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MOLLOY COLLEGE
The Division of Nursing
PhD in Nursing Program

FACTORS ASSOCIATED WITH COLLEGE STUDENTS' WILLINGNESS AND
READINESS TO ACT

IN A FOOD ALLERGIC EMERGENCY

A dissertation by

OLGA KAGAN, PhD Candidate

submitted in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

April 3, 2018

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2018

MOLLOY COLLEGE

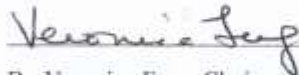
THE BARBARA H. HAGAN SCHOOL OF NURSING

The dissertation of Olga Kagan

Entitled FACTORS ASSOCIATED WITH COLLEGE STUDENTS' WILLINGNESS AND READINESS TO ACT IN A FOOD ALLERGIC EMERGENCY in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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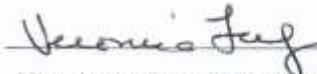
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Abstract

Problem/Significance: Food allergy is a growing public health concern in the United States affecting nearly 15 million Americans. According to FAIR Health (Gelburd, 2017), diagnoses of anaphylactic food reactions increased by 377% nationwide from 2007 to 2016, with 66% among patients 18 years or younger, and 34% in those over 18 years old. Several tragic incidents and lawsuits have occurred on college campuses in recent years raising concerns over the safety of college students experiencing a food allergic emergency.

Purpose: The purpose of this quantitative descriptive correlational study is to identify factors associated with college students' willingness and readiness to act in a Food Allergic Emergency (FAE) in a campus community. Being able to identify individuals who are willing and ready to act in FAEs would provide a foundation to guide policies related to stock Epinephrine auto-injectors and anaphylaxis, as well as training and education of unlicensed individuals on college campuses. Currently, no data have been published on college students' readiness or willingness to act in FAEs. This study will contribute to the food allergy body of knowledge and to the development of policy for college communities.

Methods: The sample for this study was drawn from a population of undergraduate and graduate students 17 years old and older enrolled in the Spring of 2017 semester for one or more credits at a suburban private Catholic college near the metropolitan New York area. The survey tool for this study was comprised of a combination of existing, modified and newly created instruments that were assembled to capture respondents' self-report of *Readiness to Act* and *Willingness to Act* in an FAE. IRB approvals were obtained for the pilot of the initial tool, and later, for the full study. Consents were provided to the participants prior to completion of the pilot and full study

surveys. The full study commenced after validity and reliability of the measurement tool was established. An email with a link to a Google forms survey was emailed to all students using the all-students distribution list, with an anticipated response rate of 10%. Email addresses were not collected to maintain anonymity. Data from the survey were analyzed in SPSS version 24. Factor analysis, correlations, ANOVA, *t*-test and regression analysis were used to describe the findings.

Results: Cronbach's alphas were reported on final measurement instruments based on a larger sample size as compared to the pilot sample size. Exploratory factor analysis examined factor validity of the instrument through factor loading results, indicating a two components structure. All components (knowledge, familiarity, experience, training and confidence) measuring readiness to act in an FAE loaded close together and were highly correlated with each other and with readiness to act. Components (fear and bystander's response) measuring willingness to act also loaded close together and were correlated with each other and with willingness to act.

Additionally, several demographic characteristics including age, having children, and college major had statistically significant correlations with readiness to act. Statistically significant correlations were found between age, having one or more child/children, college major and willingness to act in an FAE. Multiple linear regression analysis was performed with five independent predictor variables, including age, health professions major, expressed desire to be trained, social desirability, and readiness to act as guided by the theoretical frameworks used in this study, indicating ($R^2 = .35$) 35% of variability in willingness to act can be explained by these variables. Based on box and whiskers plots analysis by college major, students enrolled in non-health related majors expressed lower readiness to act, but higher willingness to act in an FAE.

Conclusion/Implications: Students enrolled in health profession majors, those who are older and those with desire to be trained conveyed higher readiness to act and were more willing to act in an FAE. However, students in non-health related majors also expressed willingness to act, but

reported lower level of readiness. Thus, establishing appropriate policies and training of willing individuals would be highly desirable to establish a pool of trained college students who can respond to an FAE in a college community. Data from this study may not be generalizable to all college campuses throughout the United States. Findings of this study may serve as a starting point for a larger population-based study as more lay people will have access to non-patient-specific Epinephrine auto-injectors and as the number of children and adults living with food allergies continues to spiral upwards.

Dedication

"True science investigates and brings to human perception such truths and such knowledge as the people of a given time and society consider most important."

~ Leo Tolstoy

This dissertation is dedicated to my beautiful and loving family:

Children Dana and David – my daily inspiration for going above and beyond my comfort zone.

Husband Andrew – my partner, my friend and my biggest supporter.

Brother Sam and his family – my cheerleaders and my source of encouragement.

Mama Zoya - my teacher, my friend and a role model.

Acknowledgments

I would like to acknowledge everyone who made my journey through the doctoral dissertation process and completion possible. To my family, my Molloy College friends and colleagues, and Dissertation Committee who supported me physically, intellectually, emotionally and spiritually to help along the way! This path would have been much different without you.

I thank my husband Andrew for his patience and encouragement throughout the years as I pursued my professional growth, leading to this moment. It was gratifying to see my daughter Dana, and my son, David, wanting to be involved with my work. I could not refuse their genuine interest in proof reading pages, and giving me feedback on the tool development in its early stages. I am grateful to my brother, Sam, whose presence and sense of humor gave me time to recharge and unwind. My mother, Zoya, who despite her weak state, stayed strong and remained my source of strength and determination until the end!

To my colleagues and friends in the PhD program, especially Alice, Mike and Lyris, who were always ready to offer a shoulder to lean on, our bond is strong, and we will continue to be there for each other in the years ahead.

I would like to extend my sincere gratitude to our librarian, Theresa Rienzo, whose help with library resources, search engines, and keeping references organized during the writing process, was invaluable. I am also grateful to Bernadette Weldon, who facilitated so much behind the scenes, including calls, emails and setting up appointments to ensure my progression.

Finally, it was an honor and a privilege to be mentored and guided by some of the most thoughtful, dedicated and inspiring professionals, who so graciously agreed to be on my Dissertation Committee - Dr. Veronica Feeg, Dr. Patricia Eckardt, and Dr. Janice Selekman, I thank you from the bottom of my heart!

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Factors Associated with College Students' Willingness and Readiness to Act in a Food Allergic Emergency

Chapter 1

INTRODUCTION

Food allergies are an emerging public health concern in the United States, and are a leading cause of anaphylaxis outside of the hospital setting. Nearly 15 million Americans, and 17 million Europeans who live with food allergies face daunting threats to their daily lives in the simple act of eating. According to the U.S. Centers for Disease Control and Prevention (CDC, 2013), food allergies in children doubled between 1997 and 2011, with approximately 1 in 13 children affected. Food allergies result in approximately 300,000 ambulatory-care visits a year among children under the age of 18. In 2007, researchers estimated the economic burden of allergic reactions caused by food and anaphylaxis at half a billion dollars and ambulatory visits accounted for more than half of the costs (Patel, Holdford, Edwards, & Carroll, 2011). Food Allergy Research and Education (FARE) is a not-for-profit organization that works on behalf of individuals with food allergies. FARE has been partnering with legislators, researchers and other stakeholders to achieve optimal accommodations for vulnerable individuals with food-induced anaphylaxis and allergies.

Within the last decade many legislative efforts focused on protecting members of society living with life-threatening food allergies. Two examples of this legislation are the Food Allergen Labeling and Consumer Protection Act of 2004 (US Food and Drug Administration, 2005) and the School Access to Emergency Epinephrine Act (H.R. 2094). In August of 2017, Governor Andrew Cuomo signed legislation sponsored by Assemblyman David Buchwald to allow school bus drivers and other contractors providing services to schools in New York to administer epinephrine (A.07635). Several other states are also examining the expansion of

access to emergency Epinephrine in restaurants, institutions of higher education, camps, and public places and among emergency responders. To date, several states have passed legislation that permits various venues to stock and use undesignated Epinephrine auto-injectors with exemptions to civil liabilities. Training requirements vary by state.

Other legislative efforts include the Airline Access to Emergency Epinephrine Act (S.1972) introduced on August 5, 2015 by Sen. Mark Kirk (R-IL) and Sen. Jeanne Shaheen (D-NH) to address air carrier food allergy policies, training, and availability of undesignated Epinephrine auto-injectors. Additional legislative efforts include, restaurant food allergy awareness, and availability and scope of practice of emergency response services (EMS) workers (FARE, n.d.). In 2016, the New York State Assembly (2016) voted on a bill to authorize public venues such as restaurants, youth organizations, sports leagues, theme parks, sport arenas, and day care and educational facilities to stock and administer Epinephrine auto-injectors in an emergency to individuals who appear to experience anaphylactic symptoms.

As these mandatory and voluntary laws continue to proliferate to meet the needs of the growing numbers of individuals with food allergies, the question to be asked is, “Who are those individuals who would be willing and ready to act in an anaphylactic emergency?” What factors determine their willingness and readiness to act? Once, these individuals and/or groups are identified, appropriate training programs and policies can be developed and instituted in targeted places. Most importantly, any individual experiencing a severe allergic reaction, or those near them, can have immediate access to a life-saving medication: Epinephrine auto-injectors.

Currently, within the school setting, nurses are responsible to train unlicensed personnel to administer patient-specific Epinephrine via auto-injectors; however, until recently, use of non-patient-specific Epinephrine auto-injectors was limited to licensed personnel. New

legislation may have an impact not only on people working and attending educational facilities, but on people in places such as restaurants, institutions of higher education, and other public facilities.

Review of national and international literature revealed a substantial increase of allergies not only in the pediatric population, but also in the adult population (Kamdar, Peterson, Lau, Saltoun, Gupta, & Bryce, 2015; Ramesh & Lieberman, 2017; Sicherer & Sampson, 2018). Additionally, new studies have been conducted to capture a more precise prevalence of childhood and adult-onset food allergies by analyzing large data within electronic health records (Acker et al., 2017) and hospital discharge data (Dyer, Lau, Smith, Smith, & Gupta 2015). An independent, nonprofit organization called FAIR Health reported that anaphylactic food reactions increased by 377% nationwide from 2007 to 2016 (Gelburd, 2017). Patients 18 years or younger accounted for 66% of insurance claims, while those over 18 years old accounted for 34%. FAIR Health oversees the nation's largest collection of healthcare claims data, which includes a repository of over 23 billion billed medical and dental procedures that reflect the claims experience of over 150 million privately insured individuals, and separate data representing the experience of more than 55 million individuals enrolled in Medicare. Certified by the Centers for Medicare & Medicaid Services (CMS) as a qualified entity, FAIR Health receives all Medicare parts A, B and D claims data for use in nationwide transparency efforts (Gelburd, 2017). Although these data are limited to insured individuals only, such a significant increase in anaphylactic food reactions, coupled with reports of adolescents being the highest risk group for fatalities due to an FAE (Lieberman et al., 2015), is alarming and cannot be ignored. Most students enter institutions of higher education starting at 17-18 years of age, and many continue or return to school for graduate studies at an older age. Extrapolating from the

number of teens with FAs, it can be assumed that they take these allergies with them as they enter college, demonstrating the need for action in providing a safe campus environment to these students.

PROBLEM STATEMENT

The number of people with food allergies continues to rise, with many more life-threatening incidents occurring outside the home. Immediate access to Epinephrine injection buys time needed to get further professional medical care, thus reducing fatalities. Currently, nearly 15 million Americans have food allergies of varying degrees of severity, including 1 in 13 children (FARE, n.d.). To date, there are no preventative treatments for food allergies, insect stings, or other anaphylaxis-inducing triggers. Therefore avoidance is paramount and prevention of serious consequences is essential. While some individuals do outgrow certain food allergies, others with no history of food allergies can develop a life-threatening food allergy. Although there has not yet been one specific causative factor identified within the environment that could be directly linked to the diagnosis of food allergies, it is known that individuals with food allergies depend heavily on others and their actions within their environment to stay safe. Epinephrine is the only drug of choice used to treat serious allergic reactions, including reactions to food proteins (Kemp, Lockey, & Simons, 2008).

Often, nurses are in the position of training the general public to develop plans and enforce policies related to food allergies and the use of non-patient-specific Epinephrine in response to anaphylaxis in the community. The training of unlicensed personnel is important as nurses or other healthcare providers may not be present or available at all times. Some public organizations that call upon individuals who have knowledge and willingness to serve a fellow citizen in a critical emergency, facilitate quick action by making resources available. For

example, having defibrillators available in public spaces such as airports, is intended to reduce death by heart attack. An anaphylactic emergency is a comparable life-threatening event that requires tools for rapid action in a crisis situation.

PURPOSE

The purpose of this quantitative study is to identify factors associated with willingness and readiness to act in an allergic emergency by college students in a campus community. Over the years, Americans have supported laws addressing life-saving measures, such as cardio-pulmonary resuscitation (CPR), automatic external defibrillators (AED), and most recently, Naloxone (Narcan) distribution policies. In 2014, a not-for-profit Food Allergy Research and Education (FARE) organization, in partnership with the National Foundation for Celiac Awareness, the National Association of College and University Food Services, food allergy experts, and stakeholders from 65 colleges and universities produced pilot guidelines (FARE, n.d.). These guidelines focus on several areas, including, but not limited to food labeling, anaphylaxis medical forms, staff training, accommodations in dining halls, signage for cross contact with major allergens, and responsibilities of students in self-management of food allergies and maintenance of emergency medication. Both prevention and action plans are paramount in keeping individuals with allergies safe.

The prevention plan focuses on preventing an allergic reaction through training, education, reasonable accommodations under the Americans with Disabilities Act and modification of the environment. The action plan includes steps needed to be completed in an anaphylactic emergency, including activation of 911 and administration of an Epinephrine auto-injector (similar to Narcan training and administration for drug overdose). Many institutions of

higher education are adapting these voluntary guidelines in efforts to protect the growing number of students with food allergies and dietary restrictions.

Being able to identify individuals who are willing and ready to act in an allergic emergency among members of a college community would provide a foundation to guide stock Epinephrine auto-injector and anaphylaxis policies, as well as training and education on college campuses. Data from this study may not be generalizable to all campuses throughout the United States, and might be limited to college communities only. However, it is a starting point for a larger college population-based study in the future, as the number of individuals living with food allergies continues to spiral upwards, and more lay people gain access to non-patient-specific Epinephrine auto-injectors. Currently, no data have been published on college students' readiness or willingness to act in an allergic emergency. This study will contribute to the food allergy body of knowledge and to the development of policy for college communities.

DEFINITION OF TERMS

For the purpose of this study, there are several key terms that warrant a conceptual understanding of their meanings. These terms include: (a) Food Allergy; (b) Anaphylaxis; (c) Food Allergic Emergencies (FAEs); (d) Readiness to Act in an FAE; and (e) Willingness to Act in an FAE.

(a) **Food Allergy (FA)** is an adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food (Boyce et al., 2010). Once an allergic individual ingests a specific food allergen, the reaction can result in clinical symptoms ranging from mild hives to life-threatening anaphylaxis (Dyer & Gupta, 2013).

(b) **Anaphylaxis** is a serious allergic reaction that is rapid in onset and may cause death.

Anaphylaxis produces signs and symptoms within minutes of exposure to an allergen, and

can result in bronchoconstriction and hypovolemic shock and may lead to death. Symptoms can be uniphasic, biphasic (within 12 hours), or protracted (within 32 hours) and can involve all organ systems (Boyce et al., 2010; Lieberman, et al., 2010; Sampson et al., 2006).

- (c) **Food Allergic Emergency (FAE)** is highly likely when one of the following three criteria are fulfilled: 1) ingestion of an allergen is confirmed, even if a person is asymptomatic or experiences only mild symptoms; 2) more than one body system is affected; or 3) respiratory or cardiovascular symptoms present in absence of cutaneous or other symptoms (Sampson et al, 2005; Sampson et al., 2006).
- (d) **Readiness to Act (RTA)** is being fully prepared for doing something.
- (e) **Willingness to Act (WTA)** is being ready to do something by choice, to act or respond without being persuaded.

Conceptual definitions of sub-concepts: knowledge, experience, training, familiarity, confidence, social desirability and fear, will be described in chapter 2. Operational definitions of the two main concepts. RTA and WTA, as well as proposed sub-concepts will be operationally defined in chapter 3.

RESEARCH QUESTIONS

Several studies have been conducted on food allergy knowledge, attitudes and beliefs in the U.S., prevalence of food allergies, food allergy health-related quality of life, and food allergy management, among other studies described in the next chapter. Many of these studies have provided data for policy makers, researchers, as well as families living with food allergies. Despite recent controversies over the cost of the Epinephrine auto-injectors and allegations against Mylan company's practices (Appendix A), and as legislation moves forward, more and more unlicensed individuals will be asked to be trained and will be given access to undesignated

Epinephrine auto-injectors to act in an allergic emergency. These changes will affect public places, including colleges, similar to changes made regarding availability of and training in Narcan administration, CPR and/or AED. Currently, it is unknown if college students would be willing and ready to act in an allergic emergency, nor do researchers know all the barriers and facilitators in order to successfully design and implement policies and procedures to ensure safety of all members of college community who may experience an anaphylactic reaction. Having answers to the following research questions will help professionals find effective ways to educate different groups as well as craft policies that benefit individuals with allergies and the general public. The following questions will be used to guide this study:

1. What are the factors associated with willingness to act in an allergic emergency?
2. What are the factors associated with readiness to act in an allergic emergency?
3. How do different (age, gender, number of children, college major, and student status) individuals and/or groups compare on dimensions of willingness and readiness to act in an allergic emergency?

SIGNIFICANCE

Anaphylaxis is an acute, life-threatening systemic reaction with varied mechanisms, clinical presentations, and severity that results from the sudden systemic release of mediators from mast cells and basophils. The more rapidly anaphylaxis develops, the more likely the reaction is to be severe and potentially life-threatening. Prompt recognition of signs and symptoms of anaphylaxis is crucial (Lieberman et al., 2015). Therefore, time is of the essence during anaphylaxis, and an increased amount of time waiting for paramedics to arrive without the intervention of epinephrine administration significantly reduces the chances of survival. Deaths associated with anaphylactic reaction are preventable if people are educated and are

aware of life-saving tools, such as the use of Epinephrine auto-injector (EAI) and activation of 911. It is important to take complaints related to anaphylaxis seriously and to act swiftly. (Refer to Appendix B for examples of tragedies reported by the news outlets). As policy makers recognize the needs of a growing number of individuals with food-allergies and address safety of these citizens by passing laws, it is important that nurse leaders act as agents of change in putting these laws into action.

The following literature review reveals that laws that benefit the public with the availability of life-saving measures are currently limited to Naloxone administration to reverse drug overdose and to CPR and AED use to respond to a cardiac emergency. Most individuals with diagnosed food allergies carry prescription Epinephrine auto-injectors. However, reactions may occur in individuals without a prior history or diagnosis, and they do not carry prescription Epinephrine. Additionally, based on the reports of prior studies, many with known food allergies may not always have or carry an EAI for a variety of reasons. For instance, Greenhawt (2009) reported that more than three-fourths of undergraduate college students did not carry self-injectable Epinephrine with them in 2009. Similar adherence rates to epinephrine auto-injector were reported by Jones, Llewellyn, Frew, Du Toit, Mukhopadhyay and Smith (2015) and by Herbert, Lin, Matsui, Wood, and Sharma (2016). This lack of self-care and illness management makes college students particularly vulnerable to food allergic emergencies. According to a study by McLaughlin, Wilson and Peterson (2018) less than 50% of college students carried epinephrine auto-injector to classes and less than 42 % carried their injectors to places where food and beverages were served/consumed. Further, in comparing three different universities (Karam, Scherzer, Ogbogu, Green, & Greenhawt, 2016), researchers found that food allergy rates, levels of campus awareness, and food labeling varied significantly. However, poor

compliance rates with self-injectable epinephrine carriage, food preparer awareness, and allergen avoidance were similar. Despite some improvements noted in a 6-year follow up study, risk-taking behaviors and poor adherence with health behavior recommendations remained problematic among food-allergic undergraduates (Karam, Scherzer, Ogbogu, Green, & Greenhawt (2017). On a positive note, researchers observed encouraging levels of awareness among non-food-allergic students, who demonstrated more awareness of practicing strict avoidance than the allergic students across three campuses. Thus, college students are of interest for this study.

CONCEPTUAL FRAMEWORKS

In the Roy Adaptation Model (RAM), the process of adopting a new role is termed "role transition," and a change in career role is termed a "secondary role transition," a transition that is an "arduous and time-consuming process" (Roy & Andrews, 1991, p. 336). Effective role transition occurs when the person at least partially meets the social expectations associated with the role but requires knowledge, education, or role models to make the transition most effective. In an allergic emergency, one must transition from a bystander to a responder. In responding to an anaphylactic emergency, one's role changes from a bystander to an active rescuer. This study will explore relationships between bystanders who have some knowledge, or training and those who may not. Roy also addresses adaptation on an organizational level. As the number of persons with life-threatening allergies continues to increase, and voluntary and/or mandatory laws to protect these individuals under the American with Disabilities Act continue to unfold, organizations will have a need to adapt to the new trends and legislation to keep pace and remain current. Nurses are in the position to disseminate new information, educate willing individuals and/or organizational leaders, and keep abreast of the needs of affected individuals.

Readiness to act is closely related to stages one must undergo to be fully prepared to act in an allergic emergency. Individuals with experience and personal and/or professional training might possess necessary skills and knowledge, but these may not always translate into their willingness to act in an allergic emergency. It is important to understand factors that play into an individual's readiness and willingness to assume a role of a rescuer and act.

Prochaska's Transtheoretical Model (TTM) of behavior change is a framework that allows for assessment of an individual's *readiness to act* on a new behavior, and provides strategies of change to guide the individual through the stages of change (Prochaska & DiClemente, 1986). There are 5 stages, consisting of pre-contemplation, contemplation (getting ready), preparation (ready), action, and maintenance. This biopsychosocial model focuses on the decision making of the individual. Progression through these stages might be linear or nonlinear, with possible regression between stages. Readiness, or preparation to act in a food allergic emergency cannot occur without an individual's willingness. Those who are knowledgeable, experienced/familiar with and have had prior training with food allergies and Epinephrine auto-injectors have gone through some stages, and therefore may express readiness to act in a food-allergic emergency (FAE).

According to Prochaska and DiClemente (1986), "a central principal of the transtheoretical approach is that different mechanisms or processes are most important in producing change at different stages of overcoming a problem" (p.177). Progress from pre-contemplation into the contemplation stage is due to either developmental changes or environmental changes that occur in people's lives. In some individuals, developmental changes such as becoming of a certain age, or entering a new stage in life can change a person's behavior, while in other individuals, external environment, such as new social norms or laws can prompt

the change. In the proposed study, similar connection may exist between anticipated correlations of one's action as a result of some of these developmental and/or environmental factors, such as age, number of children, and personal experiences with food allergies and use of Epinephrine auto-injectors.

These two frameworks complement each other and will help guide the research with focus on two main concepts: readiness to act and willingness to act in an FAE by college students. Two out of four central domains of Roy's model are person and environment. According to Roy, the *person* is viewed as a biopsychosocial being in constant interaction with a changing environment. A food allergy prevention plan is aimed at modifying the environment through development of policies and procedures to accommodate persons with diagnosed food allergies and those who might be experiencing allergic reactions for the first time. An action plan is needed if the prevention plan fails. Environment plays a significant role in how individuals may respond to an allergic emergency. People living with food allergies rely on others within their environment for information, such as cross contact or ingredient disclosures. In an allergic emergency they also may rely on their peers for support if physically compromised or unable to self-treat. A college might be fully prepared to meet individual dietary needs and ready to address anaphylactic emergencies. However, if Epinephrine auto-injectors (EAI) are not available in the immediate environment of the victim, or if people within the victim's immediate environment are unwilling to act/help, fatal outcomes may occur. Additionally, a set of interrelated biological, social and psychological systems is likely to influence one's physical and emotional ability to act. Therefore, it is important to assess students' willingness and readiness to act in an allergic emergency on college campuses to better understand existing barriers and facilitators associated with willingness and readiness to act.

Within the Roy model, a food-allergic emergency would be viewed as a focal stimuli that needs immediate attention. Social support and availability of resources, such as availability of Epinephrine auto-injectors and individuals willing to help, would be considered contextual stimuli. Finally, other factors that might play into the situation but are unknown would be viewed as residual stimuli. According to Prochaska and DiClemente (1986), one must go through stages of readiness; however, in an emergency, a bystander may need to adapt to a rescuer role very quickly and enter action mode, bypassing pre-contemplation, contemplation, and preparation stages, or going through them at a much faster pace. A bystander's ability to change roles and quickly adapt to a situation is a highly desired response in an allergic emergency. It is the goal of this study to better understand the relationship between the concepts that play into bystander's willingness in an allergic emergency.

These concepts were identified through review of the literature within the domains of allergy and immunology, and from related emergency response models, offering potential barriers and facilitators. A conceptual model has been developed to depict various concepts/components that are likely to contribute to readiness and willingness to act in an FAE. These concepts include: (a) Knowledge, (b) Level of Exposure/ Familiarity, (c) Experience, (d) Training, (e) Confidence, (f) Bystander's Likelihood to Respond, and (g) Fear. (Figure 1). The concept of social desirability is included in this model to ascertain truthfulness of the responses to validate self-reported measures of the proposed survey and is further detailed with the above stated concepts in chapter 2.

