Improving Pesticide Exposure and Toxicity Education among Providers

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Abstract

The population at risk for hazardous exposures of pesticides includes over 2 million full-time agricultural workers and their family members (Cramer, Wulf, Wendl, & Keeler, 2019). Over 130,136 pesticide related calls are made to poison control per year and an average of 20,116 cases are treated in health care facilities, yet studies have shown that there are evident gaps in pesticide knowledge among healthcare providers (Langley & Mort, 2012; Cramer, Wulf, Wendl, & Keeler, 2019). This project focuses on increasing provider pesticide knowledge with the use of a thorough and concise educational intervention for providers to be able to identify patients at risk for pesticide related illnesses and diagnose and manage patients who present with pesticide illness or toxicity.

Introduction: The Clinical Problem

Every year 1.1 billion pounds of pesticide active ingredient are used in the United States (CDC, 2019). The population at risk for hazardous exposures of pesticides includes over 2 million full-time agricultural workers and their family members (Cramer, Wulf, Wendl, & Keeler, 2019). It is important to note that certain populations may be more sensitive to pesticide exposure including children, pregnant women, and geriatrics. While others who work directly with pesticides may be more at risk for acute illnesses and poisoning such as migrant farmworkers (Edelson, Monani, & Platt, 2017). Several negative health effects have been linked to pesticide exposure, including dermatological, gastrointestinal, neurological, carcinogenic, respiratory, reproductive, and endocrine effects (Stamati, Maipas, Kotampasi, Stamatis & Hens, 2016). Over 130,136 pesticide related calls are made to poison control per year and an average of 20,116 cases are

treated in health care facilities, yet studies have shown that there are evident gaps in pesticide knowledge among healthcare providers (Langley & Mort, 2012; Cramer, Wulf, Wendl, & Keeler, 2019).

Recognizing pesticide related illnesses could be challenging due to symptoms of poisoning such as nausea, vomiting, dizziness, skin rashes, headaches, and eye irritation resembling other health issues (Beitz & Castro, 2010). Increasing provider pesticide knowledge to be able to identify patients at risk for pesticide related illnesses and diagnose and manage patients who present with pesticide illness or toxicity is essential to be able to provide quality comprehensive care to vulnerable populations and improve patient outcomes. The purpose of investigating this problem is to implement a solution that incorporates evidence-based strategies to improve provider pesticide knowledge.

Review of the Literature

A literature review was conducted to investigate pesticide knowledge among healthcare providers and effective ways to improve provider education. The initial search occurred during the month of June 2019. A literature search was performed using MEDLINE and Cumulative Index to Nursing and Allied Health Literature (CINAHL). Initial key words included ‘provider’, ‘pesticide’, and ‘knowledge’, which revealed 31 articles on MEDLINE. A broader search was conducted with key words improving, provider, and knowledge yielding 1,711 articles. To narrow these findings, abstract and full texts were included while animal species and studies older than 10 years were excluded and language was restricted to English and Spanish. The same strategy and inclusions/exclusions was performed using CINAHL. Key words provider, pesticide, and knowledge revealed 9 articles and key words improving provider knowledge revealed

176 articles. Of these findings 13 articles and 2 government websites were used to construct this paper.

Pesticide Knowledge and Practices

The literature demonstrates that despite the occurrence of individuals being impacted by pesticides, there are evident gaps in provider confidence and ability to recognize and appropriately manage pesticide related illnesses (Lekei, Ngowi, Mkalanga, & London, 2017; Trasande et al., 2010). Trasande et al. (2010) examined findings of self-reported surveys among pediatric practitioners regarding environmental health. Pediatricians reported a number of 124-320 patients being affected by pesticides in the past year. 1 in 5 reported having received training in environmental history taking and 78% voiced interest in additional training. Within these findings 20.3% of 277 New York American Academy of Pediatrics (AAP) members identified that they had high self-efficacy in dealing with lead exposure but their confidence in their skills for addressing pesticides was much lower. Of 277 Wisconsin AAP members, 88.6% identified that they referred patients to an environmental specialty clinic for further evaluation; as mentioned above this strategy becomes conflicting in rural areas where referral may not be an option. The results of this study highlight the need to assess and improve provider knowledge regarding environmental hazards, including those related to pesticides.

