agricultural respiratory exposures and the diagnosis and treatment of related agricultural health conditions. Most respondents could not identify hazardous agricultural agents and exposure sources. Many could not correctly answer questions about the diagnosis and treatment of associated health conditions, and 71% were uncomfortable concerning agricultural-related health issues and care. We used findings to develop an evidence-based educational program to address deficits, and presented at state and national professional conferences.

Keywords: agriculture, chronic disease, farmers, hazardous exposures, respiratory

BACKGROUND

Rural Americans die from respiratory disease at a greater rate than their urban counterparts,[1] and agricultural workers are especially at risk due to chronic exposures to hazardous agents.[2-4] From low-level organic dust exposure in open fields to high-level concentrations of toxic gases generated from livestock confinement facilities, the damage to agricultural worker health can be significant and result in chronic obstructive pulmonary disorder, asthma, and "farmer's lung" or in more immediate and acute insults to the respiratory system.[5-8] Organic dust is the most frequently considered contaminant, but the list is much longer and includes bio-aerosols and sprays; chemical solvents; welding fumes; zoonotic infections; chemical toxicants from pesticides, fertilizers, disinfectants; and endotoxins.[4,9-11]

The population at risk for hazardous exposures includes 2,050,000 full-time agricultural workers, but also their family members, who often live and work on the farm.[12] In 2014, an estimated 900,000 youth aged under 20 years lived on farms, and about half performed farm work.[12] Other agricultural populations at risk include migrant or hired farm/ranch workers, veterinarians, and those who work in agricultural-related industries, such as grain mills and ethanol plants.[13]

Knowledge about the prevention of hazardous agricultural exposures, as well as diagnosis and treatment of associated acute and chronic illnesses in agriculture is a necessary component of caring for rural populations.[14] Advanced practice providers (ie, nurse practitioners [NPs] and physician assistants [PAs]) are an increasingly important resource in rural health care. The National Council of State Legislatures estimates that thousands of additional advanced practice providers will be needed in the coming years to meet the current health care needs in the rural United States.[15,16] Indeed, a 2013 survey found that 41% of rural Medicare beneficiaries saw a PA or NP for all (17%) or some (24%) of their primary care in 2012.[17] It will be imperative that advanced providers in rural areas are educationally prepared to provide high-quality, comprehensive primary care for these agricultural populations at risk.

The purpose of this article is to present a pilot project using best practices to assess advanced provider learning needs and develop a continuing education program. We surveyed advanced providers in Nebraska, which is predominately rural state where 82 of 93 counties are classified as nonmetro.[18] The specific aims of the pilot project were to evaluate

advanced provider knowledge of agricultural risk exposures, and the diagnosis and treatment of agricultural-related respiratory conditions. We used findings to develop an evidence-based continuing educational program for NPs and PAs to better prepare them for delivering quality, comprehensive primary care in rural communities.

METHODS

The needs assessment used a cross-sectional study design that was limited to advanced practice providers in Nebraska. The study was approved by the institutional review board of the University of Nebraska Medical Center (UNMC). We obtained the list of all NPs and PAs (N = 631) from the Nebraska Department of Health and Human Services. We administered the survey using best practice survey technique involving the Dillman-tailored design[19] and administration methodology of 4 contacts. The surveys were administered by mail, with each including a survey link unique to each respondent to an online data collection platform. The first mailed postcard was an invitation to participate. This was followed 1 week later by the postcard containing the survey link. A reminder postcard was mailed 1 week later, and the final mailing was a reminder with the survey link sent 1 week after the third mailing.

The needs assessment survey was developed by the principal investigator who was the Program Coordinator of the UNMC College of Nursing's Family Nurse Practitioner program. She also maintained an active clinical practice in rural Iowa. It was also reviewed for face validity by 3 faculty members (ie, College of Medicine, College of Public Health, College of Nursing) all of whom have expertise in rural health. The needs assessment survey had 19 questions subdivided into 4 sections. *Section One: Demographics* included 3 items regarding years in practice, clinical specialty, and professional credential (NP or PA). *Section Two: Risk Exposure and Prevention* contained 8 multiple-choice knowledge items about specific farm and ranch exposure sources and associated exposure prevention measures. *Section Three: Diagnosis and Treatment* included 6 multiple-choice knowledge items on differential diagnosis and management of agriculturally related respiratory disorders. *Section Four: Provider Self-Assessment* asked 2 questions: provider's self-rated level of comfort in recognizing and treating agriculturally related respiratory conditions, and the provider's level of interest in a continuing education program on respiratory-related disorders in agricultural workers. Data from Survey Monkey were downloaded into SPSS (version 20) and analyzed using descriptive statistics.

RESULTS

The final response rate was 9% (n = 56/663; 32 NP, 19 PA, 5 unknown). Most respondents (n = 46) practiced in rural, nonmetro counties of Nebraska. Family practice was the most predominate specialty for both NPs and PAs (43% [14/32] and 84% [16/19], respectively), with NPs showing greater diversity in clinical specialties. The average years in practice for NPs ranged from 1 to 21 years, with an average of 6 years. For PAs, the average number of years in practice was 11, with a range of 1 to 38 years.