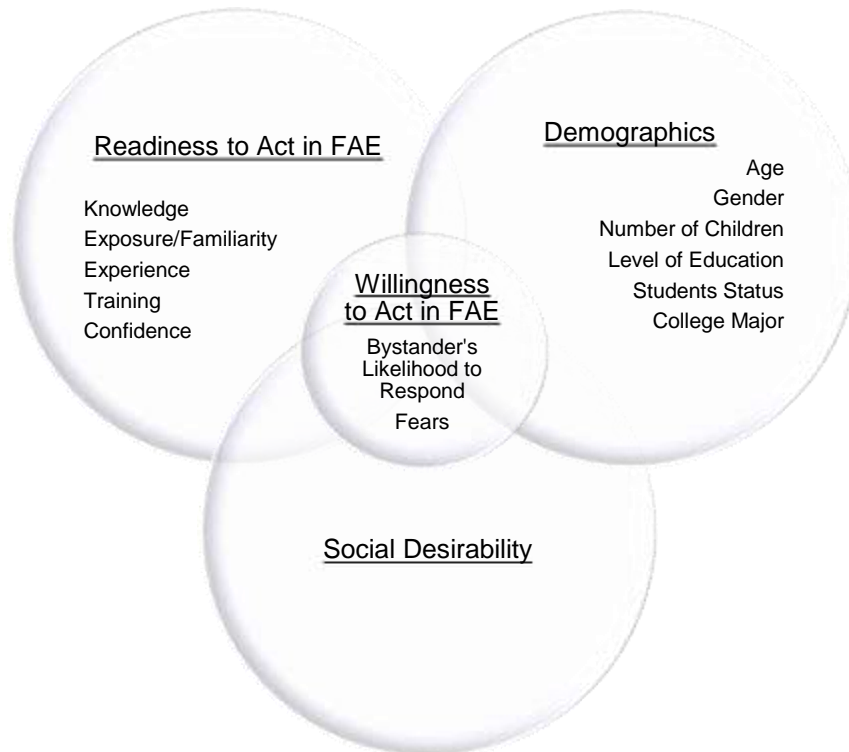
CONCLUSION

Food allergy is an emerging public health concern in the United States and around the globe. Many researchers and policy makers have been working diligently to address challenges

individuals living with life threatening food allergies face on a daily basis, including in institutions of higher education. As new policies continue to emerge, nurses are often involved in the development, implementation and dissemination of necessary safety measures, including those aimed at treatment of food allergic emergencies. Many institutions of higher education are beginning to adapt voluntary guidelines related to the availability and the use of non-patient-specific Epinephrine auto-injectors by non-licensed individuals. However, no scientific data are available that can help organizations identify groups or individuals who will be ready and willing to act in an allergic emergency.

The proposed study will be aimed at identifying factors what might be associated with individual's willingness and/or readiness to act in an allergic emergency on a college campus. Concepts that are predictive of willingness to act in an FAE would be of particular interest to guide decision making in institutions of higher education. The findings of this research will play a pivotal role in facilitating successful development and implementation of targeted training and education policies and procedures.

Figure 1. FACTORS ASSOCIATED WITH WILLINGNESS TO ACT IN FAE



Chapter 2

REVIEW OF LITERATURE

The focus of this section will be on existing literature describing barriers and facilitators in several populations, as well as examining other regulated first response models. Some of the groups that have been studied in the past are family members of children with food allergies, public school personnel, physicians, nurses and pharmacists. Literature examining Automatic External Defibrillators (AED), Cardio-Pulmonary Resuscitation (CPR)/ Basic Cardiac Life Support (BCLS) and Narcan use in various groups may assist in laying a foundation for the public availability of Epinephrine auto-injectors and associated training to protect individuals with life-threatening allergic reactions. This chapter will begin with a presentation of epidemiologic data, current policies and trends in food allergy research. It will then use the guiding conceptual frameworks to describe the need for measures specific to food allergic emergency responses, including instrumentation for these parallel life threatening events and the education efforts underway to prepare licensed professionals. It will conclude with summarizing the limited research today on readiness and willingness to act in public, anaphylactic situations.

CLINICAL PRESENTATION/ SYMPTOMATOLOGY OF ANAPHYLAXIS

Food is the most common cause of anaphylaxis in the outpatient setting, and food allergens account for 30% of fatal cases of anaphylaxis. Eight major allergens responsible for 90% of allergic reactions in most people, include milk, egg, tree nuts, peanuts, fish, shellfish, wheat and soy, with sesame quickly becoming the ninth major food allergen (Devoe, 2008; Lieberman et al., 2015; Lieberman et al., 2010; Sicherer & Sampson, 2018). Other anaphylaxis-inducing triggers include latex, medications, venom, environmental and idiopathic. Anaphylaxis presents itself differently in every person. Previous reactions are not always indicative of the

severity of future reactions. The quantity of an allergen and the type of an allergen may trigger different allergic reactions in the same individual. While it may have cutaneous symptoms, several surveys have noted that anaphylaxis can present without any skin findings in approximately 10% of cases (Lieberman et al., 2015; Sampson et al., 2006).

An exposure to an allergen usually must take place in order for a person to develop an allergic reaction, which may progress to a life threatening anaphylactic reaction, known as anaphylaxis. Some of the people might be diagnosed with allergies or the potential for having an anaphylactic reaction through blood and/or skin testing, without having an actual anaphylactic reaction due to avoidance of the suspected allergens. According to the National Health Interview Survey children with food allergy are two to four times more likely to have such conditions as asthma and eczema/skin allergies, compared with children without food allergies (Branum & Lukacs, 2008). Individuals with a history of/ diagnosis of anaphylaxis and co-existing asthma are at higher risk for a more severe and faster progression of respiratory compromise during an allergic reaction. Thus, asthma management in individuals at risk of food anaphylaxis is paramount. Additionally, exercise-induced anaphylaxis (EIA) and food-dependent, exercise-induced anaphylaxis (FDEIA) could be potentially life-threatening. This type of anaphylaxis is associated with exercise after the ingestion of specific foods, with exercise taking place 2-4 hours after ingestion (Barg, Medrala, & Wolanczyk-Medrala, 2010; Lieberman et al., 2015; Sampson et al., 2006).

In 2010, an update to the 2006 NIH definition and management of anaphylaxis document was made by the experts in the field of allergy and immunology. They agreed on the following definition of anaphylaxis as one of three clinical scenarios: 1) the acute onset of a reaction (minutes to hours) with involvement of the skin, mucosal tissue or both and at least one of the

following: a) respiratory compromise; b) or reduced blood pressure or symptoms of end-organ dysfunction; 2) two or more of the following that occur rapidly after exposure to a likely allergen for that patient – involvement of the skin/mucosal tissue, respiratory compromise, reduced blood pressure or associated symptoms and/or persistent gastrointestinal symptoms; or 3) reduced blood pressure- after exposure to a known allergen (Lieberman et al., 2015).

TREATMENT OF FA AND FOOD INDUCED ANAPHYLAXIS (FIA)

Individuals living with life-threatening food allergies are usually prescribed a drug, Epinephrine (Adrenaline), administered through an auto-injector. This medication has shown to be most effective as the first line of treatment for an anaphylactic reaction (Lieberman et al., 2015), but only, if it used correctly and timely – without any delay. Due to the unpredictable nature of the allergic reactions, one can never know whether the reaction will be mild or severe. Although an allergic reaction may not present itself as full-blown anaphylaxis with cardiopulmonary compromise, it is recommended that Epinephrine be used immediately, as its benefit of saving a life outweighs the risk of possible side effects (Sampson et al., 2006). Most fatalities have been reported among adolescents. Although it is unknown why this group is more susceptible, it is noted that most deaths occur due to lack of or delayed treatment with Epinephrine (Lieberman et al, 2015). Additionally, Gupta, Springston, Warriar, Smith, Kumar, Pongracic, and Holl (2011) reported that the odds of severe food allergy progressively increased with age and were higher in boys, children with multiple food allergies, and households with an annual income of \$50,000 or higher.

Knowing signs and symptoms, as well as carrying Epinephrine, and taking preventative measures, become part of life for affected individuals and their families. In addition to the availability of Epinephrine and knowledge of the symptoms, one must recognize when to use this

life-saving medication and be willing and ready to act. As evidenced by previous studies, parents and some healthcare professionals still struggle with the timing of Epinephrine administration, either due to fear or inadequate knowledge. For example, Chad, Ben-Shoshan, Asai, Cherkaoui, Alizadehfar, St-Pierre, and Clarke (2013) found that fifty-six percent of parents reported being afraid or somewhat afraid to use the Epinephrine auto-injector (EAI), due to fears of: (a) hurting the child; (b) incorrectly using the EAI; or (c) a bad outcome or death.

Wang, Young, and Nowak-Wezgrzyn, (2015) reported specific knowledge deficits in the diagnosis and management of food-induced anaphylaxis among 2882 physicians, 4168 allied health professionals, 362 from other health professions (psychologist, optometrist, dentist/oral health professional), 334 medical students, and 78 other non-health individuals (health business/administration, consumer/other, and media/press). While the majority of responders correctly identified the case of anaphylaxis with prominent skin and respiratory symptoms, only half recognized the case without skin symptoms as being anaphylaxis. This indicates that a substantial number of people, including physicians, and probably nurses may not be aware that anaphylaxis can occur in the absence of cutaneous symptoms. It clearly demonstrates a need for improved education about anaphylaxis but does not answer the question related to responders' willingness and readiness to act in a food allergy emergency.

EPIDEMIOLOGY OF FOOD ALLERGIES

It is essential to understand the incidence of food allergies in the U.S. Data regarding the prevalence of food allergies and the severity of food-related allergic reactions in the United States was reported by Gupta, Springston, Warriar, Smith, Kumar, Pongracic, and Holl (2011). Participants included individuals over 18 years old residing in U.S. households with at least one child, and who could complete a Spanish or English survey. The final study population consisted

of 38,480 individuals. A survey was sent to a randomly selected group of participants determined to be a representative sample of U.S. households with children. Previous allergic reactions related to food, date of onset, and method of diagnosis were asked. Data were adjusted for potential biases, and multiple logistic regression models were used to examine associations between household or child characteristics and the diagnosis, prevalence, and severity of food allergy. The prevalence of overall food allergy was 8%, and the prevalence of multiple food allergies was 2.4%. Peanut was most commonly associated with allergic reactions (25.2%), followed by milk (21.1%), and shellfish (17.2%). Prevalence of severe food allergy was 3.1%. Peanut and tree nuts produced the most severe reactions. The overall odds of reported food allergy were higher among Asian and African American children. However, odds of a physician-confirmed food allergy were significantly higher among white children, those with multiple food allergies, and in households with an annual income over \$50,000. Odds of severe food allergy progressively increased with age and were higher in boys, children with multiple food allergies, and households with an annual income over \$50,000 (Gupta et al., 2011).

It was suggested that impact of food allergy in the United States is greater than previously reported. Eight percent of children surveyed had a history of food allergy, corresponding to 5.9 million children in the United States. Of those with food allergy, 38.7% had a history of severe reaction, and 30.4% were allergic to multiple foods. Finally, Gupta et al. (2011) concluded that the disparity between reported history of food allergy and physician-confirmed diagnosis of food allergy between races and economic classes might assist in guided strategies for the prevention of food-induced reactions and for the diagnosis and management of childhood food allergy.

Additionally, most recent data from a seven-year study of medical claims (Blue Cross Blue Shield, 2018) showed that nearly 1.7 million (18%) of commercially insured children in the

U.S. suffer from one or more allergy. Anaphylactic reaction to specific foods are responsible for 47% of anaphylactic episodes, and 53% of anaphylactic reactions are to unknown foods or other causes (insect bites). Most recent data from the American College Health Association (2017) is also suggestive of higher prevalence of allergies (either of being treated or diagnosed within the last 12 months) in younger students enrolled in undergraduate studies (21.2%) as compared to graduate students (16.7%) in 2017. However, allergies remain at the top of the list for both groups, followed by reports of sinus infections and back pain. It is evident that the number of children with food allergies continues to rise. Upon entrance into institutions of higher education and the workforce, they may require some reasonable accommodations under the Americans with Disabilities laws to allow for safe and full participation in academic and workplace settings, often away from the safety of their familiar home environment.

Gupta, Kim, Barnathan, Amsden, Tummala, and Holl (2008) recognized that members of the general public play a significant role in the well-being of children with food allergies. These researchers held focus groups as a preliminary step in the development of validated survey instruments to assess food allergy knowledge, attitudes, and beliefs of parents, physicians, and the general public. They reported that the general public had wide variation in knowledge about food allergy with many misconceptions of key concepts related to prevalence, definition, and triggers of food allergy.

In 2008, Gupta and colleagues recruited a national sample of adults to complete the validated Web-based Chicago Food Allergy Research Survey for the General Public. Findings were analyzed to provide composite/itemized knowledge scores, describe attitudes and beliefs, and examine the effect of prior knowledge/familiarity with food allergy on knowledge, attitudes, and beliefs. A sample of 2,148 respondents was obtained. Participants answered 64.9% (range,

12.5%–100.0%) of knowledge-based items correctly. Strengths were identified in areas related to symptoms/severity and triggers/environmental risks of food allergy. Knowledge was poor concerning the distinction between food allergy and food intolerance, the absence of a cure, and current means to treat food allergy. Higher scores were significantly associated with self-report of prior knowledge/familiarity with food allergy, particularly among those with prior training in food allergy (median increase 7.9%). Perceptions regarding food allergy were generally well distributed, although respondents tended to minimize the stigma associated with food allergy and to oppose specific food allergy policies in schools.

Researchers concluded that there is a need to increase food allergy knowledge among the general public. Two years after this study was published, the Centers for Disease Control and Prevention (CDC, 2013) released voluntary guidelines on management of food allergies in schools, which were developed in response to Section 112 of the FDA Food Safety Modernization Act that was enacted in 2011. This act was designed to improve food safety in the United States by shifting the focus from response to prevention (CDC, 2013). Availability of stock Epinephrine, and prevention and action plans in a school setting already have saved the lives of many children (Pistiner & Wang, 2017). However, outside of home and school, these individuals continue to be at risk. During anaphylaxis, one may need assistance to call 911 and to help inject Epinephrine, especially if symptoms progress rapidly, compromising the person's ability to self-administer. Additionally, having access to Epinephrine in public places would allow individuals to respond to anaphylactic events to an unknown trigger. Similar models are already in existence today to help reverse drug overdoses or cardiac arrest, and are detailed later in this chapter.

FOOD ALLERGIES AND EPINEPHRINE AUTO-INJECTORS IN SCHOOLS

Epinephrine injections, also known as adrenaline, have been used to treat severe bronchospasms during asthma attacks since the early 1900s. In the 1960s and 1970s, inhalers were introduced into the marketplace to treat asthma (Chu & Drazen, 2005; Tanaka, 2015). However, epinephrine injector's adrenergic bronchodilator properties continued to be successfully used in reversing anaphylaxis. Prescription epinephrine was packaged in kits with a vial of medication and a syringe for use in affected individuals, including those in schools. It is evident that Epinephrine injections are not new, and have been long used to treat severe asthma and allergic reactions. Since 1987, the Epi-Pen has been marketed as a spring-loaded prefilled syringe with a premeasured amount of medicine for a one-time individual use. Due to the spike in the number of people diagnosed with food allergies and anaphylaxis, there has been an increased demand for affordable and user-friendly devices. As a result, several devices have made their debut in recent years, including the voice-guided Auvi-Q (Appendix A).

Data from the epidemiologic studies shows a two-fold rise of food allergies in school-age children since 1997, as well as deaths of students at schools due to food allergic reactions. The famous cases of a Canadian 10 year-old student Sabrina Shannon, who fell victim to an allergic reaction in 2003, and an American 7 year-old student Amarria Jonhson, who died in 2012, resulted in major legislation in Canada and the U.S. to ensure availability of Epinephrine auto-injectors for anyone experiencing an allergic reaction in schools. White (2015) conducted an exploratory cross-sectional survey of schools participating in the EpiPen4Schools program to understand better the characteristics of anaphylactic events and how they were treated, and the level of staff training needed to recognize and treat anaphylaxis. More than 32,000 schools were

contacted, and 6,019 schools provided a response within the designated time frame for completion.

A total of 919 anaphylactic events were reported by 607 schools (11%). White reported that most anaphylactic events occurred in students (89%), and 22% occurred in individuals with no known allergies. The most common triggers included food (62%), followed by insect stings (10%), and unknown triggers (20%). Schools' stock EpiPen was used to treat 49% of events, whereas the individual's personal EpiPen auto-injector was used to treat 45% of events. Approximately 36% of schools trained only school nurses and select staff to recognize anaphylaxis, 29% trained most staff and 31% trained all staff. A majority of schools (54%) permitted only the school nurse and select staff to administer Epinephrine, 16% permitted most staff and 22% permitted all staff to administer Epinephrine. Despite controversies in public policy positions related to vendors and costs associated with stocking EpiPens for emergencies with children, these data demonstrate that there is a need for a comprehensive training to properly identify and treat anaphylactic events in US schools. As more states continue to expand access to Epinephrine and training to non-medical individuals, it is still unknown if these individuals (other than nurses) would be ready and willing to be trained and to administer Epinephrine auto-injector in an anaphylactic emergency.

In a most recent study by Pistiner and Wang (2017), more than 1,200 school nurses completed an anonymous electronic survey about the use of epinephrine in schools as emergency treatment for anaphylaxis during the 2014-15 school year. Nearly one-quarter (23.9%) of participants reported epinephrine being administered in their school during the past year. In total, out of the 482 administrations of epinephrine reported, 16.2% were by unlicensed staff or students. In addition, 33.6% of administrations were to students who did not have an allergy

known to the school. The survey also found that 10.8% of students having a severe allergic reaction required more than one dose of epinephrine before emergency medical responders arrived. Epinephrine use in schools is significant, and is being given to individuals with known and unknown histories of allergies. Although epinephrine use by unlicensed staff was less frequent than by licensed school nurses, these results support the importance of training non-licensed individuals. There are no data or studies showing prevalence of epinephrine use in institutions of higher education to treat allergic reactions.

Researchers have been able to document some instances in which training along with availability of non-patient specific Epinephrine in the school settings saved lives. For instance, Wahl, Stephens, Ruffo, and Jones (2015) in Washington State, assessed the effectiveness of in-person training on enhancing knowledge about food allergies and improving self-confidence in preventing, recognizing, and treating food allergy reactions and to collect information about prior training and participation in response to food allergy incidents. A total of 4,818 individuals at 247 schools and community sites participated in the training program, which was delivered by a licensed registered nurse. Participants included teachers (48%), camp counselors (10%), childcare providers (6%), schools aide (5%), administration (5%), bus drivers (4%), nurses (2%), people holding multiple job titles (5%) and others, including coaches, volunteers, parents, and food service workers (15%). Written evaluations, online surveys, and phone interviews were used to measure the impact, including content retention, confidence, and behavior changes.

The results of this descriptive observational study show that in-person training can increase participants' knowledge about food allergies and improve self-confidence in preventing, recognizing, and treating allergic reactions and that these gains were sustained over time. Participants found hands-on Epinephrine auto injector training as well as description of signs and

symptoms of an allergic reaction helpful. Additionally, researchers were able to collect information about 21 confirmed allergic reactions that occurred after the presentation using phone interviews, nine of which were to unknown allergens. This is significant because individuals may develop allergic reactions that may not have been previously documented. New legislation of expanding access to stock Epinephrine and training of non-licensed individuals has great potential to benefit anyone experiencing a reaction for the first time and allow for immediate access to a life-saving medication.

To date, very few studies focused on college students. Greenhawt (2009) assessed food allergy trends and behavioral attitudes on a large university campus among college students with food allergies. He used an online survey distributed by e-mail to local university undergraduate students. Symptom severity was determined based on previously published criteria for anaphylaxis. He found that a total of 513 individuals responded, with 57% reporting an allergic reaction to food. Of this group, 36.2% reported symptoms consistent with anaphylaxis, and these reactions frequently occurred while enrolled. Allergy to milk ($p = .032$), tree nut ($p < .0001$), shellfish ($p < .0001$), and peanut ($p < .0001$) were significantly associated with having symptoms of anaphylaxis. Some form of emergency medication was reportedly maintained in 47.7%, including self-injectable Epinephrine (SIE; 21%), although only 6.6% reported always carrying this device. Medication maintenance was significantly lower among students who had not had a reaction while enrolled ($p < .0001$). Only 39.7% reported always avoiding foods to which they were allergic. Within the group that reported intentionally consuming known allergens, there were significantly lower numbers of individuals who reported carrying SIE ($p < .0001$) and significantly higher numbers of individuals with a history of a reaction that had not resulted in symptoms of anaphylaxis ($p = .026$).

Finally, potentially life-threatening anaphylactic reactions to foods are occurring on college campuses. Only 39.7% of students with food allergy avoided a self-identified food allergen, and more than three fourths did not maintain self-injectable epinephrine (SIE). Such behaviors might place these students at increased risk for adverse events. Self-report data and respondents' selection bias were reported as the limitations. A multiple campus study was recommended by Greenhawt. The finding of this study further demonstrates increased need for availability of non-patient specific Epinephrine and training on college campuses.

RESPONDING TO AN FAE BY FAMILY MEMBERS AND BY INDIVIDUALS WITH FAs

Several studies reported on use of Epinephrine auto-injectors by children, and adults with food allergies as well as by their parents. According to Kim, Sinacore, and Pongracic (2005), EpiPen is often underused in children with food allergy experiencing anaphylaxis. Researchers explored whether underuse of EpiPen might be attributed to parental discomfort with administration, as measured by a lack of parental empowerment and knowledge of proper administration. Researchers mailed a written survey to parents of children with food allergy. Those children with physician-diagnosed food allergy who had been prescribed EpiPen were included in the analysis. They recruited parents from a local food-allergy support group and private allergy practice. Perceived comfort with administering EpiPen was measured by using a 10-cm visual analog scale. Knowledge of EpiPen use and anaphylaxis was tested by using a series of multiple-choice questions. Empowerment was measured with a 16-item instrument that included statements from the Family Empowerment Scale. Multiple regression analysis was used to determine how much of the variance in the comfort ratings could be explained by knowledge, empowerment, and other factors assessed in the survey.

Of 360 mailed surveys, 165 (46%) of completed surveys met the inclusion criteria and were analyzed. Anaphylaxis was reported in 42% of children (n = 70); 8% of parents (n = 14) had administered EpiPen to their child. Factors correlating with comfort included prior administration of EpiPen (P= .009), EpiPen training (P = .005), and empowerment (P < .0005). Neither a history of anaphylaxis nor knowledge correlated with an increased level of comfort with administration. Researchers concluded that empowerment directly correlated with increased comfort with EpiPen use, but knowledge did not. Researchers recommend that physicians should continue to instruct all parents on EpiPen administration because this correlated significantly with comfort. Perhaps there are other psychological factors beyond empowerment that might contribute to underuse of EpiPen. Although the proposed study will not focus on parents of children with food allergies, college students' knowledge alone may not correlate with willingness or readiness to act in FAE. Other factors, such as fear may influence the decision to act.

Fear.

Fear has been reported as a barrier to act in other emergency response situations as reported by studies described in the models section of this review. Fear related to Epinephrine auto injector in an allergic reaction has been studied by Chad et al. (2013). It was found that a majority of parents of children with peanut allergy fear using the Epinephrine auto-injector. Researchers aimed to identify factors that may contribute to parental fear of using an Epinephrine auto-injector (EAI). The study included 1,229 parents of children with peanut allergies, all of whom had been prescribed an EAI. The mothers had a mean age of 37.9 years, and the fathers had a mean age of 40 years. Children with peanut allergy were retrospectively identified from 2000 to 2004 through chart review, and they were prospectively identified between 2004 and 2011 at their visit to Montreal Children's Hospital.

Parents of these children were mailed a questionnaire on whether and why they feared using an EAI, if their child had ever received an EAI, who prescribed the EAI, their level of satisfaction with the EAI training they received, the interval between the initial reaction and the EAI prescription, the type of EAI they were prescribed initially, whether they had changed devices, and the number of EAIs purchased. Fear was characterized as “afraid,” “somewhat afraid,” or “not afraid.” They found that 56% of parents reported being afraid or somewhat afraid to use the EAI. The most commonly reported fears were hurting the child, incorrect use of the EAI, or a bad outcome or death. Several predictors of parental fear were identified, including having a younger child and those with shorter disease duration. In addition, their children were less likely to have experienced a severe reaction or to have required an EAI. With regard to parental characteristics, those who were characterized as having fear were slightly younger, had less satisfaction with EAI training, and were less likely to find the EAI easy to use. Factors associated with less fear included longer disease duration or older age of the mother. This study found that a majority of parents have fear regarding use of the EAI. Factors that may predict fear include younger age of children, lack of severe reaction, and dissatisfaction with EAI training.