Research by Lekei, Ngowi, Mkalanga, and London (2017) further demonstrates lack in knowledge. By interviewing participants using standardized questionnaires, Lekei and colleagues examined knowledge and practices relating to acute pesticide poisoning (APP) among 66 health care providers (HCPs) responsible for managing APP in Tanzania. This study found that 30% of respondents do not know any treatment strategy

for patients presenting with APP and 17.6% of HCPs knowledge of treatment was inaccurate or inappropriate for example giving antibiotics, milk, and antihistamines. Only 8% of respondents reported having high knowledge about the health effects of pesticides and 50% acknowledged having no awareness of pesticide toxicity. Lastly, 55% of HCPs reported having no knowledge of pesticide safety instructions, for example use of PPE, washing after handling, and refraining from eating while handling pesticides. This type of knowledge is equally important when counseling patients on safe pesticide use to be able to prevent toxicity events.

Evaluating Pesticide Education and Effectiveness

An additional theme identified in the literature concerns the evaluation of pesticide education and the effectiveness of educational interventions. Studies show that using an educational intervention focusing on general pesticide knowledge in addition to gaps identified by survey or interviews has shown positive outcomes in improving pesticide knowledge among providers (Cramer, Wulf, Wendl, & Keeler, 2019; Sibani, Jessen, Tekin, Nabankema, & Jors, 2017).

An example is seen in a study, which focused on a pilot project for continuing education regarding agricultural health in Nebraska (Cramer, Wulf, Wendl, & Keeler, 2019). They began by surveying nurse practitioners (NPs) and physician assistants (PAs) in regard to agricultural health conditions and hazardous agricultural respiratory exposures. Surveys included four sections involving demographics, risk exposure and prevention, diagnosis and treatment, and provider self-assessment. Some findings from the risk exposure and prevention included that 40% of respondents did not agree that dust masks or respirators required proper fitting to be effective and 16% did not identify that

chronic dust exposure could result in persistent nasal congestion and chronic exposure to spoiled hay or grain could contribute to farmers lung. Respondents were given case scenarios to evaluate their ability to identify diagnosis and treatment, which also revealed gaps in knowledge. Lastly, provider self-assessment indicated that 68-78% of NPs and PAs felt uncomfortable with recognizing and treating agricultural-related illnesses and the same percentages were interested in participating in continuing education. With findings from the needs assessment survey, Cramer and colleagues (2019) were able to develop a 2-part evidence based continuing education program that addressed gaps identified. This was then tested at Nurse Practitioner Conferences across various states, which resulted in positive learning outcomes for participants.

The last example that investigates pesticide education and effectiveness is seen in research by Sibani, Jessen, Tekin, Nabankema, & Jors (2017). This study took place in Uganda; with a focus on identifying effectiveness of training provided by the Pesticide use, Health, and Environment (PHE) project and how this impacted the ability of health care workers (HCWs) to diagnose and treat acute pesticide poisoning. The PHE project consisted of 2-day training and/or a refresher course lasting 2-3 hours. This project also gave HCWs who missed initial trainings the opportunity to receive training at another time. Using a standardized questionnaire 326 HCWs were interviewed on knowledge and management of acute pesticide poisoning. The intervention group consisted of 176 HCWs, which had received prior PHE training and the control group consisted of 153 HCWs that had not participated in any training. Study findings concluded that the intervention group scored significantly higher in the identification of pesticides and their toxicity and in identification of signs and symptoms while similar knowledge was shown

in questions about routes of entry. Sibani and colleagues (2017) reinforce the importance and effectiveness that pesticide related training and continuing education have in providing adequate health care in rural and urban areas at risk for pesticide related illnesses.

The literature identifies gaps in provider pesticide knowledge and positive outcomes of educational interventions. Using the Ottowa Model of Research, the proposed pesticide education intervention will be implemented. The purpose of this project and report is to increase provider pesticide knowledge by implementing a pesticide related educational intervention.

