Published in final edited form as:

Ann Allergy Asthma Immunol. 2015 March ; 114(3): 254–255.e3. doi:10.1016/j.anai.2014.11.020.

The effectiveness of a computer module to augment the training of school staff in the management of students with food allergies

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Keywords

epinephrine delegation; food allergies; computer-based learning module; school nursing; unlicensed assistive personnel

Food allergies have increased dramatically among children, affecting approximately 1 in 25 school-age children,^{1, 2} with delays in treatment contributing to increased death,³ which may occur in school or day care.⁴ The presence of nurses in schools varies greatly,⁵ suggesting a

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Author contributions:

Laura White contributed to the conception and design of the study, analysis and interpretation of the data and preparation of the manuscript.

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role for school staff with appropriate training. However, current training is informal and evidence-based training consistent with the Centers for Disease Control and Prevention (CDC) guidelines is scarce. The purpose of this study was to evaluate the effectiveness of a computer-based learning module as an additional teaching tool to increase the knowledge and confidence of school staff in the recognition and management of food allergies.

This pre and post-test study was implemented during the 2012/2013 school year by school nurses of the Massachusetts School Nurse Research Network interested in participation. The nurses presented the study at the beginning of the school year at orientation or a staff meeting as an option to the usual nurse-led didactic training. Usual nurse-led epinephrine administration demonstration was scheduled after the post-test. The voluntary convenience sample of school staff was at least 18 years of age; able to read, write, and speak English; and able to operate a computer. No one was excluded from participation.

The intervention was a thirty-minute, self-directed, non-interactive computer module including visual power-point slides with audio presenting: the fundamentals of food allergies; prevention, symptoms, management of reactions, auto-injector administration, and social emotional issues. The program was created by pediatric allergists with guidance from the Massachusetts Department of Public Health School Health Services and reviewed by national experts and organizations to help school nurses deliver to staff content consistent with the CDC and Massachusetts food allergy guidelines. This freely available on-line program has been edited twice since this study and may be accessed at: <http://www.allergyhome.org/schools/management-of-food-allergies-in-school-what-school-staff-need-to-know/>.

The researchers created paper pre and post-tests with school nurses and pediatric allergists to measure knowledge, confidence, and attitude. The 11-item knowledge test was adapted from a test used by a Massachusetts school district and was scored 1 point for each correct answer. Confidence was measured by four-items and attitude by seven items on a 5-point scale with a higher score suggesting greater confidence and favorable attitude. A written evaluation described the location and timing of the module, comparison with prior allergy training, and whether new allergy issues were raised. Pre and post-test differences were tested by paired t-tests (see eSupplement).

The majority of participants (88%) were female, teachers (68%), with the remaining participants reported as administrators, secretaries, or cafeteria staff (eTable 1). The sample included 85 participants from six schools (eTable 2). Response rates ranged from 8 to 36% possibly due to the start of the academic year and many professional commitments.

Participants reported significant increases in knowledge, confidence and attitude scores ($P < 0.001$) (Table 1, eTables 3,4, 5). The sensitivity of change was tested by stratifying the sample into teachers ($n=58$) and all other staff ($n=27$). No significant difference was noted between the two groups by paired t-tests or independent t-tests. Both groups showed a significant increase in pre and post-test scores. A regression was run to control for the variation of nursing hours, student enrollment and staff experience. After controlling for full time equivalence (FTE) of nurses, student enrollment, and experience, the significant

differences in knowledge, confidence and attitude remained. On average, the knowledge pre-test scores were 1.57 units lower than post-test ($p < .001$), confidence pre-test scores were 3.09 units lower than post-test ($p < .001$) and attitude pretest scores 2.92 units lower than post-test ($p < .001$).

The item regarding the risk of bullying particularly increased from 29.4 % of participants at pre-test agreeing that children with food allergies are at risk of being bullied to 85.9% agreeing with the risk at post-test.

The significant increase in knowledge is important considering the high percentage of previous training in a state that requires emergency anaphylaxis protocols, and reporting anaphylaxis and epinephrine administration. The ease, flexibility, time of training and positive experience suggests the feasibility of the program for school staff. The increase in scores, although significant, was small and the clinical significance is unclear, however, the staff reported learning new information, including allergens in nonfood school products; auto-injector insertion; anaphylaxis symptoms, effective surface cleaning and hand washing. The increase in score of even one item may affect the prevention, recognition or reaction to a child with an allergy. The clinical significance may be even greater in schools without a school nurse or other training program.

The increased recognition that children with food allergies are at risk for being bullied was not an anticipated finding and one that requires further study. In a study of individuals with food allergies reporting experiences with bullying, 21.4% reported staff as the perpetrators.⁶ This particular training appeared to influence staff's perception of the risk for being bullied and has implications to decrease bullying, recognize children at risk for bullying and to intervene earlier if a child is being bullied.

Limitations of this study include homogeneity, small convenience sample, lack of a control group, self-selection bias such as facility with computers, and the unique characteristics of the schools and state. The study measures were not previously validated and while the pre and post-test differences were significant, the clinical significance was not statistically measured.

These findings are encouraging and novel in that it demonstrates feasibility, practicality, and effectiveness of this computer-based model, and provides evidence for larger scale evaluation and consideration of dissemination in other school settings to determine its effectiveness.

This online module may enhance school preparedness in addressing the needs of students with food allergies. Awareness among adult learners regarding the increased risk for bullying of children with food allergies may also arise from this training.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

AllergyHome.org for the design of the computer module

Massachusetts School Nurse Research Network for the recruitment of school nurses as coordinators, interventionists.

Funding Sources This work was supported in part by NIH grant K24 AI 106822 (PI, Phipatanakul)

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Table 1

Changes in Knowledge, Confidence, and Attitude * (n=85)

Total Group Teachers (n=58) Other Staff (n=27)	Pre-test Mean (SD)	Post-test Mean (SD)	Standard Error of the Mean
Knowledge	8.6 (±1.3)	10.1 (±1.1)	.15734
Teachers	8.6 (±1.3)	10.2 (±1.1)	.18115
Other Staff	8.2 (±1.2)	9.9 (±1.1)	.31038
Confidence	11.5 (±3.3)	14.6 (±1.6)	.30889
Teachers	11.4 (±3.2)	14.5 (±1.7)	.35086
Other Staff	11.4 (±3.4)	14.7 (±1.4)	.62382
Attitude	23.0 (±2.9)	26.0 (±2.1)	.25426
Teachers	22.9 (±2.9)	26.1 (±2.0)	.30629
Other Staff	22.9 (±2.9)	25.4 (±2.3)	.45407

* Paired t-tests, $p < .001$