This study was the largest to examine parental attitudes towards the Epinephrine auto-injector and factors associated with fear of use. The presence of parental fear could lead to delayed or lack of use in a severe allergic reaction, which is consistent with previous studies demonstrating low EAI use even in the face of severe reactions. Parents who were dissatisfied with their EAI training were more likely to express fear, highlighting the importance of appropriate EAI training by both prescribing physicians as well as others caring for children who have food allergies. This study was limited with regard to ethnic diversity, and the majority of parents were highly educated and employed. In the development of the tool for the proposed

study, fears described in the above study are anticipated to exist in other individuals and may pose as barriers to one's willingness to act in a food allergic emergency. Additionally, fear or phobia of blood and injections (Ost, 1992) may play a role as well. Thus, three fear-related questions were included in the survey. Sum of these fears is used to measure overall fear or lack thereof (fearless).

Training.

A more recent study conducted by Topal, Bakirtas, Yilmaz, Ertoy, Arga, Demirsoy, and Turktas (2013) in Turkey found that training programs performed by allergists have increased the ability of patients' recognition and management of anaphylaxis. The researchers aimed to investigate the permanence of the effect of an anaphylaxis training program and to determine the factors affecting it beyond training given by allergists. Children and/or their caregivers who had been prescribed an adrenaline auto-injector at least 1 year before were invited to take part in the study. The knowledge about anaphylaxis was assessed using a questionnaire and the skills were tested. Sixty-four (50 caregivers/14 children >12 years of age) of 80 patients who accepted the invitation were included in the study. Of these, 59 patients obtained the auto-injector after initial prescription; among them, 42 (71%) still had the device at the time of the study.

The most common reason for not having the auto-injector was no longer feeling it was necessary (54.6%). Of the cases, 39.4% were competent in auto-injector use. There was a significant relationship between adrenaline auto-injector competency and regular allergy visits ($p = 0.010$), believing that it is necessary ($p = 0.04$), having an adrenaline auto-injector ($p = 0.003$), and previous history of severe anaphylaxis ($p = 0.010$). Auto-injector competency score decreased as time elapsed from the last visit ($\rho = -0.382$; $p = 0.002$) and the first instruction ($\rho = -0.317$; $p = 0.01$). Regular visits ($p = 0.009$) and history of severe anaphylaxis ($p = 0.007$)

were found to be independent factors having an effect on adrenaline auto-injector competency. Researchers concluded that training of patients/caregivers by allergists does not guarantee the permanence of acquired skills on anaphylaxis in the long run, and that regular follow-up visits should be fostered. As school communities look to implement non-patient specific Epinephrine auto-injector policy, training of willing individuals must be done on a regular basis to maintain competency.

Confidence.

Due to the potential of anaphylaxis to be life-threatening, individuals need to be confident and well trained in using their EAI. Those with prior training, experience or history of self-injecting to treat anaphylaxis may or may not feel confident in acting during a food allergic emergency. Therefore, studies describing confidence with EAI device use were sought. Daley, Wei, Ogbonnaya, Hines, Wade, & Portnoy (2015) conducted The Real-World Assessment of Patients' Carrying Time and Confidence with Epinephrine Auto-Injector Devices (RACE); this was a non-interventional, cross-sectional survey among patients age ≥ 7 years who filled ≥ 1 prescription for Auvi-Q (N=1,000; children: n=597; adults: n=403) or EpiPen (N=1,000; children: n=105; adults: n=895) between 2013 and 2014. Patients were surveyed regarding their confidence and training experience with EAIs; predictors of patients being “very confident” using their EAI and receiving EAI training were identified by multivariate analyses (stratified by age, children: 7-17 years; adults: ≥ 18 years). Among children, having previously experienced anaphylaxis (≥ 2 times) was the only significant predictor of patients being “very confident” using their EAI (adjusted odds ratio [aOR]=1.65; p=0.0271). Among adults, significant predictors of being “very confident” using their EAI were: being between 47 and 56 years (aOR=2.00; p=0.0008), having Auvi-Q instead of EpiPen (aOR=2.02; p<0.0001), having

previously experienced anaphylaxis (≥ 2 times; aOR=1.69; $p=0.0017$), and responding to the survey via a call-center (vs on-line, aOR=2.65; $p<0.0001$). Being female (aOR=0.73; $p=0.0311$) and having an allergist as prescriber (aOR=0.68; $p=0.0076$) were associated with significantly lower odds. Similar predictors were observed for patients' confidence in others injecting them in case of anaphylaxis, and for receiving EAI training. There were significant variations among patients at risk of anaphylaxis regarding their confidence in correctly using EAIs and receiving EAI training. It is possible that in the proposed study, those who previously experienced anaphylaxis will be more willing and ready to act in an allergic emergency. Therefore, questions assessing experience and confidence will be asked in the proposed study.

Knowledge and AEI use by groups.

There are a few studies that were conducted among certain groups of professionals, such as pharmacists, nurses, EMS workers and physicians and are discussed in more details below.

Medical professionals and allied health.

According to Wang et al. (2015), studies show that anaphylaxis is under-recognized and Epinephrine (adrenaline) is under-used by medical personnel as well as patients and their families. This study assessed the knowledge of food-induced anaphylaxis diagnosis and management across different populations of providers and caregivers and other interested respondents. An online survey embedded in a case discussion of food-induced anaphylaxis was distributed by Medscape to registered members. A total of 7,822 responders who started the activity chose to answer at least some of the questions presented (response rate 39.5%). Over 80% of responders in all groups correctly identified the case of anaphylaxis with prominent skin and respiratory symptoms; however, only 55% correctly recognized the case without skin symptoms as anaphylaxis. Only 23% of responders correctly selected risk factors for

anaphylaxis, with physicians significantly more likely to choose the correct answers as compared to allied health, other health professionals, and medical students ($p < 0.001$). Ninety-five percent selected Epinephrine (adrenaline) as the most appropriate treatment for anaphylaxis, and 81% correctly indicated that there are no absolute contraindications for Epinephrine (adrenaline) in the setting of anaphylaxis. When presented a case of a child with no documented history of allergies who has symptoms of anaphylaxis, more physicians than any other group chose to administer stock Epinephrine (adrenaline) (73% vs. 60%, $p < 0.01$). Specific knowledge deficits for food-induced anaphylaxis persist across all groups. Further educational efforts should be aimed not only at the medical community but also for the entire caregiver community and general public, to optimize care for individuals with food allergy. This study highlights needs for education about FIA not only among healthcare professionals, but among lay people as well.

EMS workers.

Anaphylaxis requires prompt recognition and management to improve patient outcomes. Chung et al. (2014) examined the diagnosis and treatment of anaphylactic reactions by the Emergency Medical Services (EMS) in a Canadian urban center. Researchers retrospectively reviewed electronic patient care records (ePCRs), identifying allergy-related calls in the Edmonton-Zone for the year 2011 to confirm anaphylaxis diagnosis and record treatments. Data were abstracted and entered into the REDCap electronic platform. Descriptive and multivariate analyses were performed. Pre-hospital management included any care provided by paramedic personnel and/or first-aid treatment received prior to EMS arrival. From 481 identified allergy-related case records, 136 (28%) met guideline criteria for anaphylaxis. Seventy-six (56%) of these confirmed cases were deemed high acuity by medical dispatchers. Self-medication and bystander first-aid was recorded in 60 (44%) anaphylactic events; 34 (25%) received

Epinephrine. Paramedics administered Epinephrine in an additional 49 cases (36%); only 7% received all three primary pre-hospital anaphylaxis treatments: epinephrine, corticosteroids, and antihistamines. Factors associated with pre-hospital epinephrine administration included: previous episode of anaphylaxis (adjusted odds ratio [aOR]=4.9, 95% confidence interval [CI]: 1.30, 19.21); administration of corticosteroids by bystanders or EMS personnel (aOR=3.8, 95% CI: 1.36, 10.65); and transport severity (aOR=3.2, 95% CI: 1.21, 8.36).

The researchers concluded that paramedics in their region demonstrated higher use of Epinephrine than reported elsewhere; however, almost half of all patients meeting anaphylaxis criteria did not receive pre-hospital Epinephrine. Instead, more patients received antihistamines. This study demonstrated not only the need to adhere to anaphylaxis protocols and guidelines, but also, underuse of Epinephrine in anaphylaxis. Only 44% of anaphylactic events were treated by bystanders/self-medication before EMS arrived and Epinephrine was used in only 25% of anaphylactic events before EMS arrived. Delayed treatment or lack thereof has been cited to significantly reduce chances of survival. Time waiting for the EMS to arrive to administer Epinephrine may result in unfavorable outcome due to rapid progression of anaphylaxis in some cases. Immediate availability and use of Epinephrine is highly encouraged. Additionally, the role of a bystander in delivering first aid treatment prior to EMS arrival is very important in increasing survival rates.

According to Cristiano, Hiestand, Gower, Gilbert, Caldwell, Fernandez, and Winslow (2016), timely administration of Epinephrine is critical in the treatment of anaphylaxis. Researchers stated that there is very little information available on the rates of administration of Epinephrine by EMS providers caring for pediatric patients in the prehospital setting. Researchers examined data from the NC EMS database (PreMIS) from 2010-2013 to determine

rates of Epinephrine administration in pediatric patients with anaphylaxis. They studied patients <18 years of age with an EMS provider impression of “allergic reaction.” Anaphylaxis was present if there was hypotension (defined as SBP <90 or DBP <45 for patients age 11 and older, and SBP <70 + (2 x age) for patients ages 0-10), or impaired respirations (defined as description of labored or absent respirations, or RR <12 or >30). They determined the overall rate of Epinephrine administration. A multivariate logistic regression was then constructed to examine the impact of the following variables on appropriate Epinephrine administration: age <7, non-white race, rural county of case origin, duration of transportation from scene, and presence of a paramedic. Five hundred and four patients met inclusion criteria, of which, 471 demonstrated anaphylaxis as defined above; one hundred fifty-seven patients received Epinephrine (33.3%, 95% CI 29-38%). Age <7 was associated with increased odds of not receiving Epinephrine appropriately (OR 3.36, 95% CI 2.14-5.27, p <0.001). Other variables did not have statistically significant impact on Epinephrine administration. There are missed opportunities for prehospital administration of Epinephrine in pediatric patients with anaphylaxis. Very young children (age <7) had increased odds of not receiving Epinephrine. EMS workers, who are trained in recognition and treatment of anaphylaxis, did not administer Epinephrine in many cases. If states continue to expand access to emergency Epinephrine, it is paramount that training programs are available similar to CPR or Narcan training. However, it is still unknown if lay people would be willing to inject Epinephrine in an anaphylactic emergency, even if trained.

Pharmacists.

Salter, Delfante, de Klerk, Sanfilippo, and Clifford (2014), evaluated how community pharmacists manage patients with anaphylaxis by conducting a randomized, cross-sectional, simulated patient study of community pharmacist practice of 300 metropolitan pharmacies

located in Perth Australia, randomized to three groups of 100 pharmacies. Each group corresponded to a different Epinephrine auto-injector: original EpiPen, new-look EpiPen or Anapen. Three hundred pharmacies were visited with 271 simulated patient visits included in the final analysis (88=original EpiPen, 92=new-look EpiPen, 91=Anapen). The following were defined: *Primary* anaphylaxis preparedness (readiness to treat acute anaphylaxis) and *Secondary* anaphylaxis engagement (willingness to engage the patient in a discussion about their anaphylaxis). Simulated patients approached pharmacists, using a standardized scenario, for assistance with Epinephrine auto-injector use and advice about the use of antihistamines in anaphylaxis. Scores for each outcome were obtained based on the number of predefined statements addressed by the pharmacist during the consultation (maximum score=5 for preparedness and 8 for engagement). The mean anaphylaxis preparedness score was 2.39 points (SD 1.17). Scores for new-look EpiPen were significantly higher than for original EpiPen and Anapen (2.75 vs 2.38 points, $p=0.027$; 2.75 vs 2.03 points, $p<0.001$, respectively). Overall, 17.3% of pharmacists correctly demonstrated the Epinephrine auto-injector. The mean anaphylaxis engagement score was 3.11 points (SD 1.73). Scores for new-look EpiPen were similar to original EpiPen and Anapen (3.11 vs 3.32 points; 3.11 vs 2.90 points, both $p=0.42$). Engagement was associated with preparedness. For each additional engagement point, preparedness increased by 7% (0.357 points; 95% CI 0.291 to 0.424; $p<0.001$). Pharmacists demonstrated reasonable knowledge of anaphylaxis symptoms and emergency care, but had poor Epinephrine auto-injector technique and rarely discussed anaphylaxis action plans. Pharmacists who had a more comprehensive discussion about anaphylaxis with patients were more prepared for anaphylaxis emergencies. Future research should evaluate the nature and significance of errors in pharmacists' auto-injector technique. Studying pharmacists is an important step as some

states are looking to extend use of non-patient specific Epinephrine in an anaphylactic emergency, creating an additional layer of protection and access to Epinephrine to treat anaphylactic events.

McMillan, Hattingh, and King (2012), investigated community pharmacists' responses to hypothetical medical emergency situations in Australia. Researchers posted a survey to 151 Gold Coast and Toowoomba community pharmacies in October of 2009. Pharmacists were asked to document their opinions regarding the pharmacist's role in medical emergencies and to respond to statements associated with two hypothetical medical emergency situations, 1) an anaphylaxis scenario and 2) an asthma attack. Forty five pharmacists responded to the survey (29.8%). In response to a hypothetical situation involving an asthma attack, 41 pharmacists (91.1%) agreed that they would assist the asthmatic person to administer salbutamol through a spacer, with 28 pharmacists (62.2%) confident in treating an asthma attack in the pharmacy. In comparison, only 21 out of 38 pharmacists (55.3%) agreed to administer an adrenaline auto-injector (Epi-Pen) for a child experiencing anaphylaxis, with 9 respondents (23.7%) indicating they would ask the mother for directions in a situation where they were unsure how to administer it. Several pharmacists questioned whether indemnity insurance covers them for medicine administration. Twelve pharmacists indicated that they would ask the mother to administer the adrenaline if unsure of the coverage. In conclusion, factors like familiarity with medication, its safety profile and uncertainty about the pharmacist's role and responsibilities contributed to varied responses. Further training and clear guidelines were recommended by the researchers. Although this study was conducted outside of the U.S., it is evident that inadequate knowledge and comfort level in administering the adrenaline auto-injector may impede willingness to act in an anaphylactic emergency.

EMERGENCY RESPONSE MODELS

Narcan/ Naloxone as a model.

Bachhuber, McGinty, Kennedy-Hendricks, Niederdeppe, and Barry (2015) conducted a randomized survey to increase public support for Naloxone distribution policies in the United States. Barriers to public support for naloxone distribution include lack of knowledge, concerns about potential unintended consequences, and lack of sympathy for people at risk of overdose. The method used was a randomized survey conducted with a nationally-representative web-based survey research panel (GfK KnowledgePanel). Participants were randomly assigned to read different messages alone or in combination: 1) factual information about naloxone; 2) preemptive refutation of potential concerns about naloxone distribution; and 3) a sympathetic narrative about a mother whose daughter died of an opioid overdose. Participants were then asked if they support or oppose policies related to naloxone distribution. For each policy item, logistic regression models were used to test the effect of each message exposure compared with the no-exposure control group. The final sample consisted of 1,598 participants (completion rate: 72.6%). Factual information and the sympathetic narrative alone each led to higher support for training first responders to use naloxone, providing naloxone to friends and family members of people using opioids, and passing laws to protect people who administer naloxone. Participants receiving the combination of the sympathetic narrative and factual information, compared to factual information alone, were more likely to support all policies: providing naloxone to friends and family members (OR: 2.0 [95% CI: 1.4 to 2.9]), training first responders to use naloxone (OR: 2.0 [95% CI: 1.2 to 3.4]), passing laws to protect people if they administer naloxone (OR: 1.5 [95% CI: 1.04 to 2.2]), and passing laws to protect people if they call for medical help for an overdose (OR: 1.7 [95% CI: 1.2 to 2.5]). All messages increased public support, but combining factual information and the sympathetic narrative was most effective. Public support for

naloxone distribution can be improved through education and sympathetic portrayals of the population who stand to benefit from these policies.

Cardio-Pulmonary Resuscitation (CPR) model.

According to Chew, Yazid, and Abu (2008), despite the importance of early effective chest compressions to improve the chance of survival of an out-of-hospital cardiac arrest victim, it was unknown how willing the Malaysian population is to perform bystander cardiopulmonary resuscitation (CPR). Researchers conducted a voluntary, anonymous self-administered questionnaire survey of a group of 164 final year medical students and 60 final year dental students to assess their attitudes towards performing bystander CPR. Using a 4-point Likert scale of "definitely yes," "probably yes," "probably no," and "definitely no," the students were asked to rate their willingness to perform bystander CPR under three categories: chest compressions with mouth-to-mouth ventilation (CC + MMV), chest compressions with mask-to-mouth ventilation (CC + PMV), and chest compressions only (CC). Under each category, the students were given ten hypothetical victim scenarios. Categorical data analysis was done using the McNemar test, chi-square test, and Fisher exact test where appropriate. For selected analysis, "definitely yes" and "probably yes" were recoded as a "positive response." Generally, they found that only 51.4% of the medical and 45.5% of the dental students are willing to perform bystander CPR. When analyzed under different hypothetical scenarios, they found that, except for the scenario where the victim is their own family member, all other scenarios showed a dismally low rate of positive responses in the category of CC + MMV, but their willingness was significantly improved under the CC + PMV and CC categories. This study showed that there were unique sociocultural factors that contributed to the reluctance of the students to perform CC.

There is a close contact with bodily fluids during mouth-to-mouth resuscitation, which is absent during epinephrine injection. Thus, bystanders' willingness to act might not be affected, and be similar to the responses of individuals who were willing to act with chest only compressions and if a mask is used. Barriers that might prevent individuals to act in an FAE might be closely associated with fears of injections, injury or legal liability as further discussed below.

Automatic External Defibrillators (AED) model.

Sneath and Lacey (2009) conducted an exploratory study identifying perceptions of and participation in resuscitation training programs, and bystanders' willingness to resuscitate cardiac arrest victims. While most of the study's participants greatly appreciated the importance of saving someone's life, many indicated that they did not feel comfortable assuming this role. The findings also demonstrate there is a relationship between type of victim and bystanders' willingness to intervene. Yet, bystander intervention discomfort can be overcome with cardiopulmonary resuscitation and defibrillation training, particularly when the victim is a coworker or stranger.

Federal Occupational Health (FOH) administers a nationwide public access defibrillation program in US federal buildings. Kilaru et al. (2014) described the use of automated external defibrillators (AEDs) in federal buildings and evaluated survival after cardiac arrest. Using the FOH database, researchers examined reported events in which an AED was brought to a medical emergency in federal buildings over a 14-year period, from 1999 to 2012. There were 132 events involving an AED, 96 (73%) of which were due to cardiac arrest of cardiac etiology. Of 54 people who were witnessed to experience a cardiac arrest and presented to the hospital with ventricular fibrillation or ventricular tachycardia, 21 (39%) survived to hospital discharge. Public

access defibrillation, along with protocols to install, maintain, and deploy AEDs and train first responders, help survival after cardiac arrest in the workplace.

According to Gonzalez et al. (2015), a sudden cardiac arrest (SCA) strikes over 40,000 people in the public environment annually in the U.S.; however, despite evidence-based interventions such as prompt CPR and defibrillation, less than 25% of patients survive public SCA events. Effective use of automated external defibrillators (AEDs), especially by lay bystanders, represents an important strategy to improve survival rates. Previous investigations in Europe and Asia have demonstrated variable public awareness of AEDs. The goal was to measure understanding of AEDs among the general public, at multiple sites within a busy urban transportation system, using surveys administered at two high-volume train stations in Philadelphia, Pennsylvania between April and June, 2013. A total of 514 surveys were completed. Two thirds (66%) of respondents were able to correctly identify an AED and its purpose, and just over half (58%) of respondents reported willingness to use an AED in an emergency situation. Less than 10% of respondents presented with a hypothetical SCA scenario spontaneously mentioned using an AED when asked what actions they would take. In this cross-sectional survey, public knowledge about AEDs and their use was high. However, a smaller number of respondents expressed thoughts of using the device in an emergency situation and demonstrated willingness to serve as a responder. Researchers concluded that increased education and training efforts, as well as potential interventions such as 911 dispatcher-assisted AED use may help improve bystander response in SCA events.

Lubin, Chung, and Williams (2004) assessed the familiarity of the general public with automated external defibrillators (AEDs) and their willingness to use them. Shoppers were asked to complete a survey in an AED-equipped suburban shopping mall; 359 surveys were analyzed.

Of the participants, 11% were healthcare professionals, 51% had training in CPR or first aid, and 44% had no medical training. Sixty percent were able to define defibrillator adequately. Seventy-one percent stated they would be likely to use an AED to resuscitate a stranger. The most common concerns were fear of using the machine incorrectly (57%) and fear of legal liability (38%). After being told of liability protection from the federal Cardiac Arrest Survival Act, 84% stated they would be likely to use the AED. This increased further to 91% if the participants were given an opportunity to receive training. Although a substantial number of people in this setting were willing to use an AED, education regarding legal liability and proper use of the machines increased the reported likelihood of use. In regards to the use of Epinephrine auto-injector, fear for legal liability and fear of using devices incorrectly are possible barriers to one's willingness to act in a food-allergic emergency. These are reflected in the tool used in this study, and should be considered in the future when developing training and education materials.

TOOLS SELECTION

Care was taken in researching suitable tools that could be useful in measuring willingness and readiness to act in a food-allergic emergency. Several tools were identified through the literature that could be adapted or modified for the proposed study.

Knowledge is one of the essential components that is needed for one to become ready to act and possibly be willing to act in an FAE. Prochaska & DiClemente (1986) and Roy & Andrews (1991) implicate knowledge as one of the stages in prompting one's change in behavior, leading to readiness. Therefore, knowledge will be measured using an existing tool by Gupta et al. (2009) The Chicago Food Allergy Research Survey, assessing knowledge, attitudes and beliefs will be modified to be suitable for college students. Please see Appendix C for a full description of Gupta's tool, with permission to use and modify it. The modified version consists

of 15-items of True/False/ Don't Know, with reported validity (CVI=0.96) and reliability (Cronbach alpha=0.814) during the pilot study. This will be further discussed in Chapter 3.

Holmes, Corrigan, Williams, Canar, and Wozniak (1999), developed a 12-item measure grading familiarity with a mentally ill person. Authors reported interrater reliability as 0.83, with higher scores signifying more familiarity or personal contact. Using this scale, Feeg, Smith, Prager, Moylan, and Cullinan (2014) found that students with less familiarity with mental illness were significantly less willing to work with or live near a person with mental illness. The higher the sum of scores, the more familiar one is with the condition. This tool will be adapted to the proposed study because it is anticipated that individuals who are more familiar with food allergies and EAI would be more willing and ready to act in an FAE compared to individuals who are less familiar or not familiar at all.

Analogous to Holmes' scale, a new 10-item scale was developed to obtain information about individuals' experience with or exposure to EAIs. Respondents are asked to select Yes or No to a series of statements, such as "I injected my child at least once" or "I practiced with a trainer device." The total sum of scores will be calculated for each respondent. The new scale was tested for validity (CVI=0.815) and reliability (Cronbach's alpha=0.732) during a pilot study on college students, and was further validated during the full study.

Likelihood to respond by a bystander has been studied for over half a century. It is likely that the presence of other people in a critical situation, such as a food-allergic emergency, may reduce the likelihood that an individual will help; however, factors such as a person in immediate danger may prompt action. According to the famous experiment conducted by Darley and Latane (1968), the presence of other bystanders reduced the individual's feeling of personal responsibility. However, perception of immediate physical danger prompts faster response

according to Fischer, Krueger, Greitemeyer, Vogrincic, Kastenmuller, Frey, Heene, Wicher, and Kainbacher (2011). Thus, a new scale was developed to measure likelihood of response by bystanders in a food allergic emergency. This 5-point Likert scale is based on a scenario and consists of questions such as “I would help”, or “Someone else should help”, with reverse coded questions such as “I would walk away.” This tool started as a 15-item scale, but after expert review (CVI=0.80) and further reliability testing in the pilot study (Cronbach’s alpha= 0.874), items were reduced to 10, with several items revised for simplified wording. Further testing was done on data from the full study.

Individuals responding to surveys may answer questions in a way that are most socially desirable. To minimize this bias, the survey was administered via web-based format with all responses remaining anonymous. Additionally, the Marlowe-Crowne Social Desirability Scale--Form C (Reynolds, 1982) was used to validate self-reported measures to ascertain how truthful responders were in answering the questions. The scale’s reported reliability is Kuder-Richardson-20 = .76. (See Appendix D). This tool was chosen because it is often used in health research and social sciences that utilize self-reported measures, similar to the self-reported measures used in the proposed study.

Finally, based on the above discussed review of literature several analog scales were developed to capture self-reported knowledge, willingness to act, confidence to act, willingness to be trained, and fears preventing one’s ability to help in an FAE. (See Appendix E for tool items).