Needs Assessment Findings

Section Two: Risk Exposure and Prevention. Overall, fewer than half (45%) of all respondents in both groups correctly identified the most common source of feedlot irritant to cause acute onset of fever, headaches, and muscle aches (ie, grain dust from bin cleaning). About 25% could not identify exposure sources in hog confinement that caused airway disease (ie, endotoxins from Gram-negative bacteria, ammonia from urine, and feed dust). About 20% did not identify that anhydrous ammonia released during fertilizer application could cause acute onset of wheezing and shortness of breath. Fewer than half (47%) correctly identified that respirators were the best way to reduce hazardous exposures in a hog barn. About 40% did not agree that dust masks or respirators required proper fitting to be effective, but most (84%) did know that respirators for farm use should be approved by the National Institute of Occupational Safety and Health (NIOSH). Most respondents (84%) correctly identified that chronic dust exposure could result in persistent nasal congestion and that chronic exposure to spoiled hay or grain could contribute to farmer's lung.

Section Three: Diagnosis and Treatment. Overall, only 76% of all respondents in both groups correctly diagnosed organic dust toxic syndrome based on a

case scenario. Twenty percent did not correctly identify the appropriate treatment for organic dust toxic syndrome. Only 14% could identify the diagnostic test needed to differentiate organic dust toxic syndrome from acute farmer's lung. Most (90%) correctly identified that chronic antigen exposures to patients with farmer's lung could result in irreversible lung damage. Only 58% identified that an asymptomatic farmer with a 25% decrease in baseline plasma cholinesterase testing should be reassessed for safety practices in pesticide application.

Section Four. Most NPs (78%) and PAs (68%) reported feeling "somewhat uncomfortable" to "uncomfortable" with recognizing and treating agricultural-related illnesses. The same percentages (78% NP, 68% PA) said they were interested in participating in a continuing education on respiratory-related disorders in agricultural workers.

Pilot Testing Continuing Education Program

On the basis of the needs assessment survey findings, UNMC College of Nursing Continuing Nursing Education office collaborated with the principal investigator to develop a 2-part evidence-based series directed at advanced practice providers that addressed important knowledge gaps identified in the needs assessment.[20,21] The objectives for the series were for participants to (1) describe 5 common agricultural respiratory hazards and sources, (2) identify the diagnosis and treatment for common respiratory conditions associated with agricultural agents exposures, (3) determine when personal protective equipment is indicated to prevent acute and chronic agricultural respiratory diseases, and (4) provide information to help advanced providers teach patients about how to reduce their risks. The principal investigator then pilot tested the 2-part educational series at the Nebraska Nurse Practitioner Conference, where the audience included an estimated 75 NPs employed in both urban and rural communities of the state. On the basis of evaluation results from this pilot test, the principal investigator made minor modifications and included more web-based resources on agricultural risk prevention education in the series. Subsequently, the principal investigator was invited speaker at several advanced practice nurse conferences across the country (ie, New Orleans, LA; Niagara Falls, NY; San Diego, CA; and Denver, CO) where she presented the 2-part series and where the combined total audience was estimated at 200 NPs. The participant evaluations were overwhelmingly positive.

DISCUSSION AND CONCLUSIONS

Pilot studies are generally underpowered for sample size because they are not designed to formally assess evidence of benefit.[22-24] Our project goal was consistent with the intent of pilot studies that was to report on the need for and promise of an intervention[22] (ie, continuing education) to improve advanced provider knowledge about respiratory agricultural safety and health. Our needs assessment response rate (9%) was low and was likely related to the fact that we did not have access to NP and PA e-mail addresses. Thus, we found it necessary to mail the invitation letters with the survey address and ask respondents to type the address into their web browsers—a cumbersome and inefficient process for survey participation. Most respondents practiced in rural communities, and it is likely our results had response bias because rural NP and PA respondents likely had greater interest in the survey topic. Still, we believe the data results provided a snapshot of Nebraska's advanced provider knowledge and professional interest concerning agricultural respiratory risks. The findings also served as the basis for best practices in developing a focused educational program on a very important topic.

Advanced providers are pivotal in assuring health care access to rural populations and where agriculture is a major industry.[25] About 60 million Americans, or about 19% of the U.S. population, lives in rural communities where advanced providers are an essential component in primary care.[26] Yet, few are well prepared to provide preventive health education to mitigate the respiratory risk exposures associated with the agricultural industry.[27] Indeed, many are not familiar with the diagnosis and treatment of agricultural-related respiratory conditions.[14] This project demonstrated the need to develop educational programs that better prepare advanced providers for caring for rural agricultural populations. Data from this needs assessment and pilot education program were used to support the application for a

3-year $769,000 grant from the Health Services and Resource Administration. The purpose of the grant was to design and implement new coursework at UNMC for NPs that focused on rural population health care. The grant was funded and is currently being implemented. JNP

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