Approach to the Conduct of the Project

The setting of this project will occur within a mobile health center that is part of La Clinica, a federally qualified health center that serves Southern Oregon. Anticipated challenges related to this project will be attaining enough provider participation, being that this educational intervention will be time consuming. Participants of this project will include participating health care providers at mobile health center migrant camps and providers at other La Clinica health center sites. To recruit providers, I will discuss the event with providers prior to the educational intervention, create flyers to post at different clinic sites, and offer intervention during lunch break with lunch provided.

Proposed Implementation

Provider pre-assessment of pesticide knowledge will take place followed by a 30-minute educational intervention related to pesticides. This intervention will include:

- A brief introduction on pesticide use.
- Pesticide safety to be able to educate patients.

- Recognizing acute pesticide related illnesses in the health care setting.
- Patient work-up, including pesticide diagnostic testing that can be utilized
- Management, including follow up.

A final post intervention assessment of provider knowledge will also be collected.

Outcome Evaluation

If electronic use is available, pre and post assessments will be collected using survey monkey since Internet data collection is economical and provides automated data input, handling, analysis, and reporting (Murphy, Staffileno, & Foreman, 2018; Polit & Beck, 2016), if not available paper surveys will be administered. Being that pre and post intervention differences will be evaluated, paired t-test will be used to analyze data. In addition, depending on the number of participants, a bar graph will be created to show participant pre and post intervention scores. Ethical issues are not anticipated with this educational intervention project. The only anticipated costs associated will be providing refreshments to participants.

Implementation of Project

A 16-slide power-point was presented to providers employed at a local community clinic. Before and after the presentation providers were asked to complete a 13-question survey related to pesticides and pesticide related illnesses. The educational intervention was implemented via video conference due to changes in the community related to COVID-19. A consequence of this was needing to change surveys to online format using Survey Monkey instead of paper format to be administered in person. This could have impacted survey reliability being that participants had access to the survey for a greater amount of time before the intervention. This also resulted in lower survey

participation. There were 10 participants during the educational intervention presentation but only 5 of them completed the pre-interventional survey. I believe this number could have been higher if I administered the surveys in person and allowed time for completion before beginning the intervention and after.

Since my original plan was to take refreshments to encourage providers to attend the meeting during lunch, I offered a gift card raffle to providers that attended and participated in the intervention. Elements that contributed to the project success was adapting to changes such as offering the educational intervention on video, adjusting the educational intervention presentation to shorten time utilized, changing survey distribution format, and offering an incentive to participate despite the inability for in person attendance. This project found that by participating in a pesticide related educational intervention providers knowledge increased compared to their pre-intervention pesticide knowledge.

Outcomes

The literature studied prior to the project implementation identified gaps in provider pesticide knowledge and positive outcomes of educational interventions (Cramer, Wulf, Wendl, & Keeler, 2019; Lekei, Ngowi, Mkalanga, & London, 2017; Sibani, Jessen, Tekin, Nabankema, & Jors, 2017; Trasande et al., 2010). My project findings concurred with these studies being that providers average survey score was 46% before the educational intervention and 79% after. Individual pre-test scores ranged from 30%-61% and post-test scores ranged from 69% to 84%. Paired t-tests were used to further analyze data and found there to be significant improvement between participant pre and post intervention survey scores ($p=0.003$).

Practice-related Recommendations and Limitations

Feedback from providers included that the educational intervention was useful and needed. More specifically providers who work in the mobile health unit which serves migrant farmworkers felt it would benefit them in their current and future practice. Other providers felt that although it was useful information it may not apply to their practice often.

The potential to sustain this intervention and increase influence is likely in community settings where pesticide related illnesses may be more likely to appear. In this particular federally qualified health center, the mobile unit that focuses on migrant farmworker health may find this intervention more applicable compared to other areas of focus such as school-based health centers. This intervention could also be applied to other regions in the state or to different states that have increased agricultural employment. Although only five participants answered survey questions this educational intervention showed positive outcomes which could be beneficial for healthcare workers, facilities, and patients.

Summary and Next Steps

Despite changes made to the project due to COVID-19, implementation of the educational intervention to improve healthcare provider pesticide knowledge showed to be effective. Implementing the intervention and administering surveys in person as well as increasing provider participation can be potential next steps to further strengthen validity of survey data collection and to better display the positive correlation between pre and post intervention data. Although this project concurred with the literature reviewed these next steps could further enhance implementation.

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