CONCLUSION

Although many researchers have looked at caregivers and individuals with allergies to identify knowledge, readiness, confidence and willingness to self-inject Epinephrine auto-

injector, no studies have focused on members of a college community in identifying factors associated with willingness and readiness to act in a food allergic emergency. Figure 1 introduced in chapter 1 illustrates concepts and sub-concepts extracted from the literature review and used to construct the tools for the proposed study. Through this research, shared components among these concepts and how they relate to each other were explored.

ASSUMPTIONS

This study's findings are important in safeguarding the growing number of individuals with diagnosed or undiagnosed food allergies and anaphylaxis on a college campus. It is assumed that respondents answered survey questions truthfully knowing that provisions were made to ensure their anonymity and confidentiality. Participants were also given an option to withdraw at any time. Additionally, the Marlowe-Crowne Social Desirability Scale--Form C (Reynolds, 1982) was used to validate self-reported measures to ascertain how truthful responders answered the questions. The sample for this proposal was drawn from a population of college students that was ethnically diverse based on selected college demographics (College Factual, 2013). Therefore, the sample for this study was representative of the student population to be able to make inferences to similar private suburban schools with similar demographics.

Chapter 3

METHODOLOGY

In this section of the dissertation, the research design, population of interest, sample and sampling procedure, measures, as well as research questions/ hypotheses are discussed. Additionally, data collection, instrumentation, and ethical considerations are outlined. Operational definitions of the research variables and procedures for answering the research questions are described.

Before undertaking the full study, an extensive procedure for developing and testing the survey instrument to be used was done to assure validity and reliability. This pilot testing included two data collection activities discussed in this chapter. Content and construct validity were assessed and described as well as reliability tests for internal consistency of the measures and test-retest using alternate forms (web and paper) data collection approaches.

The research design of the full study is presented following the pilot study results. The proposed quantitative, correlational, descriptive study help identify factors associated with willingness and readiness to act in a food-allergic emergency in a college student population and test relationships between the study variables. Potential relationships between and among willingness and readiness to act based on knowledge, experience, and/or demographic characteristics may exist. Thus, the proposed study survey of all levels of students in a college-wide population was the most appropriate design for this investigation. A web-based online survey tool in Google forms was developed, tested and distributed to a suburban private Catholic college situated near a large metropolitan city in the United States. All survey responses were collected after all necessary approvals were obtained from the IRB of the research site (See Appendices G and H).

STUDY POPULATION

For the full study, college students were recruited through an e-mail blast to all college students enrolled in the 2017 school year for at least one or more credits. Students age 17 and older enrolled in undergraduate and graduate level programs were invited. The target college of interest has a population of approximately 4,000 students with majors such as criminal justice, art, business, education, and health professions and allied health. Based on previous survey research with incentives, approximately 400 responses were expected. Students were invited to participate in a web-based survey with an incentive of \$100 offered for every 100 students who completed the survey, which was sent to participants drawn at random upon completion of the study. Two reminders were sent to improve the response rate.

METHOD OF RECRUITMENT / SAMPLING

Undergraduate and graduate students of a private suburban college in the New York metropolitan area enrolled in the 2017 school year for one or more credits were recruited. An email with a link to a Google forms survey was emailed to all students using the all-students distribution list. Google forms is a free online software for building surveys that was used for this study because the college selected as a research site uses Google platform for emails. Thus, Google drive is familiar to students to maximize responses. Data from the survey were exported to Excel and then into SPSS version 24 for data analysis. Previous studies using online-based survey format at this research site yielded 530 responses in 2010 (Feeg, Upton, & Vitale, 2010) and 309 responses in 2014 (Feeg et al., 2014). Thus, it was estimated that approximately 400 (10%) students out of 4000 would complete the survey in the proposed study. The targeted number of approximately 10% (474) responses was achieved with three rounds of emails within a 2 weeks apart each. Based on the ten variables in this study, with an estimation of 10 subjects

per variable, the minimum sample size was set at 100. An alternative approach to estimating sample size for this study was to perform power analysis (Polit & Beck, 2012). Online calculation for the estimated sample size for multiple regression and ANOVA based on 2 predictor variables is $n = 67$, with desired statistical power of .80, significance alpha level (or p-value) = 0.05, and estimated medium effect size Cohen's $f^2 = 0.15$ or $R^2 = .13$. It is important to have a sample size large enough to obtain meaningful results (Polit & Beck, 2012). Based on prior web-based survey research of this college population (Feeg et al., 2010; Feeg et al., 2014), an adequate sample was highly likely following similar recruitment procedures.

SAMPLE

The sample for this proposal was drawn from a population of college students that is ethnically diverse based on college demographics (College Factual, 2013). Email addresses of the students were not collected to maintain anonymity. However, upon completion and submission of the survey, respondents were directed to a different Google web link disconnected electronically from their survey responses, where they were given the option to provide their contact information email or phone number for future studies and/or training. In addition students were given an option to provide their email address in order to receive the \$100 gift card if selected by drawing at the conclusion of the study. Contact information provided for the raffle drawing was held separately from the survey responses. Before completing the survey, participants had an opportunity to read the following: the description of the study, options to withdraw from participation, risks and benefits, freedom of participation, deadline for responses and available incentives.

INSTRUMENTATION

The survey tool for this study was comprised of a combination of instruments that were assembled to measure the variables of interest. These variables are defined to capture respondents' self-report of their *Readiness to Act* and *Willingness to Act* in a Food Allergic Emergency (FAE). Each of these variables contains a variety of components representing different aspects of the variable as described in the literature and developed from existing scales. Some variables are newly created for this study; others are modified from existing scales. These variables are listed in Table 1 and operationalized in Table 2.

Table 1. THE VARIABLES OF INTEREST

<p>Readiness to Act</p> <ul style="list-style-type: none"> Knowledge of FAEs Level of Exposure/Familiarity with FAEs Experience with FA Experience with EPI and Other Injections Training about FAEs Confidence in FA and EPI <p>Willingness to Act</p> <ul style="list-style-type: none"> Willingness to Act – Bystander's Likelihood to Respond (LTR) Willingness to Act – Fear / Fearless <p>Demographic Variables</p> <ul style="list-style-type: none"> Age Gender Number of Children College Major Student Status <p>Social Desirability</p>

Table 2. INSTRUMENT COMPONENTS WITH OPERATIONAL DEFINITIONS

Overall Variables of Interest	Variable Components - Definitions	Instrumentation
Readiness to Act (sum of 5 scores)	Knowledge of Food Allergies and Epinephrine auto-injectors (Sum score) OKFA (Self-Report Analog Scale) OKEA (Self-Report Analog Scale) 15-Item Knowledge Test KT1 – 15 (T/F/DK)	<u>Modified from</u> The Chicago Food Allergy Research Surveys for Parents of Children with Food Allergy. R. Gupta (2009)
	Level of Exposure/ Familiarity with Food Allergies and Epinephrine auto-injector (Highest score on item checked per original tool instructions) (the mean of rank order correlations summarizing interreter reliability=0.83) Level_of_Exposure1 –12 (Checkboxes)	<u>Adapted from</u> Level of Contact (familiarity) Holmes et al. (1999)
	Experience self-reported (Sum score) EXPE1-10 (Y/N) EXP_EPI (Analog Scale) EXP_MED (Analog Scale)	Developed for this study
	Training self-reported (Yes/No) If Y, go to Checkboxes 1-6; If N, go to Willingness to Train (Analog Scale)	Developed for this study
	Confidence self-reported (sum score) CRAR (Analog Scale) CEPI (Analog Scale)	Developed for this study
Willingness to Act (sum of 2 scores, if both measures are correlated)	Bystander/Likelihood to Respond to Scenario LTR1 – 10 (Likert Scale)	Developed for this study
	Fearless self-reported (sum score) Fear1, Fear2, Fear3 (Analog Scale)	Developed for this study
Social Desirability	Social Desirability (sum score) Marlowe-Crowne Social Desirability Scale - Form C (Kuder-Richardson-20 reliability = .76) Social11 – Social13 (T/F)	<u>Original Short Form:</u> Marlowe-Crowne Social Desirability Scale--Form C W. M. Reynolds (1982)
Demographics	Age, Gender, Ethnicity, Number of Children, Student Status and College Major	Modified from recommendations by the U.S. Census Bureau

TOOL DEVELOPMENT – PILOT TESTING

The instrument to measure readiness and willingness to act in a food-allergic emergency (FAE) was measured by a tool that consists of true/false questions, several Likert scale questions,

several analog scales and check boxes. The Willingness and Readiness to Act in a Food-Allergic Emergency Scale (WilRAFAE) was developed by the investigator prior to the full study commencement. The complete survey instrument was developed to measure the variables of interest using items from the literature as well as developing new items. The phases of tool development included development of the items and pilot of the tool. Pilot testing included several steps to formalize the final tool.

Developing the items:

Elements were initially identified from the literature by the investigator. Reverse coded items were added to validate if the participants are responding to the survey attentively. In the development phase, the items were assessed by members of the dissertation committee. Items were edited and prepared for assessment of content validity. Five Master's prepared nurses who were Advanced Practice Registered Nurses reviewed the items, and any items not representative of the concepts or sub-concepts were adjusted for the final version.

The content validity was established by expert review of the concepts and sub-concepts. Two main concepts were identified from the literature: ***Willingness to Act*** and ***Readiness to Act***. Several sub-concepts were identified for each main concept. According to Prochaska's Transtheoretical Approach (Prochaska & DiClemente, 1986), an individual must go through several stages, including the preparation stage to acquire a new skill or behavior and maintenance stage to sustain it to reach a *Readiness to Act*. Therefore, knowledge, exposure/familiarity, experience, or prior training might be predictive of one's ability to be ready to act. *Willingness to Act* is a second concept being measured by the tool. Based on the literature review, several factors may influence one's willingness to act, including fear or lack thereof, as

well as certain social and demographic factors such as age, career aspirations, or behaving in a way that is socially desirable.

A content validity grid was developed for expert review of the concept and additional input. A conceptual definition of concepts and sub-concepts was included in the content validity grid for clarification of review. Each item had a scale from 1-4 indicating its representation of the concept. The numbers were described as 1= the item is not representative of the concept, 2= the item requires major revisions to be representative of the concept, 3= the item requires minor revisions to be representative of the concept, and 4= the item represents the concept. The items were numbered with a corresponding box adjacent to it with the 1-4 scale and a section for comments. A section for suggestions on how to improve any item was included. The Construct Validity Index (CVI), the degree to which it measures the construct under investigation (Polit & Beck, 2012), was calculated (range across measures = .80 to .96). (See Appendix F)

Following a discussion of the assessments derived from the experts, the items were clarified, reduced and prepared for follow-up testing. Two aspects were assessed: (1) construct validity using known groups; and (2) internal consistency for the elements within some of the measures. Additionally, a subset of analysis was done to test the use of alternative forms (pen-paper vs. web-based) for future execution of the study.

Pilot of the tool.

With IRB approval, the tool was assessed in a pilot study for psychometric properties on a convenience sample of 55 undergraduate students, enrolled in criminal justice, business, and nursing classes. (See Appendix G for IRB approval). Because the pilot testing of the tool was based on a paper-pencil format and the final implementation of the survey would be web-based, test-retest reliability was used with the alternate forms. Test-retest is one of the simplest ways to

test reliability of the tool on the same individuals over a short period of time or using alternate formats (Polit & Beck, 2012). Knowing that in the full proposed study, the survey tool would be administered in the web-based format, further testing was needed on the tool. A test-retest process using the two forms was executed on a convenience sample of undergraduate and graduate students in nursing. Test-retest was performed with graduate and undergraduate nursing students (n=42), using a confidential web-based survey, followed by a confidential in-class pen/paper format survey, with a modest incentive of a \$20 gift card raffle.

The study was voluntary and subjects were told that completion of the survey represented their consent to participate. The online and paper surveys asked participants to volunteer their email addresses so that the two sets of data could be paired. After completion of both versions, without disclosure of any students' responses, the instructors of the classes had an opportunity to hold classroom discussion about research. (See Appendix H for IRB request modification).

Test-retest reliability was performed on two classes: undergraduate freshman nursing students enrolled in a nursing fundamentals course and registered nurses (RNs) enrolled in a graduate nursing research course with permission from the class instructors. The aim was to assess if responses had any significant variations from Web-based format using Google forms versus pen and paper format as well as to determine differences in knowledge for construct validity. Students completed the online version of the survey before completing the pen and paper version. Survey completion time varied from 12 to 20 minutes in each format. An in-class raffle was held upon submission of both surveys. Out of 34 undergraduate students 30 completed both surveys. Out of 14 graduate students 11 completed both surveys. Data were reviewed for any significant discrepancies between web-based and paper-and-paper responses for each

participant. The percent agreement for all participants on alternate forms was 90%, making it possible to use the web form of the instrument in the full study.

Construct validity was assessed by using these known groups (graduate nursing students who are already registered nurses and undergraduate nursing students). Several items were selected to test the hypotheses that Registered Nurses (RNs) would score higher on the Knowledge items of the scales developed for the study. The results were statistically significant as predicted with the Knowledge mean scores for RNs ($m=12.8$, $sd = 1.51$) significantly higher ($p<.05$, $t = -3.15$) than the Knowledge mean scores for Freshman nursing students ($m=10.2$, $sd = 3.25$).

To further assess construct validity using known groups and reliability of the instrument that would be used in the proposed full study, a second pilot study using the paper survey was designed. The sample for the pilot study consisted of a convenience sample of undergraduate freshman students enrolled in the fall 2016 semester at the same private Catholic suburban college in metropolitan NY area that was used in the full study. Three classes were recruited specifically to differentiate how known groups should answer some of the items based on their career choices (i.e. “helping” professions vs. “business” professions). Students enrolled in criminal justice, business, and nursing classes were visited and given an anonymous pen and paper survey during their class time. Names were collected on separate index cards and returned together with the survey for a raffle drawing incentive of \$20. All survey responses were coded and entered into Google forms for analysis. The data were analyzed for validity and reliability of the instrument. (See Appendix I for full consent form).

Reliability Results. The sample yielded a complete set of data from a total sample of 55 students, cleaned for completeness, and prepared for analysis of internal consistency using

Cronbach alpha. Items were tested for reliability using total inter-item correlation and several items were removed to reduce the length of the instrument, reduce survey burden, and improve the alpha for the combined elements of the sub-scales for *Knowledge*, and *Bystander's Likelihood to Respond*. The results supported the use of the measures with alphas ranging from .814 to .874 respectively.

Following reliability testing, items and/or sections of the tool were cut down to reduce the length of the survey, to prevent fatigue and incomplete entries (Table 3). The final survey for the study using these items organized with general instructions and headings that do not bias the respondents were finalized for email to the study population of all students on campus. Demographic variables were added at the beginning of the survey. The final survey offered clear directions for how to submit the form anonymously with a mechanism to provide email information to be contacted for the drawing (\$100) incentive. (See Appendix J for final survey).

Table 3. Reliability for Food-Allergic Emergency Survey Scale

Tool /Scales	Code	Scale	Original Items	S-CVI	Final Items	Cronbach's Alpha	N
<i>Readiness to Act - Knowledge</i>	KN	Y/N/DKN	15	.96	15	.814	54
<i>Willingness to Act- Bystander's Likelihood to Respond</i>	LTR	1-5	15	.80	10	.874	54

Construct Validity Results. The sample was coded to test differences among the three groups of freshman students from the different disciplines: Group 1 (n=16) (Business); Group 2 (n=18) (Criminal Justice); and Group 3 (n=21) (Nursing), detailed in Table 4. The hypotheses were tested that predicted students who selected health or service professions would demonstrate higher scores on items that reflected their “willingness” to respond to a food-allergic emergency.

An ANOVA was used on the summed scores of *Bystander's Likelihood to Respond (Total LTR)*; as well as on individual (LTR 1-13) items yielding a statistically significant scores for several items including: LTR2, "I would intervene if no one else intervened" ($F=7.151, p=.010$) (b) LTR9, "I would help inject Epinephrine Auto-Injector" ($F=5.727, p=.006$); LTR13, (c) "It is my professional obligation to intervene" ($F=5.222, p=.009$); and (d) LTR15, "It is my moral obligation to help" ($F=3.530, p=.037$); and total sum LTR ($F = 5.021, p<.05$). (Tables 5). Bonferroni multiple comparisons analysis of total sum of bystander's LTR by college majors yield statistically significant differences between nursing major students and business major ($m=6.373, p=.010$), with no significant differences with students in criminal justice in their likelihood to respond (Table 6). These results provide reasonable evidence that the measures will be able to detect differences when implemented in the full study on the population of college students at the target school.

Table 4. Descriptive of Total Sum of Bystander's LTR

College Major	N	Mean	Std. Deviation
Business	18	36.7222	4.90864
Criminal Justice	16	38.7500	7.04746
Nursing	21	43.0952	7.07039
Total	55	39.7455	6.89932

Table 5. One Way ANOVA – Bystander's Likelihood to Respond (LTR)

		Sum of Squares	F	P	(df)
LTR1	Between Groups	1.966	2.043	.140	2
	Within Groups	25.016			52
	Total	26.982			54
LTR2	Between Groups	14.393	7.151	.002	2
	Within Groups	52.334			52
	Total	66.727			54
LTR3	Between Groups	4.239	1.999	.146	2
	Within Groups	55.143			52

	Total	59.382			54
LTR5	Between Groups	4.356	1.845	.168	2
	Within Groups	61.390			52
	Total	65.745			54
LTR6	Between Groups	.262	.194	.824	2
	Within Groups	35.120			52
	Total	35.382			54
LTR8	Between Groups	.125	.097	.908	2
	Within Groups	33.620			52
	Total	33.745			54
LTR9	Between Groups	14.211	5.727	.006	2
	Within Groups	64.516			52
	Total	78.727			54
LTR10	Between Groups	2.802	2.527	.090	2
	Within Groups	28.834			52
	Total	31.636			54
LTR13	Between Groups	14.634	5.222	.009	2
	Within Groups	71.459			51
	Total	86.093			53
LTR15	Between Groups	8.420	3.530	.037	2
	Within Groups	62.016			52
	Total	70.436			54
TOT_SUM_LTR	Between Groups	416.016	5.021	.010	2
	Within Groups	2154.421			52
	Total	2570.436			54

p<.05

Table 6. Bonferroni Multiple Comparisons: Total Sum Bystander's LTR by Major

College Major	(J) Class code	Mean Difference (I-J)	Std. Error	Sig.
Business	Criminal Justice	-2.02778	2.21160	1
	Nursing	-6.37302*	2.06752	.010
Criminal Justice	Business	2.02778	2.21160	1
	Nursing	-4.34524	2.13597	.141
Nursing	Business	6.37302*	2.06752	.010
	Criminal Justice	4.34524	2.13597	.141

*. The mean difference is significant at the 0.05 level.

METHOD OF DATA COLLECTION

Data were collected via email surveys and responses were collected through Google forms of college students enrolled in 2017 school year. An incentive of \$100 for every 100 responses was offered in a drawing at the end of the study for those who chose to provide contact information for the raffle drawing. Three reminders were sent out within 2 weeks apart of each mailing to achieve targeted response rate of 400 or more students. The survey was opened on March 21st, 2017 and closed within 6 weeks on May 5th, 2017. The survey yielded a total of 474 responses, an estimated 10% to 11% response rate.

HYPOTHESES/ RESEARCH QUESTIONS

In this section, several hypotheses were tested based on the main research questions previously introduced in chapter 1 and are as follows:

1. What are the factors associated with readiness to act in a food allergic emergency?
2. What are the factors associated with willingness to act in a food allergic emergency?
3. How do different (age, gender, having children; student status, and student's major) individuals and/or groups compare on dimensions of readiness and willingness to act in a food allergic emergency?

Variables were predicted to be correlational in a model that describes how students might react in a food allergic-emergency (FAE). Further modeling may be possible to test if relationships are established among independent and dependent variables of interest. The goal of this study is to establish evidence-based data that could serve as a starting point for policy development and implementation on college campuses.

Readiness to act.

It is hypothesized that those who are knowledgeable, experienced/familiar and have had prior training with food allergies and Epinephrine auto-injector have gone through some stages of readiness and therefore, would express readiness to act in a food-allergic emergency (FAE).

- There is a relationship between knowledge and readiness to act in an FAE.
- There is a relationship between level of exposure/familiarity and readiness to act in an FAE.
- There is a relationship between experience and readiness to act in an FAE.
- There is a relationship between training and readiness to act in an FAE.
- There is a relationship between confidence and readiness to act in an FAE.

Willingness to act.

During role transition in an emergency situation, one who may not be ready to act, and might or might not be willing to act in an FAE under certain circumstances, such as exhibiting less fear and Bystander's Likelihood to Respond, might be willing to act. Fears and Bystander's Likelihood to Respond do not measure the same thing, but if correlated, could be combined to measure one's willingness to act in an FAE. Therefore, the following will be tested:

- There is a relationship between fear and Bystander's Likelihood to Respond to an FAE.

Demographics.

In an emergency situation, factors such as personal/demographic characteristics may play into individuals' willingness and/or readiness to act in an FAE.

- There is a relationship/differences between readiness to act in an FAE and demographic characteristics:
 - Age
 - Having children
 - Student status
 - Gender
 - College major

- There is a relationship/differences between willingness act in an FAE and demographic characteristics:
 - Age
 - Having children
 - Student status
 - Gender
 - College major

ETHICAL CONSIDERATIONS AND CONSENT

Category of review.

The research proposal was sent to the Molloy Institutional Research Board (IRB) requesting review in the exempt category because the study does not collect students' names except for the email addresses to send the gift card if selected a winner (separate from their survey responses) and if responders are interested to be contacted for future studies or training. Participants were able to voluntarily disclose their contact information by clicking on a separate web link after submitting their survey responses. Thus, participants' identities on the survey questioner were kept anonymous. Email addresses collected for the drawing of the gift card incentives were not be associated with the survey responses.

Students were informed in the beginning of the survey that the completion and submission of the survey constitutes their consent to participate. The embedded consent form included the title and purpose of the study, the risks and benefits of participating in the study, the significance of the findings and the freedom to withdraw or not participate in the study. Confidentiality related to participant email or phone number contact was clearly stated. The time necessary to complete the survey and time frame to respond to the survey was included. (Appendix K – consent form for full study; Appendix L – IRB approval letter).

Data preparation.

Collected data were exported from Google Forms into Excel and then imported into the Statistical Package for Social Sciences (SPSS) version 24 for analysis with embedded labels and codes. Data calculation and coding per each measurement was done on the data set. The Likert-

like scale used to assess Bystander's Likelihood to Respond has answers that range from +1 to +5. Reverse coded questions were reversed and dummy codes were applied to categorical data, such as data in demographics. In the questionnaire, fear visual analog scales with lowest score indicate less fear (fearless) and higher score indicate more fear (fearful). However, these numbers were reversed coded for the purposes of the analysis in SPSS, specifically when adding three fear questions together (Sum_Fearless), and also when combining Sum_Fearless with total sum of LTR scale scores. Thus, the higher the total sum of fear number, the lower the total sum of fear score (eg. fear number of 30 = fear score of 3 and vice versa).

Method of analysis.

Data were collected on all independent predictor variables and on two dependent variables (readiness and willingness). All data were entered, cleaned, coded and analyzed using IBM SPSS Statistics version 24. Pearson Correlation Coefficients were used to estimate relationships between the predictor and the outcome variables. Regression analysis was used to assess the degree with which each of the independent predictor variables of knowledge, experience, exposure/familiarity, fear and selected demographics influence willingness to respond in an FAE.

Procedure for answering research questions.

Participant responses were coded in SPSS 24. Descriptive statistics were run on the study demographics and variables prior to other analyses. The hypotheses are listed with null hypotheses as follows:

Readiness to act.

1. H0. There is no relationship between knowledge and readiness to act in an FAE.
H1. There is a relationship between knowledge and readiness to act in an FAE.

2. H0. There is no relationship between level of exposure/familiarity and readiness to act in an FAE.

H1. There is a relationship between level of exposure/familiarity and readiness to act in an FAE

3. H0. There is no relationship between experience and readiness to act in an FAE.

H1. There is a relationship between experience and readiness to act in an FAE.

4. H0. There is no relationship between training and readiness to act in an FAE.

H1. There is a relationship between training and readiness to act in an FAE.

5. H0. There is no relationship between confidence and readiness to act in an FAE.

H1. There is a relationship between confidence and readiness to act in an FAE

Willingness to act.

6. H0. There is no relationship between fear and Bystander's Likelihood to Respond to an FAE.

H1. There is a relationship between fear and Bystander's Likelihood to Respond to an FAE.

Demographics.

7. H0. There is no relationship/differences between readiness to act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

H1. There is a relationship/differences between readiness to act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

8. H0. There is no relationship/differences between willingness act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

H1. There is a relationship/differences between willingness act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

PLAN FOR DISSEMINATION

Findings from this study can contribute to knowledge in the field of allergy, and inform administrators of college communities about potential policy and practices associated with safety of college students living with food allergies. There is a potential for policy, education and future research on local and national levels. Information can be disseminated through presentations, webinars, and scholarly publications.

Chapter 4

RESULTS

This quantitative study was conducted on a college campus located in a New York metropolitan suburban area. The survey was administered via a web-based questionnaire with the link emailed to all-students in a distribution list. Google forms online software was used for this study because the college selected as a research site uses Google platform for emails and it is familiar to students. The total number of respondents was 474, an estimated 11% response rate.

GENERAL DESCRIPTION OF DATA

Sample Characteristics.

The ages of participants ranged from 18 to 64 years old (mean=22.9, n=380). More female respondents, n=397 (83.8%), than male, n=74 (15.6%) might be due to a higher response from students enrolled in health sciences, such as nursing, allied health, speech pathology, and audiology, with a total n=261 (55.1%). Mostly female students are enrolled in these health majors which is consistent with approximate gender distribution employed in these fields. Based on research site demographic gender distribution of the male to female student ratio it is comparable to the national average of about 40:60 with a student body that is predominantly female (College Factual, 2013). White students represented more than half of the sample (65%, n=308), followed by Black/African American (9.5%, n=45), Hispanic (8.9%, n=42), Asian (8.2%, n=39), and others (6.1%). The majority of students did not have any children (91.8%, n=435), as anticipated given the average age of students between ages 22 and 23 years old. Eight percent of students (n=38) reported having one or more children. Undergraduate students represented the majority of the respondents (83.8%, n=397), compared to graduate students (15.3%, n=72). College majors were grouped based on similar characteristics resulting in a total of seven groups: 1) health sciences, including nursing, speech-language pathology, audiology,

psychology and social work (55.1%, n=261); 2) business, administration, marketing, computer and political sciences (16.9%, n=80); 3) education (12.9%, n=61); 4) criminal justice (2.1%,n=10); 5) art, music, theater and humanities (8.4%, n=40); 6) physical and biological sciences (2.1%, n=10); 7) other, included students in interdisciplinary fields and with an undecided major (1.7%, n=8). Descriptive study characteristics are referenced in Table 7.

Although the return rate is low, the demographic data suggest that data are representative of the school population.

Table 7. Sample Characteristics

	Frequency=N	Percentage %
Age		
17-20	185	39.0%
21-30	164	34.6%
31-40	12	2.5%
≥ 41	19	4.0%
Missing	94	19.8%
Total	474	100.0%
Gender		
Female	397	83.8%
Male	74	15.6%
Other	2	.4%
Total	474	100.0%
Ethnicity		
White	308	65.0%
Black/African American	45	9.5%
Hispanic	42	8.9%
American Indian	2	.4%
Asian	39	8.2%
Other	29	6.1%
Total	465	98.1%
Missing System	9	1.9%
Total	474	100.0%
Children		

No children	435	91.8%
1 or more child	38	8.0%
Total	473	99.8%
Missing System	1	.2%
Total	474	100.0%
Level of Education		
Some HS/ Some College	223	47.0%
2 Year College	60	12.7%
4 Year College	152	32.1%
Master's/ Doctorate	34	7.2%
Total	469	98.9%
Missing System	5	1.1%
Total	474	100.0%
Student Status		
Undergraduate Student	397	83.8%
Graduate Student	72	15.2%
Undergrad./Grad. Students	2	.4%
Total	474	100.0%
College Major		
Health Sciences	261	55.1%
Bus/Comp/Admin/Market/Polit.	80	16.9%
Education	61	12.9%
Criminal Justice	10	2.1%
Art/Music/Theater/Humanity	40	8.4%
Physical/Bio Sciences	10	2.1%
Other/Undecided	8	1.7%
Total	470	99.2%
Missing System	4	.8%
Total	474	100.0%

Reliability of the Measurement Instruments.

This section will discuss instrumentation utilized in the study. Several new and existing tools used in this study were previously described in detail. During the full study, psychometric properties of these tools were reassessed for internal consistency reliability and compared to the values obtained in previously published studies and/or during pilot work prior to the commencement of this study (Table 8).

Table 8. Reliability of the Measurement Instruments

Instrumentation	Cronbach's Alpha		
	Published	Pilot	Current Study
The Chicago Food Allergy Research Surveys for Parents of Children with Food Allergy- Modified	Expert panel	.814 (15 items)	.718
Level of Exposure/Familiarity	Inter-rater Reliability=0.83		
Willingness to Act: Bystander/Likelihood to Respond	New	.874 (10 items)	.630 (10 items)
Marlowe-Crowne Social Desirability Scale -Form C	Kuder- Richardson-20 Reliability = .76		.732 (13 items)

Instruments used for this study with this population demonstrated overall acceptable internal consistencies in scales with alpha values slightly lower than observed in the pilot study and ranged between .630 and .732.

Descriptive Statistics for Measurement Instruments.

The construct of Readiness to Act in an FAE was measured by several instruments and consists of sum of scores detailed in this section and in tables 7 and 8. Two self-reported analog scale knowledge questions scores of (1) food allergies and (2) Epinephrine auto-injector were added to the total knowledge 15-item scale score to compute total knowledge score, and labeled as Sum_Knowledge. Similarly, Sum_Experience was computed by adding scores for self-reported analog scale questions scores of experience with (1) Epinephrine auto-injector and (2) other injectable medications/non-epinephrine injections to the total Experience score. Lastly, self-reported confidence (1) to recognize an allergic reaction and (2) to inject Epinephrine auto-injector analog scale questions scores were added to calculate sum score of reported overall

confidence, and labeled as Sum_Confidence. These new variables' scores were then added to compute total score of Readiness to Act in FAE.

The construct of Willingness to Act in an FAE was measured by the total score computed by adding scores of two measures: sum of scores for total Likelihood to Respond Likert-scale questionnaire (LTR) and sum of three scores of Fearless questions, measured by self-reported analog scale. Descriptive analysis of these variables were conducted (Tables 9 and 10).

Table 9. Descriptive Statistics of the Measurement Tools

Variables	N (%)	Mean	Std. Deviation	Range	
				Potential	Actual
Readiness to Act in FAE Measures ^a	429	56.04	16.724	8-97	18-94
Sum_Knowledge ^a	449	23.19	6.774	2-35	3-35
Knowledge	469	11	2.884	0-15	0-15
Knowledge overall ^b	469	12.13	4.781	2-20	2-20
Food Allergy	469	6.36	2.220	1-10	1-10
Epinephrine auto-injector	470	5.76	3.061	1-10	1-10
Exposure/Familiarity ^c	453	9.40	2.655	1-12	1-12
Sum_Experience ^a	451	10.9	6.464	2-30	2-27
Experience ^a	453	2.47	1.561	0-10	1-8
Experience overall ^b	470	7.60	5.433	2-20	2-20
Epinephrine Auto-Injector	470	3.33	2.965	1-10	1-10
Other Injections	472	4.27	3.373	1-10	1-10
Training:					
No	283 (59.7)				
Yes	189 (39.9)				
Sum_Confidence ^a	471	12.73	4.787	2-20	2-20
Recognize FAE ^b	471	6.82	2.232	1-10	1-10
Inject Epi Auto-Injector ^b	472	5.91	3.010	1-10	1-10
Willingness to Act in FAE Measures ^a	441	62.12	9.108	13-80	29-80

Likelihood to Respond (LTR) ^d	442	40.46	4.551	10-50	18-50
Sum_Fearless ^a	471	21.75	6.532	3-30	3-30
Blood/Needle ^b	472	8.93	2.100	1-10	1-10
Legal Responsibility ^b	471	6.73	2.864	1-10	1-10
Injury/Death ^b	472	6.10	2.835	1-10	1-10
Social Desirability Scale (SD)	456	8.11	2.924	0-13	0-13
Willing to be Trained ^b	470	8.44	2.297	1-10	1-10

Note: ^aSum of scores. ^bAnalog scale. ^cRank Order. ^dLikert scale.

Table 10. Food Allergy Level of Exposure/Familiarity Measure Highest Element Selected

Exposure/ Familiarity (N=469)	Frequency=N	Percent
(1) I have never observed a person that I was aware had a food allergy.	4	.8%
(2) I have observed, in passing, a person I believe may have had an allergic reaction.	6	1.3%
(3) I have watched movie or television show in which a character depicted a person with food allergies.	26	5.5%
(4) I have watched a documentary on television about food allergies.	7	1.5%
(5) I have observed a person with food allergies on a frequent basis.	6	1.3%
(6) I have worked with a person who had a food allergy in my place of employment.	16	3.4%
(7) My job includes providing services to persons with food allergies.	16	3.4%
(8) My job involves providing care services/treatment for persons with food allergies.	28	5.9%
(9) A friend of the family has food allergy/ allergies.	73	15.4%
(10) I have a relative who has a food allergy.	93	19.6%
(11) I live with a person who has a food allergy.	92	19.4%
(12) I have food allergy/allergies.	102	21.5%

Note: Score can range based on ranked order 1-12.

Demographic data, the social desirability scale and the above described variables were used to conduct final analyses consisting of factor analysis for factor validity of the measurement tool, correlations to test hypotheses, ANOVA, and multiple regression to identify future direction.

FACTOR ANALYSIS

Factor analysis was used to determine factor validity of the WilRAFAE in college students through factor loading results. The Kaiser-Meyer-Olkin (KMO) measure of sampling

adequacy provided support for proceeding with the analysis (.848). Bartlett's test of sphericity yielded significant results ($p \leq .001$). The original principal component analysis with oblique rotation explained a two component structure. High loading items ($\geq .70$) in component one included: Sum_Knowledge (.805), Sum_Experience (.823), Training (.779), and Sum_Confidence (.794). Second component included Social Desirability (.744). Likelihood to Respond (.619) and Fearless (.610) scales loaded close together as both were intended to measure bystander's willingness to act in a food allergic emergency (Appendix M). The correlation coefficients of five subscales measuring readiness to act and two subscales measuring willingness to act, and social desirability scale depicted in the model, identified the relationships between the variables using Person product-moment correlation testing detailed in Table 11.

Table 11. Pearson Correlation

Pearson Correlation	SUM_KN	LEVEL_EXPO	SUM_EXPE	TRAINING	SUM_CONF	SOC_DESIR	TOT_LTR	TOT_FEAR
SUM_KN	1							
LEVEL_EXPO	.146**	1						
SUM_EXPE	.659**	.141**	1					
TRAINING	.511**	.191**	.572**	1				
SUM_CONF	.686**	.141**	.647**	.507**	1			
SOC_DESIR	.241**	-.052	.207**	.110**	.264**	1		
TOT_LTR	.394**	.077	.246**	.212**	.412**	.263**	1	
TOT_FEAR	.353**	.117	.294**	.243**	.386**	.266**	.329**	1

Note. ** Correlation is significant at the 0.01 level (1-tailed). KN=Knowledge; EXPO=Exposure; EXPE= Experience; CONF=Confidence; SOC_DESIR=Social Desirability; LTR=Likelihood to Respond; FEAR=Fearless

ANSWERING THE RESEARCH QUESTIONS

This study was aimed at identifying factors associated with willingness and readiness to act in an allergic emergency by college students in a campus community. This section will present answers to each research question and will provide results of tested hypotheses.

What are the factors associated with readiness to act in an allergic emergency?

It was hypothesized that those who possess knowledge, experience, familiarity/exposure, confidence and have had prior training with food allergies and Epinephrine auto-injectors have gone through some stages of readiness and therefore, would be ready to act in a food-allergic emergency (FAE). To answer this question, the following five hypotheses were tested

1. H0. There is no relationship between knowledge and readiness to act in an FAE.

H1. There is a relationship between knowledge and readiness to act in an FAE.

There is a statistically significant correlation found between having knowledge about food allergies and Epinephrine auto-injector and readiness to act in an FAE ($r=.892$, $p<0.01$).

2. H0. There is no relationship between level of exposure/familiarity and readiness to act in an FAE.

H1. There is a relationship between level of exposure/familiarity and readiness to act in an FAE.

There is a statistically significant correlation between exposure/familiarity to persons with food allergies and readiness to act in an FAE ($r=.316$, $p<0.01$).

3. H0. There is no relationship between experience and readiness to act in an FAE.

H1. There is a relationship between experience and readiness to act in an FAE.

There is a statistically significant correlation between having experience with Epinephrine auto-injector and readiness to act in an FAE ($r=.875$, $p<0.01$).

4. H0. There is no relationship between training and readiness to act in an FAE.

H1. There is a relationship between training and readiness to act in an FAE.

There is a statistically significant correlation between having training in food allergies and Epinephrine auto-injector and readiness to act in an FAE ($r=.644$, $p<0.01$).

5. H0. There is no relationship between confidence and readiness to act in an FAE.

H1. There is a relationship between confidence and readiness to act in an FAE.

There is a statistically significant correlation between confidence to recognize an allergic reaction/ using Epinephrine auto-injector and readiness to act in an FAE ($r=.838$, $p<.01$).

Table 12. Correlation Coefficients: Readiness to Act and Knowledge (KN),

Exposure/Familiarity (EXPO), Experience (EXPE), Training and Confidence.

Variable	KN	EXPO	EXPE	TRAINING	CONFIDENCE
READINESS	.892**	.316**	.875**	.644**	.839**

N=429, ** $p<.01$, two-tailed

What are the factors associated with willingness to act in an allergic emergency?

It was hypothesized that during role transition in an emergency situation, those with or without expressed readiness, under certain circumstances, such as a Bystander's Likelihood to Respond and fear, might be willing act in an FAE. If two constructs (fear and LTR) are correlated, they can be combined to measure willingness to act in an FAE.

6. H0. There is no relationship between fear (blood/needle, legal liability, and injury/death) and a Bystander's Likelihood to Respond to an FAE.

H1. There is a relationship between fear (blood/needle, legal liability, and injury/death) and a Bystander's Likelihood to Respond to an FAE.

There is a statistically significant correlation between fear (blood/needle, legal liability, and injury/death) and a Bystander's Likelihood to Respond to an FAE ($r=.329$, $p<.01$).

Table 13. Correlation Coefficients: Fear and Bystander's Likelihood to Respond (LTR)

Variable	LTR
Fear	.329**

** $p<.01$, two-tailed

How do different (age, gender, having children; student status, and student's major) individuals and/or groups compare on dimensions of willingness and readiness to act in an allergic emergency? In an emergency situation, factors such as demographic characteristics may play into an individual's willingness and/or readiness to act in an FAE.

7. H0. There is no relationship/differences between readiness to act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

H1. There is a relationship between readiness to act in an FAE and demographic characteristics:

There were a statistically significant correlation found between age, and having one or more children and readiness to act in an FAE. Graduate/undergraduate student status was found to have non-significant correlation with readiness to act in an FAE.

Table 14. Correlation Coefficients: Readiness and Age, Number of Children, and Student Status

Variable	Readiness to Act	Age	Number of Children	Student Status
Readiness	1	.239**	.226**	.086

Independent samples t-test did not show statistically significant differences between male (M=52.86, SD=18.06) and female (M=56.62, SD=16.45) in readiness to act $t(426) = -1.676$, $p = .095$. ANOVA analysis revealed statically significant differences in readiness to act and college major (F=8.622, $p < .001$), Table 13.

Table 15. ANOVA Readiness to Act by College Major

	Sum of Squares	F	P	(df)
Between Groups	11101.796	8.622	.001	5
Within Groups	106356.791			413

Furthermore, Bonferroni multiple comparisons post hoc test was performed demonstrating that students in health professions expressed readiness to act that was statistically significant in comparison to other majors, with exception of students in physical/biological sciences (Table 14).

Table 16. Bonferroni Multiple Comparisons: Readiness to Act by College Major

College Major	College Major	Mean Difference	Std. Error	Sig.
Health Sciences	Bus/Comp/Admin/Market/Polit.	10.544**	2.147	.001
	Education	8.416**	2.366	.006
	Criminal Justice	17.311**	5.180	.014
	Art/Music/Theater/Humanity	10.099**	2.981	.012
	Physical/Bio Sciences	.936	5.768	1
Bus/Comp/ Admin/Market/Polit.	Health Sciences	-10.544**	2.147	.001
	Education	-2.128	2.836	1
	Criminal Justice	6.767	5.411	1
	Art/Music/Theater/Humanity	-.445	3.366	1
	Physical/Bio Sciences	-9.608	5.976	1
Education	Health Sciences	-8.416**	2.366	.006
	Bus/Comp/Admin/Market/Polit.	2.128	2.836	1
	Criminal Justice	8.895	5.502	1
	Art/Music/Theater/Humanity	1.683	3.510	1
	Physical/Bio Sciences	-7.480	6.059	1
Criminal Justice	Health Sciences	-17.311**	5.180	.014
	Bus/Comp/Admin/Market/Polit.	-6.767	5.411	1
	Education	-8.895	5.502	1
	Art/Music/Theater/Humanity	-7.212	5.793	1
	Physical/Bio Sciences	-16.375	7.612	.481
Art/Music/Theater/H umanity	Health Sciences	-10.099**	2.981	.012
	Bus/Comp/Admin/Market/Polit.	.445	3.366	1
	Education	-1.683	3.510	1
	Criminal Justice	7.212	5.793	1
	Physical/Bio Sciences	-9.163	6.324	1
Physical/ Bio Sciences	Health Sciences	-.936	5.768	1
	Bus/Comp/Admin/Market/Polit.	9.608	5.976	1
	Education	7.480	6.059	1

Criminal Justice	16.375	7.612	.481
Art/Music/Theater/Humanity	9.163	6.324	1

*. The mean difference is significant at the 0.05 level.

**. The mean difference is significant at the 0.01 level.

8. H0. There is no a relationship/differences between willingness act in an FAE and demographic characteristics:

- Age
- Having children
- Student status
- Gender
- College major

H1. There is a relationship between willingness act in an FAE and demographic characteristics:

There were statistically significant correlations found between age and having one or more children, and willingness to act in an FAE. Student status (undergraduate/graduate) was found to have non-significant negative correlation with willingness to act in an FAE.

Table 17: Correlation Coefficients: Willingness and Age,

Number of Children, and Student Status.

Variable	Willingness to Act	Age	Number of Children	Student Status
Willingness	1	.301**	.165**	.045

Independent sample *t*-test did not show statistically significant differences between male ($M=60.90$, $SD=11.41$) and female ($M=370$, $SD=62.27$) in their willingness to act, $t(437) = -1.151$, $p=.251$. ANOVA analysis revealed statically significant differences between college majors and willingness to act ($F=11.957$, $p<.001$).

Table 18. ANOVA Willingness to Act and College Major

	Sum of Squares	F	P	(df)
Between Groups	4462.399	11.957	.001	5
Within Groups	31797.518			426

Additionally, Bonferroni multiple comparisons post hoc test was performed demonstrating that students in health professions expressed willingness to act that was statically significant in comparison to other majors, with exception of students in criminal justice and physical/biological sciences. However, students in criminal justice and physical/bio sciences did not differ from other groups.

Table 19. Bonferroni Multiple Comparisons: Willingness to Act by College Major

College Major	College Major	Mean Difference	Std. Error	Sig.
Health Sciences	Bus/Comp/Admin/Market/Polit.	6.488**	1.153	.001
	Education	5.235**	1.290	.001
	Criminal Justice	3.662	2.787	1
	Art/Music/Theater/Humanity	8.337**	1.474	.001
	Physical/Bio Sciences	3.162	2.787	1
Bus/Comp/ Admin/Market/Polit.	Health Sciences	-6.488**	1.153	.001
	Education	-1.253	1.543	1
	Criminal Justice	-2.826	2.913	1
	Art/Music/Theater/Humanity	1.849	1.700	1
	Physical/Bio Sciences	-3.326	2.913	1
Education	Health Sciences	-5.235**	1.290	.001
	Bus/Comp/Admin/Market/Polit.	1.253	1.543	1
	Criminal Justice	-1.573	2.970	1
	Art/Music/Theater/Humanity	3.102	1.795	1
	Physical/Bio Sciences	-2.073	2.970	1
Criminal Justice	Health Sciences	-3.662	2.787	1
	Bus/Comp/Admin/Market/Polit.	2.826	2.913	1
	Education	1.573	2.970	1
	Art/Music/Theater/Humanity	4.675	3.055	1
	Physical/Bio Sciences	-.500	3.864	1
Art/Music/Theater/H umanity	Health Sciences	-8.337**	1.474	.001
	Bus/Comp/Admin/Market/Polit.	-1.849	1.700	1
	Education	-3.102	1.795	1
	Criminal Justice	-4.675	3.055	1
	Physical/Bio Sciences	-5.175	3.055	1
Physical/ Bio Sciences	Health Sciences	-3.162	2.787	1
	Bus/Comp/Admin/Market/Polit.	3.326	2.913	1

Education	2.073	2.970	1
Criminal Justice	.500	3.864	1
Art/Music/Theater/Humanity	5.175	3.055	1

*. The mean difference is significant at the 0.05 level.

**. The mean difference is significant at the 0.01 level.

BOX AND WHISKERS PLOTS

In addition to Bonferroni's test, supplemental box and whiskers plots analysis was conducted to obtain a visual representation of college majors in which a larger number of students expressed readiness and willingness to act in FAE. Students enrolled in health-related majors expressed highest rate of readiness and willingness. Students in non-health related majors expressed lower readiness to act, but high willingness to act in an FAE (Figures 2, 3). Although non- health majors lack readiness to act as anticipated, they are willing to act in an allergic emergency. Thus, they can be trained in order to become ready. This finding is important for administrators in institutions of higher education when developing recruitment strategies for students' training on college campus, and for drafting stock Epinephrine auto-injector and allergy preparedness policies/guidelines to protect vulnerable individuals in an allergic emergency.

Figure 2. Box and Whiskers Plots: Readiness to Act by College Major

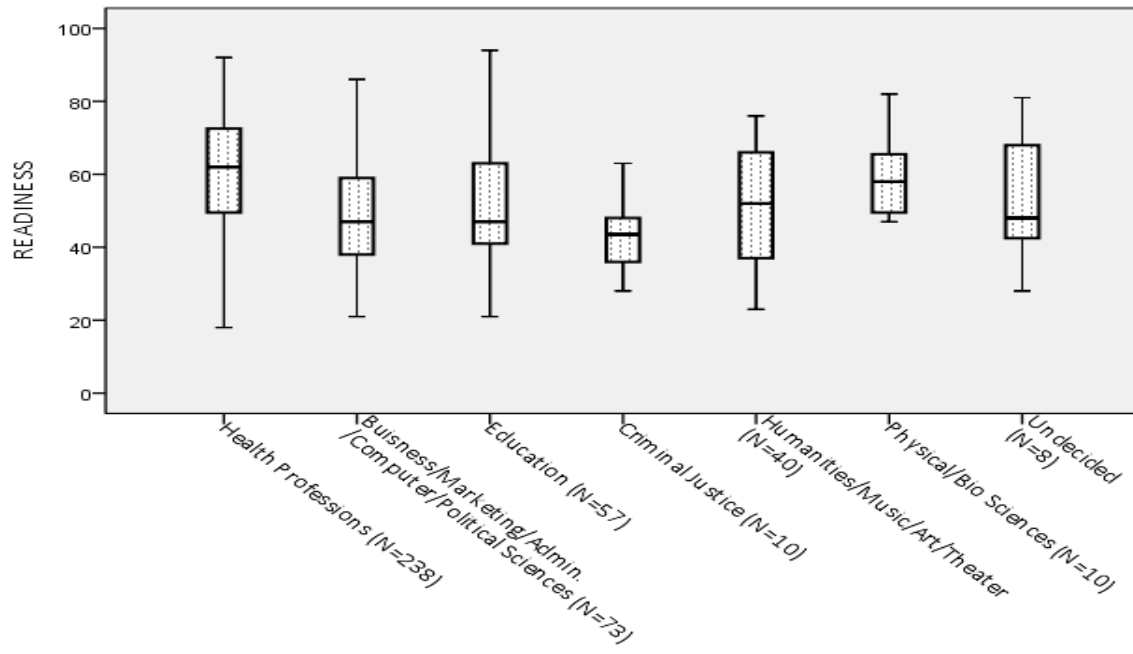
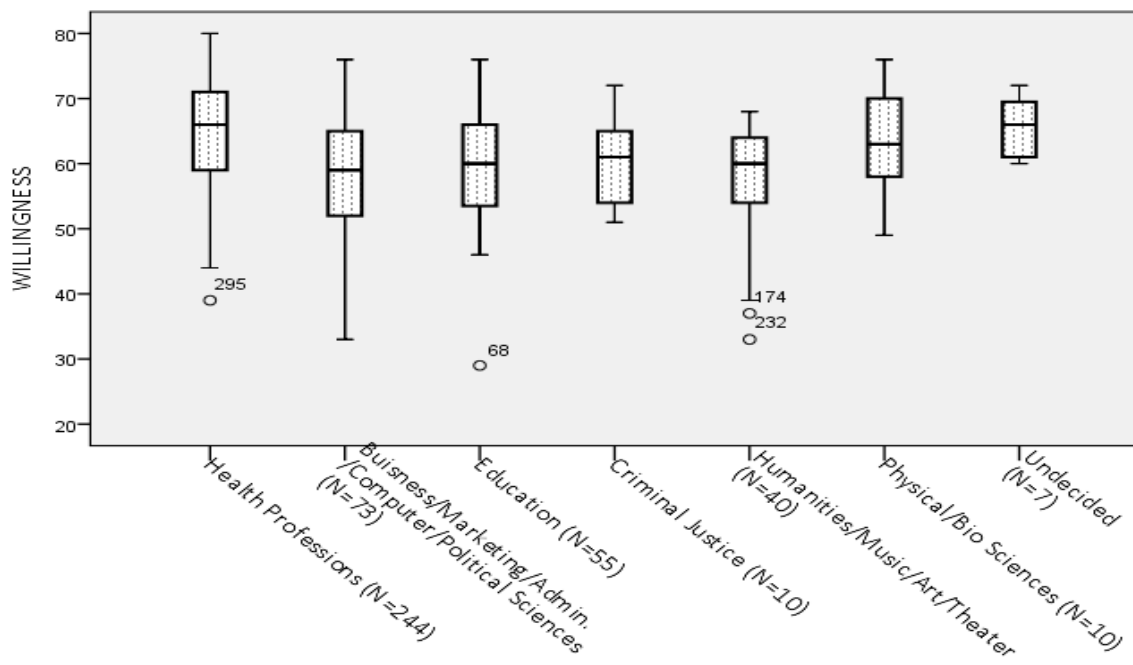


Figure 3. Box and Whiskers Plots: Willingness to Act by College Major



MULTIPLE LINEAR REGRESSION

Multiple linear regression analysis was performed to assess the degree with which each of the independent predictor variables, such as readiness to act (knowledge, experience, exposure/familiarity, training, and confidence), social desirability, and willingness to be trained as well as age and college major, are predictive of dependent variable, willingness to act in an FAE. Independent variables for regression analysis were selected based on conceptual and theoretical frameworks detailed in chapters 1 and 2, and the findings of previously tested hypotheses in chapter 4. For example, readiness to act was chosen for regression analysis because it had a statistically significant positive correlation with willingness to act ($r = .478$, $n = 404$, $p < 0.001$, two-tailed). A statistically significant positive correlation was also observed between reported willingness to be trained ($r = .357$, $n = 267$, $p < 0.001$, one-tailed) and willingness to act among respondents who reported no prior training. Finally, responses from students in health professions were selected because their mean score in willingness to respond based on ANOVA analysis results was highest ($M = 64.76$, $SD = 7.766$) compared to six other groups (Tables 20 and 21).

Table 20. Mean Scores of Willingness to Act in FAE by College Major

	Health Professions	Business/Marketing/ Admin./Comp./Polit.	Education	Criminal Justice	Humanities/ Art/Theater	Phys/Bio Sciences
Mean	64.76	58.27	59.53	61.10	56.43	61.60
SD	7.766	9.879	9.618	7.109	9.964	9.396
Minimum	39	33	29	51	33	47
Maximum	80	76	76	72	72	76
Range	41	43	47	21	39	29

Table 21. Analysis of Variance for College Major and Willingness to Act in FAE

N	Sum of Squares	F	P	(df)
Between Groups	4462.399	11.957	.001	5
Within Groups	31797.518			426

*Correlation is significant at the 0.05 level, two-tailed.

Regression analysis on the basis of the theoretical framework for this study, with the five predictor variables, produced $R^2 = .35$. Thus, 35% of variability in willingness to act can be explained by these five independent variables. The multiple regression analysis table demonstrates predictors of willingness to act in FAE: age ($\beta = .151$; $t = 3.218$, $p < .001$); health professions major ($\beta = .142$; $t = 3.001$, $p = .003$); willingness to be trained ($\beta = .219$; $t = 4.471$, $p < .001$); social desirability ($\beta = .162$, $t = 3.391$, $p < .001$); and readiness to act ($\beta = .286$, $t = 5.593$, $p < .001$). Additional regression analysis was performed on all predictor variables (Appendix N).

Table 22. Regression Analysis with Five Predictor Variable for Willingness to Act in FAE.

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
(Constant)	37.120	2.111		17.583	.000**
Age	.178	.055	.151	3.218	.001**
College Major: Health professions	2.486	.829	.142	3.001	.003**
Willing to Train to Recognize & Treat FAE	.901	.201	.219	4.471	.001**
Social Desirability	.478	.141	.162	3.391	.001**
Readiness to Act	.151	.027	.286	5.593	.001**

** $p < 0.01$.

ADDITIONAL FINDINGS

Additional analyses were conducted to further understand fears associated with one's willingness to act in an FAE (Table 23). Based on ANOVA by total sum of three fears, it was

found that older students are less fearful ($F=8.894$, $p<.001$) (high fear number=lower fear score) than younger students. Students with children are less fearful ($F=20.601$, $p<.001$); students with higher level of education ($F= 3.190$, $p=.24$) and those enrolled in graduate studies ($F=4.814$, $p=.029$) are less fearful. Gender was not statistically significant ($F=.241$, $p=.624$).

Table 23. Total Sum of Three Fears and Demographics

		N	Mean	Std. Deviation
Age				
	Missing	93	21.81	6.476
	17-20	184	20.13	6.619
	21-30	163	22.55	6.204
	31-40	12	26.58	4.400
	≥ 41	19	27.16	4.127
	Total	471	21.75	6.532
Gender				
	Male	73	22.05	6.635
	Female	396	21.65	6.509
	Total	469	21.71	6.523
Children				
	0	433	21.35	6.451
	≥1	38	26.26	5.769
Level of Education				
	Some HS/College	222	21.14	6.269
	2 year College	59	20.69	7.302
	4 year College	152	22.71	6.072
	Master's/Doctorate	34	23.59	8.095
	Total	467	21.77	6.537
Student Status				
	Undergraduate	395	21.55	6.432
	Graduate	72	23.36	6.568
	Total	467	21.83	6.479
College Major				
	Health Sciences	261	23.24	5.780

Bus/Comp/Admin/Market/Polit.	79	19.80	6.817
Education	61	20.48	7.056
Criminal Justice	10	21.40	6.132
Art/Music/Theater/Humanity	40	17.45	7.629
Physical/Bio Sciences	10	21.80	5.391
Total	461	21.71	6.575

Health professions students were less fearful than students in other majors ($F=8.620$, $p<.001$); further analysis was performed to understand how majors compare to each other on the measure of fear. Bonferroni analysis showed that health professions students had statistically significant difference in fear level compared to business/ marketing/ administration/ computer and political sciences students ($m=3.444$, $p <.001$), education students ($m=2.766$, $p=.033$), as well as art/music/theater and humanities majors ($m=1.073$, $p <.001$). (Table 24).

Table 24. Bonferroni Multiple Comparisons of Sum of Three Fears by College Major

College Major	College Major	Mean Difference	Std. Error	Sig.
Health Sciences	Bus/Comp/Admin/Market/Polit	3.444**	.811	.001
	Education	2.766*	.899	.033
	Criminal Justice	1.841	2.036	1
	Art/Music/Theater/Humanity	5.791**	1.073	.001
	Physical/Bio Sciences	1.441	2.036	1
Bus/Comp/ Admin/Market/ Polit	Health Sciences	-3.444**	.811	.001
	Education	-.678	1.077	1
	Criminal Justice	-1.603	2.121	1
	Art/Music/Theater/Humanity	2.347	1.226	.843
	Physical/Bio Sciences	-2.003	2.121	1
Education	Health Sciences	-2.766*	.899	.033
	Bus/Comp/Admin/Market/Polit	.678	1.077	1
	Criminal Justice	-.925	2.156	1
	Art/Music/Theater/Humanity	3.025	1.286	.285
	Physical/Bio Sciences	-1.325	2.156	1
Criminal Justice	Health Sciences	-1.841	2.036	1
	Bus/Comp/Admin/Market/Polit	1.603	2.121	1
	Education	.925	2.156	1

	Art/Music/Theater/Humanity	3.950	2.234	1
	Physical/Bio Sciences	-.400	2.826	1
Art/Music/Thea	Health Sciences	-5.791**	1.073	.001
ter/Humanity	Bus/Comp/Admin/Market/Polit	-2.347	1.226	.843
	Education	-3.025	1.286	.285
	Criminal Justice	-3.950	2.234	1
	Physical/Bio Sciences	-4.350	2.234	.782
Physical/	Health Sciences	-1.441	2.036	1
Bio Sciences	Bus/Comp/Admin/Market/Polit	2.003	2.121	1
	Education	1.325	2.156	1
	Criminal Justice	.400	2.826	1
	Art/Music/Theater/Humanity	4.350	2.234	.782

*. The mean difference is significant at the 0.05 level.

** . The mean difference is significant at the 0.01 level.

Additionally, during the pilot study, analysis of Bystander's Likelihood to Respond (LTR) by 3 college majors showed statistically significant differences between nursing students and business students in LTR, with no significant differences with students in criminal justice in their likelihood to respond. Bonferroni analysis of multiple comparisons of Bystander's LTR by college major in the full study also demonstrated that students in health professions had statistically significant difference in LTR compared to business/ marketing/ administration/ computer and political sciences students ($m=2.912$, $p<.001$), education students ($m=2.129$, $p=.028$), as well as art/music/theater and humanities majors ($m=2.554$, $p=.016$). Students in criminal justice, and physical and biological sciences showed no statistically significant differences. (Appendix O).

CONCLUSION

In this chapter, measurement tool and gathered data were organized and described. Analyses, including correlations and factor analysis for factor validity of the measurement tool; ANOVA and *t*-test to test hypotheses and answer research questions; multiple regression to

identify predictor variables for willingness to act in FAE; and box and whiskers plots analysis to assess respondents' self-reported readiness and willingness to act in an FAE, were completed and displayed in tables and figures.

Chapter 5

DISCUSSION AND RECOMMENDATIONS

The purpose of this study was to first validate previously developed tools to assess and then describe factors associated with students' readiness and willingness to act in a food allergic emergency (FAE). This chapter details the discussion of the tools and their use for this study, statistical analyses, discussion of the findings, limitations, direction for future research and implications.

In 2017, FAIR Health released a report of increased diagnoses of anaphylactic food reactions by 377% nationwide from 2007 to 2016 (Gelburd, 2017). Patients 18 years or younger accounted for 66% of the claim lines, while those over 18 years old accounted for 34%. Prior to this report, non-patient specific or stock Epinephrine auto-injectors were already available in most schools since President Obama signed the Access to Emergency Epinephrine Act in 2013. Many progressive school districts stocked non-patient specific EAI's several years prior to this law, based on the voluntary recommendations from 2010. However, increases in food allergies not only in children, but in adults as well, with many accidental deaths, and near death occurrences, some of which were reported in the media outlets, continued to be highly alarming (Appendix B). Due to this growing public health concern, places like Disney parks, have created an allergy friendly environment, ranging from their menu options to establishing EAI stations located throughout their properties.

Several institutions of higher education are striving to keep their students with dietary restrictions safe by modifying practices and policies aimed at training selected individuals to use EAI's and to have a non-patient specific EAI available on campus. Some of these changes are occurring in response to legal actions due to poor management of dietary restrictions, as in the

case of Lesley University's settlement (US Department of Justice, 2012). In several states, these changes are occurring in response to legislative actions such as by the Indiana General Assembly, 2014 and New Jersey through the Higher Education Epinephrine Emergency Treatment Act (2013), and in some instances due to loss of life (Vuchnich, 2015). As more places continue to adapt these voluntary protocols, more individuals will become trained and available to help in food allergic emergencies. In addition to availability of EAI, it is paramount that individuals undergo training to be able to recognize an allergic emergency, and to be able to administer epinephrine via the EAI device. Most recent example of these recommendations seen in action, is a college in Rochester, NY, which placed 12 stock Auvi-Q Epinephrine auto-injectors in high traffic areas and trained all security officers on the proper use of the device (Bloom, 2018).

TOOL DEVELOPMENT/TESTING

The aim of this study was to identify factors associated with college students' readiness and willingness to act in an FAE. The tool for this study was developed and tested, first in the pilot study, resulting in elimination and alteration to some of the items, with consecutive validation in the full study. Development of the tool included establishment of content validity of concepts and sub-concepts through calculations of CVIs and S-CVIs based on the ratings from 5 experts. Internal consistency, Cronbach's coefficient alpha was established to assess reliability of the scale for each new and modified scales. A test-retest reliability process using the two forms was executed on a convenience sample of undergraduate and graduate students in nursing. There was no significant variation from Web-based format using Google forms versus pen and paper format. Construct validity was assessed by comparing the means of two known groups: graduate nursing students who are already registered nurses and undergraduate nursing students. The

results were statistically significant as predicted with the knowledge mean scores for RNs significantly higher than the knowledge mean scores for freshman nursing students.

The tool showed to be valid based on the results of construct validity testing using 3 known groups of freshman students, with the summed scores of bystanders' likelihood to respond, yielding a statistically significant score for selected items.

A Cronbach's alpha calculated in the full study for 15 knowledge scale items and bystanders' likelihood to respond 10 items scale were slightly lower than in the pilot study. Larger sample size and more diversity of student population might have played a role in a lower Cronbach's alpha. Although reasonably acceptable for the purpose of this study, further testing and validation of Bystander's Likelihood to Respond scale is highly suggested. Several existing instruments were used in the pilot and full study, including Level of Exposure/ Familiarity with Food Allergies and Epinephrine auto-injector adapted from Holmes et al. (1999) Level of Contact; and Marlowe-Crowne Social Desirability Scale--Form C (Reynolds, 1982). Other questions included a demographics questionnaire modified from recommendations by the U.S. Census Bureau; self-reported 1-10 analog scales; and questions with yes/no responses.

Although the sample size for this study was modest (n=474), it was sufficient based on power analysis performed prior to the study commencement. Participants' ages ranged from 18 to 64 years old (mean=22.9, n=380), with more female respondents (83.8%), than male (15.6%). This can be explained by a higher response from students enrolled in health sciences (55%), such as nursing, allied health, speech pathology, and audiology. These health professions are dominated by female students which is consistent with approximate gender distribution employed in these fields. Research site demographic gender distribution of the male to female student ratio is about 40:60 with a student body that is predominantly female (College Factual,

2013). More than half of the sample were white, followed by Black/African American, Hispanic, Asian, and others. The research site was a private Catholic college in a NY metropolitan area with a large number of students enrolled in the nursing program. It is possible that results might be skewed and may not be representative of all schools with nursing programs in the country. The majority of respondents were in undergraduate studies and did not have children. Although the sample was not as heterogeneous as desired, it was representative of the school population and thus, reasonably representative for a similar national metropolitan area private school.

RESEARCH QUESTIONS

Research questions were aimed at identifying factors associated with readiness and willingness to act in an allergic emergency, as well as describing how different (age, gender, number of children, college major, and student status) individuals and/or groups compare on dimensions of willingness and readiness to act in an allergic emergency. Additionally, factor analysis was performed to identify predictor variables of one's willingness to act in an FAE.

Through this research in answering the first question, factors that play into an individual's readiness to act in an FAE were identified. Readiness to act consisted of several components, including knowledge of food allergies and EAI, level of exposure/ familiarity with food allergies, experience with EAI, food allergy and EAI training, and confidence in being able to administer EAI and other injectable medications. It was found that knowledge, experience, familiarity/exposure, confidence and prior training were highly correlated with each other and with overall readiness to act in an FAE. Based on Prochaska's Transtheoretical Model (TTM) of behavior change framework, one must go through stages of readiness to be fully prepared to act in an emergency or to be willing to assume a role of a rescuer. The findings of this study support this framework. It was evident that those who possessed knowledge, experience,

familiarity/exposure, and confidence and have had prior training with food allergies and Epinephrine auto-injector have gone through some stages of readiness, and thus, expressed higher willingness to act in an FAE than those who lacked readiness. Additionally, older students, students with children, and those enrolled in health professions, reported a higher readiness level than other groups.

It was found that those who indicated a higher readiness level were also more willing to act in an FAE. If readiness to act is highly predictive of willingness to act in an FAE, development of policies aimed at training willing individuals should be strongly encouraged. Although training modalities and content to train college students was not part of this study, predictor variables and barriers identified through this research have potential to inform future development of the training modules.

The second question was aimed towards identifying factors related to willingness to act. Willingness to act in an FAE during a role transition in an emergency situation may influence one's action based on certain circumstances, such as a Bystander's Likelihood to Respond and fear. Blood and injection phobia has been previously reported in the literature. For example, Ost (1992) found that blood and injection phobias are very similar from a cognitive, physiological and behavioral standpoint. Fear to cause damage or death as reported by Chad et al. (2013) might prevent others to act in an anaphylactic emergency. Lubin et al. (2004) noted that liability was one of the concerns in using an AED by lay people. Although trained individuals are exempt from civic liabilities, it is possible that some may not be aware of it and/or are still afraid to use the EAI device incorrectly. Although not the same, AEDs and EAIs are devices that save lives through application to the human body. Thus, three combined fear questions were included in the survey assessing overall fear level, and 10-item Bystander's Likelihood to Respond scale to a

hypothetical scenario. Both constructs were highly correlated with each other, and were combined to assess students' willingness to act in an FAE. As initially anticipated, the findings of this study showed that participants in health professions, criminal justice and physical and bio/sciences were less fearful of needles, liability and causing injury/death when responding to an FAE than students in business/marketing/administration/computer and political sciences students, education students, and art/music/theater and humanities majors. Students in service professions/majors, such as health and criminal justice, who exhibited less fear and higher willingness to act in an FAE, should be considered for recruitment of becoming trained in recognition of FAE and in the use of Epinephrine auto-injectors on a college campus.

Despite the lack of readiness/ lower readiness level reported by students in non-health-related professions, it was found that higher willingness to act was expressed by students in all majors. In the study by Lubin et al. (2004), a substantial number of people were willing to use an AED, but education regarding legal liability and proper use of the machines increased the reported likelihood of use. Chad et al. (2013) reported that older mothers and mothers whose children had longer disease duration had less fear of causing injury/death by Epinephrine injection. In the current study, older students and those with children reported less fear of causing injury/death than younger students and those without children. These findings are concurrent with similar studies, and are significant because with proper training these students can gain necessary skills and knowledge to become proficient in readiness to act in an FAE. This finding is important for leaders in institutions of higher education when developing stock Epinephrine and training policies, and guidelines to protect individuals at risk for an allergic emergency on college campus.

LIMITATIONS

The use of self-report in the data collection tools used in this study includes inherent risk to internal validity related to social desirability bias, inaccurate or selective recall bias. Additionally, only limited generalization can be made to other institutions of higher education as this study focused on one private catholic college in a suburban community of a metropolitan NY area. The survey captured responses from students who are English-proficient, with average age between 22 and 23 years old, 88% in undergraduate studies, and over 55% in health-related fields. Correlational descriptive design of this study is less rigorous than experimental or quasi-experimental. Although web-based format of the survey is a quick and easy way to reach college students, all of whom have college assigned email accounts, it is possible that some students do not utilize their college email accounts or receive overwhelming amount of emails, thus, contributing to a lower response rate (11%). The length of the survey may have contributed to the lower response rate, and a few incomplete entries. Most data missing was the variable of age. Monetary \$100 incentive was offered for every 100 responses to improve the response rate, and Google form feature was used to limit one response per individual, to avoid multiple responses. Finally, the first question asked respondents to type in their age; out of 474 total responses 380 students indicated their age, 94 did not. Although it is unclear if the order of this question, or the way it was worded, or displayed played a role in a large number of missing age data point, it should be considered when using this tool in the future. For data analysis involving demographic characteristics, age was grouped into 4 groups: 17-20; 21-30; 31-40; 41 and older.

IMPLICATIONS

Practice.

Findings of this study were intended to inform policy makers and other stakeholders, responsible for safety and inclusion of individuals with food allergies and dietary restriction in

institutions of higher education, about groups and individuals who are willing and/or ready to help in an allergic emergency on college campus. Findings of this study are congruent with previous studies (Daley et al., 2015; Gupta et al., 2008) in identifying training, knowledge, experience and confidence as contributing factors of readiness. Researchers looked at knowledge of food allergies and anaphylaxis among the medical community, parents, and individuals with food allergies. Inadequate or lack of knowledge cited by several researchers (Chad et al., 2013; McMillan et al., 2012; Wang et al., 2015) can impede one's ability and willingness to act in an emergency. The finding of this study demonstrated willingness to be trained as well as willingness to act in an FAE among college students. Thus, training and education of willing individuals/groups should be considered on college campuses, especially among those with reported willingness to act, such as students in health sciences, physical/bio sciences and criminal justice majors. Registered nurses or other licensed healthcare professionals employed by college health services department might be in a unique position to advocate for the safety of vulnerable students, help them recognize potential dangers of new environment, and train willing individuals in the use of Epinephrine auto-injectors in food allergic emergencies. Nurses may further advance the need for non-patient specific EAI's to be strategically placed next to AEDs that could be used in an FAE by unlicensed, but previously trained individuals.

Education.

Improving knowledge is a key component in readiness and willingness to acting an FAE. Further educational efforts are still needed for the caregiver community and general public/laypeople. It was anticipated that willingness to act in a food allergic emergency among laypersons, such as college students, would be similar to the models previously described in the literature, including AED, CPR and Narcan. As in previous studies related to AEDs and CPR,

individuals were more willing to intervene if they had knowledge of how to use the device/technique, had been exempt from liability, and had a relationship to the victim. For example, according to Taniguchi, Omi, and Inaba (2008), many non-medical people in Japan reported willingness to operate an AED if they had better understanding of AEDs. Similarly, Cho Sohn, Kang, Lee, Lim, Kim, and Lim (2010) reported that BLS training increased laypersons' confidence and willingness to perform bystander CPR on a stranger. Wahl et al. (2015) found that in-person training can increase participants' knowledge about food allergies and improve self-confidence in preventing, recognizing, and treating allergic reactions and that these gains can be sustained over time. Hands-on Epinephrine auto injector practice were also found to be helpful by participants. In a follow-up interview, 8 out of 21 allergic reactions occurred to unknown allergens/not previously diagnosed. Recognition of symptoms and prompt treatment in an allergic emergency of individuals with previously diagnosed or undiagnosed food allergy can only be achieved through training and ready availability of stock Epinephrine auto-injectors. It should be noted that increased use of simulation within institutions of higher education for students in health care professions and other interested groups, is a highly conducive environment for acquisition of skills and confidence level in administration of Epinephrine auto-injections in an FAE. Development of the curriculum with related simulation scenarios should be considered. Finally, findings of this study can be used for development and implementation of training of selected individuals to use EAIs and for strategic placement of non-patient specific EAIs in places throughout campus, similar to AEDs.

Research.

Findings of this study can inform colleges/universities similar to the college site chosen for this study. However, future research should also include: multi-site research and research on a

local and national scale, on more heterogeneous population and with larger sample sizes. This will provide/allow for the potential to inform policy makers at various levels in crafting policies on city, state, or federal levels. Although findings from this study have limited generalizability, similar campus-based studies could be conducted in other sites to assist universities/colleges in meeting the needs of their individual college community in development and implementation of training modules/modalities, and of policies/practices to:

1. Safeguard vulnerable individuals (prevent deaths/injuries);
2. Improve quality of life (QOL) of individuals with food allergies/dietary restrictions;
3. Heighten awareness among the college community;
4. Reduce liabilities to the organization;
5. Elevate college marketability to students nationally and internationally (FARE college registry).

Finally, the tools used in the pilot and full study described in this manuscript should be further tested and validated on:

1. Larger sample size;
2. Other geographic regions;
3. More heterogeneous populations, such as more proportionate male/female ratio, college majors not included in this study or overrepresented, and multicultural diversity;
4. Among groups with limited English proficiency;
5. Multi-site research on local, national and international scales;
6. Partial use of the tool (Readiness only, or Willingness only components);
7. Re-assessment of the tool for possible modification.

CONCLUSION

Food allergies and anaphylaxis is a public health concern in the United States and other developed countries. Students locally and from abroad enter institutions of higher education in America. Many have previously diagnosed food allergies, and some might be developing new allergies when trying new foods for the first time. Regardless of the situation, all institutions of higher education can be prepared to provide a safe and inclusive environment to their students. Some measures already in place include CPR and Narcan-trained resident assistants, and availability of AEDs in easily accessible locations on college campuses. Availability of Epinephrine auto-injectors and training isn't yet widely practiced within the institutions of higher education. The foundation for the development and implementation of these life-saving tools and education is paramount as more and more individuals with life threatening allergies enter as students and as employees on college campuses. Non-patient specific Epinephrine to which some registered nurses may have access during day hours, isn't available for use in a food allergic emergency when nurses are off duty. The need for availability of Epinephrine auto-injectors in institutions of higher education and sufficient numbers of trained lay individuals has yet to be fulfilled. This research is the first step in building a safer environment for students, by identifying those who are willing and ready to act in a food allergic emergency on a college campus.

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*Note: References used for tool development scenario.

Appendix A

Epinephrine Controversies in the News Outlets

Adamis Pharmaceuticals Announces FDA Acceptance for Review for the Supplemental New Drug Application of Its Low Dose Symjepi Product Candidate

Globe Newswire: February, 2018

<https://globenewswire.com/news-release/2018/02/12/1339106/0/en/Adamis-Pharmaceuticals-Announces-FDA-Acceptance-for-Review-for-the-Supplemental-New-Drug-Application-of-Its-Low-Dose-Symjepi-Product-Candidate.html>

Reviewing the rising price of EpiPens.

Full House Committee on Oversight and Government Reform.

Hearing Date: September 21, 2016

<https://oversight.house.gov/hearing/reviewing-rising-price-epipens-2/>

EpiPen competitor Auvi-Q comes back Feb. 14 with a pricing scheme that will blow your mind.

Meg Tirrell

CNBC: January 19, 2017

<http://www.cnbc.com/2017/01/19/epipen-competitor-auvi-q-comes-back-feb-14.html>

CVS cuts cost for generic EpiPen competitor.

Aaron Smith

CNN: January 13, 2017

<http://money.cnn.com/2017/01/12/news/companies/cvs-adrenaclick-generic-epipen-price-cut/index.html>

Mylan CEO on EpiPen drug price controversy: "I get the outrage."

CBS News: January 27, 2017

<http://www.cbsnews.com/news/epipen-price-hike-controversy-mylan-ceo-heather-bresch-speaks-out/>

Sanofi files US antitrust lawsuit against Mylan over EpiPen.

Drew Angerer

CNBC: April 24, 2017

<http://www.cnbc.com/2017/04/24/sanofi-files-us-antitrust-lawsuit-against-mylan-over-epipen.html>

EpiPen Failures Cited in Seven Deaths This Year, FDA Files Show.

Anna Edney

Bloomberg: November 2, 2017

<https://www.bloomberg.com/news/articles/2017-11-02/epipen-failures-cited-in-seven-deaths-this-year-fda-files-show>

Appendix B

Food Allergy Tragedies Reported in News Outlets

- 1) Boxer with nut allergy suing cafe for £300k after milkshake triggered heart attack that ended career.
Nick Parker, March 27, 2018
<https://www.thesun.co.uk/news/5916224/boxer-nut-allergy-suing-cafe-for-300k-after-milkshake-triggered-heart-attack-that-ended-career/>
- 2) 3-Year-Old Boy With 'Severe' Dairy Allergy Dies After Being Served Grilled Cheese at NYC School: Family
Rana Novini, November 9, 2017,
<https://www.nbcnewyork.com/news/local/3-Year-Old-Boy-Elijah-Grilled-Cheese-Dairy-Allergy-NYC-Harlem-School-Hospital-Dies-Family-GoFundMe-456302913.html>
- 3) Edmonton man dies after inhaling walnut particles used in sandblasting.
Sarah Kraus, October 22, 2017, Global News
<https://globalnews.ca/news/3818707/edmonton-man-dies-after-inhaling-walnut-particles-used-in-sandblasting/>
- 4) “I think I am going to die,” terrified schoolboy, 9, died from severe allergic reaction as frantic staff took 11 minutes to find EpiPen which could have saved him.
Amanda Devlin, Aug. 2017, The Sun
<https://www.thesun.co.uk/news/4319486/school-boy-died-allergic-reaction-11-minutes-find-epipen/>
- 5) An appeal from Nainika's parents to save lives.
May, 2017, Asian Voice
<https://www.asian-voice.com/Lifestyle/Food/Health-Diet/An-appeal-from-Nainika%27s-parents-to-save-lives>
- 6) High-flying This Morning producer with a nut allergy who was left brain-damaged after eating one bite of a meal re-joins her colleagues on air as they vow to help ban nuts on flights.
Natalie Corner, 2017, Daily Mail
<http://www.dailymail.co.uk/femail/article-4809148/Former-ITV-producer-reveals-shocking-effect-nut-allergy.html>
- 7) Chatfield High student dies after eating s'more containing peanut butter.
Tom McGhee , 2015, The Denver Post
http://www.denverpost.com/news/ci_28864937/chatfield-high-student-dies-after-eating-smore-containing
- 8) Killed by a cereal bar, the 21-year-old woman who died after EXERCISE triggered a fatal nut allergy
Mario Ledwith and Madlen Davies, 2015, The Daily Mail
<http://www.dailymail.co.uk/health/article-2961405/Recruitment-consultant-died-eating-cereal-bar-gym-EXERCISE-triggered-severe-allergic-reaction-nuts.html#ixzz3UpoxLw9y>

- 9) Shahida Shahid death: Teenager “told Almost Famous about her food allergies before eating”, inquest hears.
Dan Thompson, 2015, Manchester Evening News
<http://www.manchestereveningnews.co.uk/news/greater-manchester-news/shahida-shahid-death-teenager-told-8460359>
- 10) Boy, struck by egg allergy, dies in hospital.
Chaitanya Swamy H M, 2014, Bangalore Mirror Bureau
<http://www.bangaloremirror.com/bangalore/crime/Boy-struck-by-egg-allergy-dies-in-hospital/articleshow/45462452.cms>
- 11) Hooksett man with food allergy dies in Vermont.
2014, WMUR 9 NEWS
<http://www.wmur.com/news/hooksett-man-with-food-allergy-dies-in-vermont/30138022>
- 12) Milwaukee boy, 16, dies after allergic reaction to peanut butter cookie
Don Behm, 2014, Journal Sentinel
<http://www.jsonline.com/news/health/milwaukee-boy-16-dies-after-allergic-reaction-to-peanut-butter-cookie-b99399161z1-284153231.html>
- 13) 19-year-old Chandler Swink suffered severe allergic reaction to peanuts
Roger Weber, 2014, Local 4 Reporter
<http://www.clickondetroit.com/news/parents-of-ou-student-who-died-from-severe-peanut-allergy-have-message/30066286>
- 14) Father 'devastated' as he goes from Halloween fun with Joseph DeNicola to planning the 7-year-old's funeral.
Maura Grunlund, 2014, SILive.com
http://www.silive.com/news/index.ssf/2014/11/father_devastated_as_he_goes_f.html#incart_story_package
- 15) Inquest opening hears eight-year-old Salhouse boy had food allergies.
Kim Briscoe, 2014, Eastern Daily Press
http://www.edp24.co.uk/news/inquest_opening_hears_eight_year_old_salhouse_boy_had_food_allergies_1_3423802
- 16) Boy Dies From Peanut Allergy After Eating Contaminated Takeout Food.
Jonathan Wolfe, 2014, Opposing Views
<http://www.opposingviews.com/i/health/boy-dies-peanut-allergy-after-eating-contaminated-takeout-food>
- 17) School EpiPen Stocks Save Lives in First-Time Anaphylaxis.
Kate Johnson, 2014, Medscape Medical News
<http://www.medscape.com/viewarticle/835113>
- 18) First picture emerges of British teenager, 18, who died after suffering a mysterious allergic reaction during school trip to Tanzania.
By Ted Thornhill, 2014, Daily Mail.com
<http://www.dailymail.co.uk/news/article-2704124/First-picture-emerges-British-teenager-18-died-suffering-mysterious-allergic-reaction-school-trip-Tanzania.html#ixzz3UpQA7G7F>
- 19) Another Life Lost To Anaphylaxis: Let Us Make This The Last One.
Onespot Allergy, 2013
<http://blog.onespotallergy.com/2013/12/another-life-lost-to-anaphylaxis-let-us-make-this-the-last-one/>
- 20) Reaction to dessert treat claims teen at Camp Sacramento.

- Suzanne Phan, 2013, News 10 ABC
<http://archive.news10.net/news/local/article/252201/2/Allergy-attack-claims-Carmichael-teen-at-summer-camp>
- 21) Mall guards carry anti-allergy injectors after death of girl, 12.
 Carmela Fragomeni, 2013,
<http://m.thespec.com/news-story/4839514-mall-guards-carry-anti-allergy-injectors-after-death-of-girl-12/#sthash.gz1K1rFx.dpuf>
 - 22) Bryant student dies after eating cookie.
 Cierra Putman, 2013, NBC 10 News
<http://www.turnto10.com/story/21584682/bryant-student-dies-after-eating-cookie>
 - 23) Calvert Hall student's death reminder of seriousness of allergies.
 Elizabeth Lowe, 2012, CatholicReview.org
<http://catholicreview.org/article/life/catholic-education/calvert-hall-students-death-reminder-of-seriousness-of-allergies#sthash.8PdKtEbK.dpuf>
 - 24) Nut allergy teenager, 15, dies after two bites of Chinese takeaway spare ribs marinated in peanut sauce.
 Sean O'Hare, 2012, Daily Mail
<http://www.dailymail.co.uk/news/article-2259443/Nut-allergy-teenager-William-Luckett-15-dies-bites-Chinese-takeaway-spare-ribs-marinated-peanut-sauce.html#ixzz3UrHgYW23>
 - 25) Schoolboy, 11, died after suffering extreme allergic nut reaction to Father's Day takeaway meal he had eaten several times before without problems.
 Sam Webb, 2012, DailyMail
<http://www.dailymail.co.uk/news/article-2214508/Schoolboy-11-died-suffering-extreme-allergic-nut-reaction-Fathers-Day-takeaway-meal-eaten-times-problems.html#ixzz3UrJlCnx>
 - 26) Girl's death highlights allergy safety in schools
 Elizabeth Landau, 2012, CNN
<http://www.cnn.com/2012/01/11/health/living-well/food-allergies-schools/>
 - 27) Sudden Death: British High School Student's Case Raises Questions -
 Dr. Paul Ehrlich, 2012, AsthmaAllergiesChildren.com
<http://asthmaallergieschildren.com/2012/01/11/sudden-death-british-high-school-student%E2%80%99s-case-raises-questions/#sthash.RaQ8pV6K.dpuf>
 - 28) Allergic Girl's Death: "Everything Went Wrong".
 Lisa Fitterman, 2011, Allergic Living
<http://allergicliving.com/2011/11/21/allergy-death-at-school-everything-went-wrong/>
 - 29) Teen Has Fatal Reaction at School.
 Lisa Ferlino, 2011, Allergic Living
<http://allergicliving.com/2010/12/20/anaphylaxis-tragedy-for-chicago-teen/>
 - 30) Nut allergy boy, 7, suffers two heart attacks after 'teacher hands him chocolate HAZELNUT in class'.
 Daily Mail Reporter, 2011, Daily Mail.com
<http://www.dailymail.co.uk/health/article-1351313/Allergic-school-boy-7-suffers-heart-attacks-teacher-hands-chocolate-nut-class.html#ixzz3UpeWvgdk>
 - 31) Sabrina's Law: The Girl and the Allergy Law.
 Gwen Smith, 2005, *Allergic Living*
<http://allergicliving.com/2010/07/02/sabrinas-law-the-girl-and-the-allergy-law/>

Appendix C

Permission: Food allergy knowledge, attitudes, and beliefs in the United States Tool

Email correspondence to obtain permission to use and modify the attached tool:

Date: Tue, 29 Mar 2016 14:55:41 -0500

Subject: Re: Food allergy knowledge, attitudes, and beliefs in the United States Tool

From: amitts18@gmail.com

To: olga.kagan@outlook.com

CC: r-gupta@northwestern.edu; okagan06@lions.molloy.edu; alex@pilotlightchefs.org; marjorie.yarbrough@northwestern.edu

Hi Olga,

I spoke to Ruchi, and you're welcome to use and modify our tool for your study. I hope it serves you well!

Best,
Sasha

On Tue, Mar 29, 2016 at 7:53 AM, olga kagan <olga.kagan@outlook.com> wrote:
Good morning,

May I have your permission to use and modify this tool for my study?

Thank you.
Regards,

Olga

Appendix C (cont.)

The Chicago Food Allergy Research Surveys for Parents of Children with Food Allergy (Original Used to Develop Items for this Study)

*The following survey is part of a study being conducted by researchers at Children’s Memorial Hospital and Northwestern University Feinberg School of Medicine in Chicago, Illinois. The goal of this survey is to assess the knowledge, attitudes and beliefs around food allergy of **parents of children with food allergies.***

Before beginning the survey, please answer the following questions:

1. Do you have at least one child under the age of 18 with a doctor diagnosed food allergy?

Yes

No
survey.



We’re sorry, but you are not eligible for this

Thank you for your interest.

2. Are you a member of a food allergy support group? Yes No

3. What is your geographical location?

City: _____

State: _____

Please mark one box for each statement.

TRUE

FALSE

I DON'T
KNOW

- | | | | | |
|-----|---|---|--|--------------------------|
| 1. | Food allergy involves the immune system | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. | Eczema may be the first sign of having a food allergy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. | Asthma is an important risk factor for severe anaphylaxis | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. | Teenagers are at higher risk for fatal food allergy compared to younger children | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. | IgE testing alone is sufficient to diagnose food allergy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. | Skin prick testing alone is sufficient to diagnose food allergy | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. | Taking a daily antihistamine (e.g. Benadryl or Claritin) can prevent food allergy reactions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. | It is necessary to call 911 after using an epinephrine auto-injector | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. | Previous reactions <u>do not</u> predict the severity of future reactions | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. | Rapid heart-beat can be a side-effect of using epinephrine | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. | Clothing must be removed in order to use an epinephrine auto-injector | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. | Food allergies can be accurately diagnosed by using which method? | <input type="checkbox"/> IgE test | <input type="checkbox"/> Basophil activation test | |
| | | <input type="checkbox"/> Oral food challenge | <input type="checkbox"/> IgG4 test | |
| | | <input type="checkbox"/> Skin prick test | <input type="checkbox"/> I don't know | |
| 13. | A boy with a milk allergy accidentally drank some milk. Please mark all of the following that could be a sign of a food-allergic reaction. Mark all that apply | <input type="checkbox"/> After 2 days he gets hyperactive, cranky, & complains of headaches | | |
| | | <input type="checkbox"/> After 1 hour he has hives on his face and chest | | |
| | | <input type="checkbox"/> Immediately his tongue swells and he has trouble breathing | | |
| | | <input type="checkbox"/> He has a stuffy nose that won't go away for weeks | | |
| 14. | Where is the correct place to use an epinephrine auto-injector (e.g. EpiPen, Adrenaclick)? | <input type="checkbox"/> Upper arm | <input type="checkbox"/> Buttock | |
| | | <input type="checkbox"/> Outer thigh | <input type="checkbox"/> I do not know | |
| 15. | In what case is the use of an adult dose of epinephrine is recommended? | <input type="checkbox"/> If a reaction is severe | <input type="checkbox"/> If the child is over 14 | |
| | | <input type="checkbox"/> I don't know | <input type="checkbox"/> If the child weighs more than 65 pounds | |

16. When should you use an epinephrine auto-injector?
- If an allergen is nearby
 - If an ambulance arrives
 - I don't know
 - If my child has eaten a known allergen
 - At the first sign of an allergic reaction
 - 10 minutes after symptoms start
17. What are the symptoms of a food allergic reaction? Mark **all** that apply
- Hives
 - Sneezing
 - Vomiting
 - Fainting
 - Low blood sugar
 - Shortness of Breath
 - Wheezing
 - Dizziness
 - Throat tightness
 - Fever
18. What is cross-contact?
- If food grows bacteria
 - I don't know
 - If allergens mix with safe foods
 - If someone with allergies touches someone who doesn't have allergies

Appendix D

Permission to use the Marlowe-Crowne Social Desirability Scale--Form C (AN 237777)

Dear Ms. Kagan:

Thank you for your interest in the Health and Psychosocial Instruments(HaPI) database. I am pleased that we can meet your measurement needs regarding the Marlowe-Crowne Social Desirability Scale--Form C (AN 237777) that you requested.

There is only one 13-item version of this instrument. The item numbers in the record refer to the new question number as it appears in the 13-item version and they are not the question numbers from the original 33-item version. I hope this clears up any confusion.

The materials you are receiving includes: A copy of each measurement instrument that is ready to be administered and the author's permission for its administration for as many copies as you need for your study, a statement of the instrument's purpose, directions for scoring, and reliability statistics if available from the author.

Would you please send to us a brief statement regarding the purpose of your study/project so that we may inform the author(s) of the usage of their instrument. Your initial email to us provided your phone number, so we are just waiting for the statement mentioned just above.

Please let us know if you have any additional questions once you look over the attached materials.

Diane Cadwell
docdel@bmdshapi.com

Marlowe-Crowne Social Desirability Scale--Form C

W. M. Reynolds

Acronym

M-C Form C.

Primary Source

Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe-Crowne Social Desirability Scale. Journal of Clinical Psychology, 38, 119-125.

Purpose Statement

Marlowe-Crowne Social Desirability Scale (M-C Form C) is a shortened 13-item version of Crowne and Marlowe's (1960) original 33-item measure.

Reliability

Kuder-Richardson-20 reliability = .76.

Number of Questions

13.

Directions for Scoring

To obtain total scores, sum all correct responses (given a score of 1). Items 5, 7, 9, 10, and 13 are assigned a 1 if answered True and items 1, 2, 3, 4, 6, 8, 11, and 12 are assigned a 1 if answered False.

Reference

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. Journal of Consulting Psychology, 24, 349-354.

237777

Scoring Key

Marlowe-Crowne Social Desirability Scale--Form C

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

- | | | |
|---|---|--|
| T | F | *1. It is sometimes hard for me to go on with my work if I am not encouraged. |
| T | F | *2. I sometimes feel resentful when I don't get my way. |
| T | F | *3. On a few occasions, I have given up doing something because I thought too little of my ability. |
| T | F | *4. There have been times when I felt like rebelling against people in authority even though I knew they were right. |
| T | F | 5. No matter whom I'm talking to, I'm always a good listener. |
| T | F | *6. There have been occasions when I took advantage of someone. |
| T | F | 7. I'm always willing to admit when I make a mistake. |
| T | F | *8. I sometimes try to get even, rather than forgive and forget. |
| T | F | 9. I am always courteous, even to people who are disagreeable. |
| T | F | 10. I have never been irked when people expressed ideas very different from my own. |
| T | F | *11. There have been times when I was quite jealous of the good fortune of others. |
| T | F | *12. I am sometimes irritated by people who ask favors of me. |
| T | F | 13. I have never deliberately said something that hurt someone's feelings. |

NOTE: Items marked with an asterisk (*) are keyed negatively

Appendix E

Survey Referenced Final Items Tool

READINESS TO ACT

is measured with the following tools:

- 1) Modified Knowledge tool: The Chicago Food Allergy Research Surveys for Patients of Children with Food Allergy.
Q.1 – Q.2 (Analog Scale)
Q.3 – Q.17 (T/F/DK)
- 2) Level of Exposure/Contact (Familiarity)
Q.1 – Q.12 (Checkboxes)
- 3) Experience with EAI and other injections/med.
Q.1 – 10 (Y/N)
Q.11 – (Analog Scale)
- 4) Training (Y/N)
Q.1 – Y (Go to Checkboxes);
Q.2 – N (Go to Analog Scale)
- 5) Confidence
Q.1 – Q.2 – (Analog Scale)

WILLINGNESS TO ACT

is measured with the following tools:

- 1) Bystander/ Social Scenario with Questionnaire
Q.1 – Q.10 (Likert Scale)
Q.F16 (Analog scale)
- 2) Fear/ Phobia
Q.1 – Q.3 (Analog Scale)

SOCIAL DESIRABILITY

- 1) Marlowe-Crowne Social Desirability Scale short form - C
Q.1 – Q.13 (T/F)

DEMOGRAPHIC CHARACTERISTICS

- 1) Modified from recommendations by the U.S. Census Bureau.
Q.J1 – Q.J7 (Fill in and Checkboxes)

Appendix F

Construct Validity Grid: Readiness to Act

Sub-Concepts: Knowledge, Familiarity, Experience, Training and Confidence

Content Validity Grid: Please review for representativeness of the concept **Knowledge**, check items for redundancy and suggest any overlooked items. Thank you.

Concept: Knowledge	Representativeness
Conceptual and theoretical definition: <i>Being fully prepared for doing something;</i> Prochaska's Transtheoretical model of acquiring and sustaining action or behavior.	1 = The item is not representative of Knowledge 2 = The item needs major revisions to be representative of Knowledge 3 = The item needs minor revisions to be representative of Knowledge 4 = The item is representative of Knowledge
Knowledge of FA and EAI - MODIFIED from existing tool	
A1. On the scale of 1 (not knowledgeable at all) through 10 (very knowledgeable), what is your overall knowledge about food allergies? (analog scale 1-10)	1 2 3 4 Comments:
A2. On the scale of 1 through 10, what is your overall knowledge about Epinephrine auto-injector? (analog scale 1-10)	1 2 3 4 Comments:
A3. Food Allergy involves the immune system T/F/DK	1 2 3 4 Comments:
A4. Severe allergic reaction can result in death if untreated T/F/DK	1 2 3 4 Comments:
A5. In an allergic reaction Epinephrine should be used as a last line of treatment T/F/DK	1 2 3 4 Comments:
A6. It is necessary to call 911 after using Epinephrine auto-injector T/F/DK	1 2 3 4 Comments:

A7. Clothing must be removed in order to use Epinephrine auto-injector T/F/DK	1 2 3 4 Comments:
A8. Fast heart beat can be a side effect of using Epinephrine T/F/DK	1 2 3 4 Comments:
A9. Epinephrine auto-injector comes in two doses: adult and junior T/F/DK	1 2 3 4 Comments:
A10. A main symptom of an allergic reaction is fever T/F/DK	1 2 3 4 Comments:
A11. Only healthcare workers can administer Epinephrine auto-injector T/F/DK	1 2 3 4 Comments:
A12. Food manufacturing recalls are often due to allergen contamination T/F/DK	1 2 3 4 Comments:
A13. Anaphylaxis is a severe allergic reaction T/F/DK	1 2 3 4 Comments:
A14. Anaphylaxis symptoms can occur suddenly and progress quickly T/F/DK	1 2 3 4 Comments:
A15. Peanut is not one of the major allergens T/F/DK	1 2 3 4 Comments:
A16. Lactose intolerance is different from allergy to milk proteins T/F/DK	1 2 3 4 Comments:
A17. Epinephrine auto-injector contains a needle T/F/DK	1 2 3 4 Comments:

<p><u>Content Validity Grid</u>: Please review for representativeness of the concept Experience, check items for redundancy and suggest any overlooked items. Thank you.</p>	
Concept: Experience	Representativeness
<p>Conceptual and theoretical definition: <i>Being fully prepared for doing something;</i></p> <p>Prochaska's Transtheoretical model of acquiring and sustaining action or behavior.</p>	<p>1 = The item is not representative of Experience</p> <p>2 = The item needs major revisions to be representative of Experience</p> <p>3 = The item needs minor revisions to be representative of Experience</p> <p>4 = The item is representative of Experience</p>
<p>Experience with or Exposure to Food Allergies and Epinephrine Auto-Injector – NEW</p> <p>What describes your experience or exposure in administering Epinephrine auto-injector in an allergic emergency?</p>	
<p>C1. On the scale from 1 (not at all experienced) through 10 (very experienced), how experienced are you in using Epinephrine auto-injector? (analog scale 1 --- 10)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C2. Self-injected at least once</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C3. Injected a patient or client at least once</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C4. Injected my child at least once</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C5. Watched on TV (in commercial/ show)</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C6. Injected my family member at least once</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>
<p>C7. Injected a friend at least once</p> <p>(Yes/ No)</p>	<p>1 2 3 4</p> <p>Comments:</p>

C8. Injected a stranger at least once (Yes/ No)	1 2 3 4 Comments:
C9. Practiced with a trainer device (Yes/ No)	1 2 3 4 Comments:
C10. Witnessed others inject (Yes/ No)	1 2 3 4 Comments:
C11. Viewed demonstration (Yes/ No)	1 2 3 4 Comments:
C12. Saw poster/ brochure/picture of Injection (Yes/ No)	1 2 3 4 Comments:
C13. Was a recipient of Epinephrine auto-injection (Yes/ No)	1 2 3 4 Comments:
Experience with other injectable medications	
C14. On the scale from 1 through 10, how experienced are you in using medications unrelated to Epinephrine (example: Insulin, Epogen, Hormones, Antiretroviral or other injectable medications)? (analog scale)	1 2 3 4 Comments:

Content Validity Grid: Please review for representativeness of the concept **Training, and Confidence**, check items for redundancy and suggest any overlooked items. Thank you.

Concept: Training and Confidence	Representativeness
Conceptual and theoretical definition: <i>Being fully prepared for doing something;</i>	1 = The item is not representative of Training and Confidence 2 = The item needs major revisions to be representative of Training and Confidence

Prochaska's Transtheoretical model of acquiring and sustaining action or behavior. Sub Concepts: knowledge, familiarity, experience, Training, and Confidence	3 = The item needs minor revisions to be representative of Training and Confidence 4 = The item is representative of Training and Confidence
Food Allergy and Epinephrine Auto-Injector Training - NEW	
Have you ever been trained on how to recognize an allergic reaction and how to inject Epinephrine auto-injector? Y/N	1 2 3 4 Comments:
D1. YES: I received training as part of my a) Job responsibility b) Volunteer work c) First Aid class d) BLS/ACLS e) Parent/Caregiver responsibility f) Social/community involvement g) Other	1 2 3 4 Comments:
D2. NO: On the scale from 0-10, how willing are you to be trained in recognizing an allergic reaction and acting in an allergic emergency? (analog scale)	1 2 3 4 Comments:
Confidence - NEW	
E1. On the scale from 0 (not confident)-10 (very confident), how confident are you in being able to recognize an allergic reaction? (analog scale)	1 2 3 4 Comments:
E2. How confident are you to be able to inject Epinephrine auto-injector in an allergic emergency? (analog scale 1—10)	1 2 3 4 Comments:

Construct Validity Grid: Willingness to Act

Sub Concepts: Bystander effect and Fear

Content Validity Grid: Please review for representativeness of the concept **Bystander**, check items for redundancy and suggest any overlooked items. Thank you.

Concept: Bystander	Representativeness
Conceptual and theoretical definition: <i>ready to do something by choice, to act or respond without being persuaded.</i> <i>Inclination, will, wish, desire.</i>	1 = The item is not representative of Bystander 2 = The item needs major revisions to be representative of Bystander 3 = The item needs minor revisions to be representative of Bystander 4 = The item is representative of Bystander
Bystander - NEW	
<p><u>Scenario:</u> During your visit to college cafeteria you overhear a young camper upset with himself for accidentally biting into a cookie containing nuts. Although he spit it out, within minutes his lips appear progressively swollen and he seems to have difficulty breathing. He says to his friend that he is very allergic to nuts and is afraid to die. He wants someone to help inject his Epinephrine auto-injector. There are several people in the cafeteria including two nursing students in the uniforms who witness this event. What would best describe your response in this situation?</p> <p><i>(5 point Likert scale: Definitely not, probably not, neutral, probably yes, definitely yes)</i></p>	
F1. The nursing student should intervene (5 point Likert scale)	1 2 3 4 Comments:
F2. I would intervene if no one else intervened (5 point Likert scale)	1 2 3 4 Comments:
F3. I will help if the nursing students intervened and asked for my assistance (5 point Likert scale)	1 2 3 4 Comments:
F4. I would not help unless I am asked by the child directly* (5 point Likert scale)	1 2 3 4 Comments:
F5. I would feel guilty if I did not help (5 point Likert scale)	1 2 3 4 Comments:

F6. If my actions will save a life I will intervene (5 point Likert scale)	1 2 3 4 Comments:
F7. I will ask someone else to help (5 point Likert scale)	1 2 3 4 Comments:
F8. I will call 911 (5 point Likert scale)	1 2 3 4 Comments:
F9. I will help administer Epinephrine auto-injector (5 point Likert scale)	1 2 3 4 Comments:
F10. I will walk away* (5 point Likert scale)	1 2 3 4 Comments:
F11. I will ask for assistance (5 point Likert scale)	1 2 3 4 Comments:
F12. I will search on my electronic device (smartphone) or tips (5 point Likert scale)	1 2 3 4 Comments:
F13. It is my professional obligation to intervene (5 point Likert scale)	1 2 3 4 Comments:
F14. I will record situation on my electronic device (smart phone) (5 point Likert scale)	1 2 3 4 Comments:
F15. It is my moral obligation help (5 point Likert scale)	1 2 3 4 Comments:
F16. Thinking about the same scenario what best describes your willingness to act in an allergic emergency involving a child (analog scale) Not willing --Very Willing	1 2 3 4 Comments:

Appendix G

IRB Approval for Pilot of the Tool



Institutional Review Board

1000 Hempstead Avenue
Rockville Centre, NY 11571
www.molloy.edu

Tel. 516.323.3801
Tel. 516.323.3711

Date: October 3, 2016
To: Olga Kagan, RN, MS
From: Kathleen Maurer Smith, Ph.D.
Co-Chair, Molloy College Institutional Review Board
Patricia Eckardt, Ph.D., RN
Co-Chair, Molloy College Institutional Review Board

SUBJECT: MOLLOY IRB REVIEW AND DETERMINATION OF EXEMPT STATUS
Study Title: Factors Associated with Willingness and Readiness to Act in Food Allergic Emergency
Approved: October 3, 2016
Approval No: 15110107-1003

Dear Olga:

The Institutional Review Board (IRB) of Molloy College has reviewed the above-mentioned research proposal and determined that this proposal is approved by the committee. It is EXEMPT from the requirements of Department of Health and Human Services (DHHS) regulations for the protection of human subjects as defined in 45CFR46.101(b). Please note that as Principal Investigator (PI), it is your responsibility to be CITI Certified and submit the evidence in order to conduct your research.

You may proceed with your research. Please submit a report to the committee at the conclusion of your project.

Changes to the Research: It is the responsibility of the Principal Investigator to inform the Molloy College IRB of any changes to this research. A change in the research may disqualify the project from exempt status.

Sincerely,


Kathleen Maurer Smith, Ph.D.


Patricia Eckardt, Ph.D., RN

Appendix H

IRB Modification Request



Olga Kagan, MS, RN
PhD Candidate
Molloy College
Rockville Centre, NY 11571

Institutional Review Board

1000 Hempstead Avenue
Rockville Centre, NY 11571
www.molloy.edu

Date: October 28, 2016
To: Kathleen Maurer Smith, Ph.D.
Co-Chair, Molloy College Institutional Review Board
Patricia Eckardt, Ph.D., RN
Co-Chair, Molloy College Institutional Review Board
From: Olga Kagan, MS, RN
PhD Candidate
SUBJECT: **MODIFICATION REQUEST FOR ADDITIONAL SAMPLES AND SURVEY DELIVERY**
Study Title: Factors Associated with Willingness and Readiness to Act in Food Allergic Emergency
Approved: October 3, 2016
Approval No: 15110107-1003

Please accept this request to modify slightly the study approved by the Molloy College IRB #15110107-1003 related to testing my instrument on willingness and readiness to act in food allergic emergencies. I am asking to expand the sample to include two additional classes and activities and to allow that the survey be delivered to them for test-retest reliability in two formats: paper and pencil, as described in the previously approved study, and web-based delivery sent to their email addresses. The study remains voluntary and subjects will be told that completion of the questionnaire represents their consent to participate. The online and paper surveys will ask participants to volunteer their email addresses so that the two sets of data can be paired. The study description will change from "anonymous" to "confidential" and subjects may choose not to enter their email addresses. If they complete both versions that will serve the instructors of the classes to be part of the classroom discussion about research, their information will not in any way be used to disclose their responses. The same \$20 drawing incentive for completion of the survey will be offered, one per class.

Thank you for your consideration.


Olga Kagan

Appendix I

Informed Consent for Pilot of the Tool

Study Title: Assessing a Tool to Measure Willingness and Readiness to Act in an Allergic Emergency in College Students.

Researcher Information/ Principal Investigator (PI): Olga Kagan, RN, MS, PhD Nursing Student at Molloy College, Okagan06@lions.molloy.edu; 516-457-4763.

Participation: You are invited to participate in a survey, aimed at assessing the validity and reliability of a tool measuring willingness and readiness to act in food allergic emergency in college community. The tool includes questions that assess factors such as knowledge, experience, training, bystander effect, personal connection, fear, social desirability, and demographics characteristics. Your participation is voluntary.

Cost/Benefits: You are invited to participate in this study because you are a member of a college community. It will not cost you anything to participate and there are no direct benefits to you from participating in this study. PI has no financial interest in this study, and is not receiving any funds to conduct this research. If you decide to participate in this study, you will be given an opportunity to enter into a raffle of \$20 gift card after all survey responses have been collected into a box provided in your classroom. Drawing will be based on randomly selected survey by reading off a number listed on last page. Please copy this number before turning in your completed survey. The survey will take approximately 15 minutes to complete.

Risk: There are no physical or psychological risks associated with this survey. If you find yourself uncomfortable, you can stop at any time. There is no penalty to you.

Confidentiality/ Anonymity: All information you provide will be kept confidential. You will not be asked any personally identifying information (names, SS#, address, etc.) and remain anonymous on your responses. All data will be aggregated and analyzed, and no one will be able to identify you in any written reports or publications.

Questions/Concerns: If you have any questions or concerns, please contact Olga Kagan (okagan06@lions.molloy.edu).

Consent to participate:

By completing and submitting this survey, I agree to participate and give permission to use and share study-related records as described above.

Thank you for taking the time to participate!

Appendix J

WIIRAFAE SURVEY FOR FULL STUDY

You are invited to participate in a survey. The main purpose of this survey is to understand factors associated with college students' readiness and willingness to act in a food allergic emergency. This study will contribute knowledge to the field of Allergy, and serve as a guide to institutions of higher education in protecting college students susceptible to allergic reactions. This survey will take approximately 10-15 minutes to complete. Your participation is voluntary, with option to withdraw at any time. The survey is anonymous. There are no risks or benefits to you. Upon completion of this survey you will have a chance to enter to win \$100 gift card, separately from the survey responses. One gift card for every 100 responses will be raffled off. If you have any questions or concerns you can contact Olga Kagan at okagan06@lions.mollo.edu. Completion and submission of this survey constitutes consent to participate.

Demographics

Please answer the following questions

1. What is your age?

.....

2. What is your gender? Check all that apply.

Male

Female

Other:

3. What is your ethnic background? Check all that apply.

White

Black/African American

Hispanic

American Indian / Alaskan Native

Native Hawaiian /Pacific Islander

Asian

Other:

4. How many children do you have? Mark

only one oval.

- 0
 1
 2
 3
 4
 More than 4

5. What is your highest level of education?
Mark only one oval.

- Some high school
 Some college
 2 year college
 4 year college
 Master's Degree
 Doctorate Degree

Current Student Status

6. What best describes your student status? Mark only one oval.

- Undergraduate Student
 Graduate Student

7. What is your college major? Check all that apply.

- Nursing Student
 Business/ Administration/ Marketing Student
 Allied Health Sciences Student
 Computer Science/Information Technology Student
 Political Science/ Communication Student
 Medical Student
 Education Student
 Criminal Justice Student
 Art/Theater/Music Student
 Physical Sciences Student (physics, astronomy, chemistry, geology)
 Biological Sciences (zoology, botany, genetics, paleontology, molecular biology)
 Other:

Knowledge

In this section you will be asked general questions about Food allergies and Epinephrine auto-injector

8. On the scale of 1 through 10, what is your overall knowledge about Food Allergies?

	1	2	3	4	5	6	7	8	9	10	
Not at all knowledgeable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very knowledgeable

9. On the scale of 1 through 10, what is your overall knowledge about Epinephrine Auto-Injector?

	1	2	3	4	5	6	7	8	9	10	
Not at all knowledgeable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very knowledgeable

10. Please read statements below and select True/False/ Don't Know for each statement. Mark only one oval.

	True	False	Don't Know
Food Allergy involves immune system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Severe allergic reaction can result in death if untreated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In an allergic reaction Epinephrine should be used as a last line of treatment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is necessary to call 911 after using Epinephrine auto-injector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clothing must be removed in order to use Epinephrine auto-injector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast heart beat can be a side effect of using Epinephrine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Epinephrine auto-injector comes in two doses: adult and junior	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A main symptom of an allergic reaction is fever	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only healthcare workers can administer Epinephrine auto-injector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food manufacturing recalls are often due to allergen contamination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anaphylaxis is a severe allergic reaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anaphylaxis symptoms can occur suddenly and progress quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peanut is not one of the major allergens	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lactose intolerance is different from allergy to milk proteins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Epinephrine auto-injector contains needle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Familiarity/ Level of Contact/Exposure

In this section you will be asked about your familiarity with Food Allergies and experience with Epinephrine Auto-Injector

11. Please read each of the following statements. After you read all of the statements below, place a check by the statements that best depicts your exposure to persons with food allergies. Check all that apply.

- I have watched a movie or television show in which a character depicted a person with food allergies
- My job involves providing care services/treatment for persons with food allergies
- I have observed, in passing, a person I believe may have had an allergic reaction
- I have observed persons with allergies on a frequent basis
- I have food allergy/allergies
- I have worked with a person who had a food allergy in my place of employment
- I have never observed a person that I was aware had a food allergy
- My job includes providing services to persons with food allergies
- A friend of the family has food allergy/allergies
- I have a relative who has a food allergy
- I have watched a documentary on the television about food allergies
- I live with a person who has a food allergy/ allergies

Experience/Exposure

12. What describes your experience with or exposure to Epinephrine auto-injector in an allergic emergency? Please select YES or NO for each statement. Mark only one oval per row.

row.	YES	NO
Self-injected at least once	<input type="radio"/>	<input type="radio"/>
Injected a patient or client at least once	<input type="radio"/>	<input type="radio"/>
Injected my child at least once	<input type="radio"/>	<input type="radio"/>
Watched on TV (in commercial/ show)	<input type="radio"/>	<input type="radio"/>
Injected my family member at least once	<input type="radio"/>	<input type="radio"/>
Practiced with a trainer device	<input type="radio"/>	<input type="radio"/>
Viewed demonstration	<input type="radio"/>	<input type="radio"/>
Saw poster/ brochure/picture of injection	<input type="radio"/>	<input type="radio"/>
Was a recipient of Epinephrine auto-injection	<input type="radio"/>	<input type="radio"/>
Injected a stranger at least once	<input type="radio"/>	<input type="radio"/>

13. On the scale from 1 through 10, how experienced are you in using Epinephrine auto-injector? Mark only one oval.

Confidence

18. How confident are you in being able to recognize an Allergic Reaction? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not at all Confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Confident

19. How confident are you to be able to inject Epinephrine Auto-Injector in an allergic emergency? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not at all Confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Confident

Bystander

Please read the following scenario and respond to question below.

20. During your visit to college cafeteria you overhear a student upset for accidentally biting into a cookie containing nuts. Within minutes student's lips appear progressively swollen, red and the student seems to have difficulty breathing. The student is expressing fear of dying from an allergic reaction if not treated. The student needs help injecting Epinephrine auto-injector.
 What would best describe your response in this situation? Mark only one oval per row.

	Definitely Not	Probably Not	Neutral	Probably Yes	Definitely Yes
I would help if no one else intervened	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Someone else should intervene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would help if asked	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel guilty if I did not help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If my actions will save a life I would intervene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would call 911	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would help inject Epinephrine auto-injector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would walk away	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is my professional obligation to help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is my moral obligation to help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Social

24. Please read the following statements and select TRUE or FALSE for each statement

Mark only one oval per row.

	TRUE	FALSE
It is sometimes hard for me to go on with my work if I am not encouraged	<input type="radio"/>	<input type="radio"/>
I sometimes feel resentful when I don't get my own way	<input type="radio"/>	<input type="radio"/>
On a few occasions, I have given up doing something because I thought too little of my ability	<input type="radio"/>	<input type="radio"/>
There have been times when I felt like rebelling against people in authority even though I knew they were right	<input type="radio"/>	<input type="radio"/>
No matter who I'm talking to, I'm always a good listener	<input type="radio"/>	<input type="radio"/>
There have been occasions when I took advantage of someone.	<input type="radio"/>	<input type="radio"/>
I'm always willing to admit it when I make a mistake	<input type="radio"/>	<input type="radio"/>
I sometimes try to get even, rather than forgive and forget	<input type="radio"/>	<input type="radio"/>
I am always courteous, even to people who are disagreeable	<input type="radio"/>	<input type="radio"/>
I have never been irked when people expressed ideas very different from my own	<input type="radio"/>	<input type="radio"/>
There have been times when I was quite jealous of the good fortune of others	<input type="radio"/>	<input type="radio"/>
I am sometimes irritated by people who ask favors of me	<input type="radio"/>	<input type="radio"/>
I have never deliberately said something that hurt someone's feelings	<input type="radio"/>	<input type="radio"/>

Financial Incentive

After you click submit you will be directed to a link to enroll in a drawing to win \$100 Amazon gift card. Your responses to the survey will not be associated with your email address. Thank you for your participation!

\$100 Raffle Drawing

1. One out of 100 respondents will be randomly selected to receive \$100 gift card and will be notified by email provided below. Please provide your email address to be entered in the raffle of \$100 gift card

My email address is _____

2. Do you wish to be contacted for future studies and/or for food allergy/anaphylaxis training?

Mark only one.

Yes

No

Appendix K

Informed Consent Form for Full Study

Study Title: Factors Associated with College Students' Willingness and Readiness to Act in an Allergic Emergency.

Researcher Information/ Principal Investigator (PI): Olga Kagan, RN, MS, PhD Nursing Student at Molloy College, Okagan06@lions.molloy.edu; 516-457-4763.

Participation: You are invited to participate in a survey, aimed at identifying factors associated with college students' willingness and readiness to act in a food-allergic emergency. The web-based survey includes questions that assess factors such as knowledge, experience, training, bystander response, personal connection, fear, social factors, and demographics characteristics. Your participation is voluntary.

Cost/Benefits: You are invited to participate in this study because you are a college student. Participation in this study will not cost you anything and there are no direct benefits to you from participating in this study. PI has no financial interest in this study, and is not receiving any funds to conduct this research. If you decide to participate in this study, you will be given an opportunity to enter into a raffle of \$100 gift card after all survey responses have been collected. \$100 for every 100 students entered for the drawing will be based on a randomly selected survey. The survey will take approximately 15 minutes to complete.

Risk: There are no physical or psychological risks associated with this survey. If you find yourself uncomfortable, you can stop at any time. There is no penalty to you.

Confidentiality/ Anonymity: All information you provide will be kept confidential. You will not be asked any personally identifying information (names, SS#, address, etc.) and remain anonymous on your responses. All data will be aggregated and analyzed, and no one will be able to identify you in any written reports or publications.

Questions/Concerns: If you have any questions or concerns, please contact Olga Kagan (okagan06@lions.molloy.edu).

Consent to participate:

By completing and submitting this survey, I agree to participate and give permission to use and share study-related records as described above.

Thank you for taking the time to participate!

Appendix L

IRB Approval for Full Study



Institutional Review Board

1000 Hempstead Avenue
Rockville Centre, NY 11571
www.molloy.edu

Tel. 516.323.3801

Tel. 516.323.3711

Date: March 6, 2017
To: Olga Kagan, RN, MS
From: Kathleen Maurer Smith, Ph.D.
Co-Chair, Molloy College Institutional Review Board
Patricia Eckardt, Ph.D., RN
Co-Chair, Molloy College Institutional Review Board

SUBJECT: MOLLOY IRB REVIEW AND DETERMINATION OF EXEMPT STATUS
Study Title: Factors Associated with College Students' Willingness and Readiness to Act in Food Allergic Emergency
Approved: March 6, 2017
Approval No: 15110107-0306

Dear Olga:

The Institutional Review Board (IRB) of Molloy College has reviewed the above-mentioned research proposal and determined that this proposal is approved by the committee for the Molloy subjects and pending approval for any other schools that you may use. It is considered an EXPEDITED review per the requirements of Department of Health and Human Services (DHHS) regulations for the protection of human subjects as defined in 45CFR46.101(b) and has met the conditions for conducting the research. Note that as Principal Investigator, please send us evidence of completing the CITI certification required for your study.

You may proceed with your research. Please submit a report to the committee at the conclusion of your project.

Changes to the Research: It is the responsibility of the Principal Investigator to inform the Molloy College IRB of any changes to this research. A change in the research may change the project from EXEMPT status that would require communication with the IRB.

Sincerely,

Kathleen Maurer Smith, Ph.D.

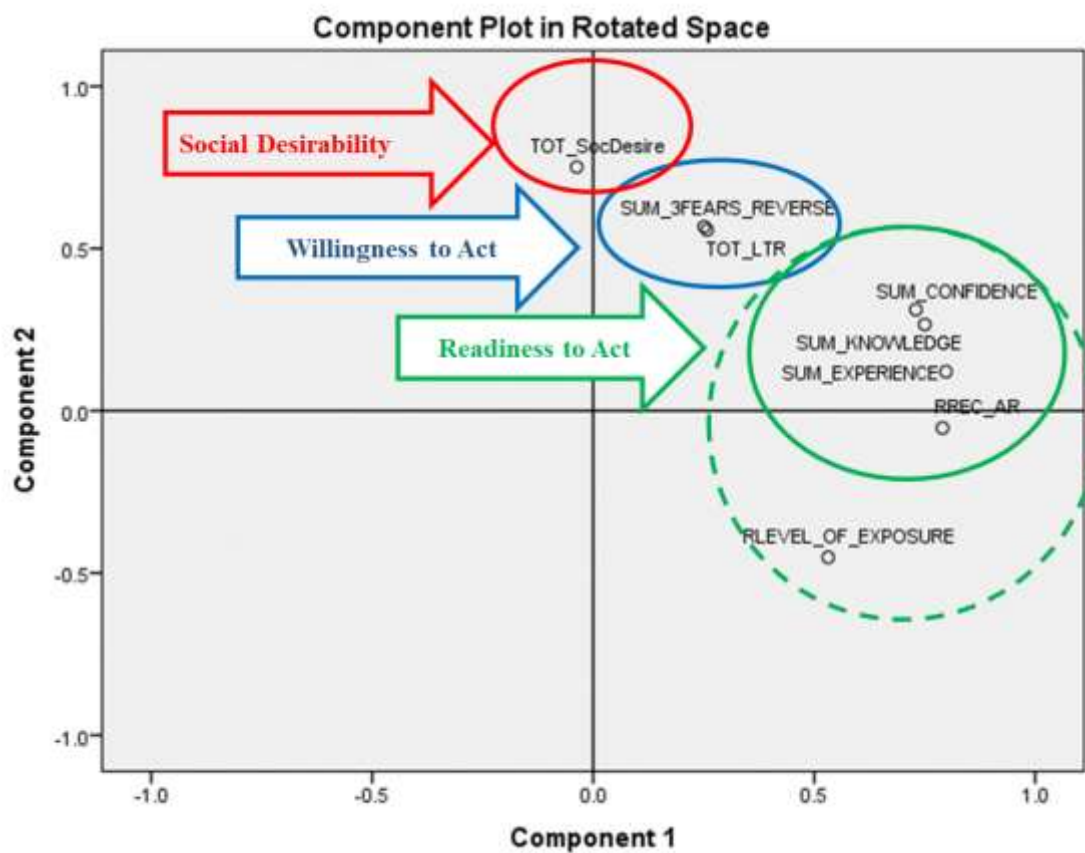
Patricia Eckardt, Ph.D., RN

Appendix M

Factor Analysis

Pattern and Structure Matrix for Willingness to Act with
Oblimin Rotation of Two Factor Solution of WilRAFAE Items

Item	Pattern Coefficients		Structure Coefficients		Communalities
	Component 1	Component 2	Component 1	Component 2	
SUM_KNOWLEDGE	.750	.266	.805	.420	.715
LEVEL_OF_EXPOSURE	.531	-.452	.439	-.343	.388
SUM_EXPERIENCE	.798	.121	.823	.284	.691
TRAINED TO RECOGNIZE FAE	.790	-.053	.779	.109	.610
SUM_CONFIDENCE	.730	.312	.794	.461	.723
TOT_SOC_DESIRABILITY	-.037	.751	.117	.744	.554
TOT_LTR	.251	.567	.367	.619	.443
TOT_3FEARS	.258	.557	.372	.610	.436



Appendix N

Multiple Linear Regression Analysis on All Predictor Variables

It was found that the R^2 value ($R^2=0.403$) or 40% of variability in the dependent variable, willingness to act in FAE, can be explained by the independent variables. The multiple regression analysis table demonstrates that strongest predictors of willingness to act in FAE are Sum_Confidence level ($\beta = .242, t = 3.767, p < .001$); Social Desirability ($\beta = .160, t = 3.682, p < .001$); Willingness to be trained ($\beta = .147, t = 3.141, p = .002$), and being a student in health professions. The following majors were not predictive of willingness to act in FAE: Business, marketing, administration, political and computer sciences ($\beta = -.141, t = -3.112, p = .002$), and humanities, art, music and theater ($\beta = -.174, t = -3.935, p < .001$). There are also moderate significant findings of relationships on the 0.05 level, including age, education college major, and knowledge about food allergies and Epinephrine auto-injector.

R	R Square	Adjusted R Square	Std. Error of the Estimate
.635 ^a	.403	.359	7.086

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	41.384	2.487		16.643	.001***
	Age 21-30	2.109	.847	.113	2.490	.013**
	Age 31-40	4.054	2.391	.076	1.695	.091
	Age ≥ 41	1.366	2.780	.031	.491	.623
	Gender Male	1.266	1.046	.052	1.211	.227
	Number of children ≥ 1	2.000	2.242	.057	.892	.373
	LOE: 2 year college	-1.377	1.213	-.051	-1.135	.257
	LOE: 4 year college	.670	.969	.035	.692	.490
	LOE: Master/Doctorate	.400	1.978	.012	.202	.840
	Graduate	1.010	1.383	.041	.730	.466

Major: Business, polit, computer, admin, market.	-3.328	1.069	-.141	-3.112	.002***
Major: Education	-3.093	1.238	-.115	-2.499	.013**
Major: Criminal Justice	-.679	2.437	-.012	-.278	.781
Major: Humanities, art, music	-5.602	1.424	-.174	-3.935	.001***
Major: Physical and biological sciences	-.956	2.627	-.015	-.364	.716
Major: Other	1.793	2.786	.027	.643	.520
Ethnicity: Black/AA	.243	1.323	.008	.183	.855
Ethnicity: Hispanic	2.160	1.354	.069	1.595	.112
Ethnicity: American Indian/Alaskan	1.965	5.264	.016	.373	.709
Ethnicity: Asian	-.731	1.377	-.023	-.531	.596
Ethnicity: Other	1.235	1.551	.033	.797	.426
SUM_KNOWLEDGE	.204	.085	.153	2.403	.017**
SUM_EXPERIENCE	-.109	.088	-.078	-1.245	.214
SUM_CONFIDENCE	.464	.123	.242	3.767	.001***
LEVEL_OF_EXPOSURE	.148	.144	.044	1.025	.306
TOT_SocDesire	.482	.131	.160	3.682	.001***
Trained to Recognize FAE	.929	.946	.052	.983	.327
Willing to be Trained	.613	.195	.147	3.141	.002***

*** $p < 0.01$; ** $p < 0.05$

Appendix O

Bonferroni Multiple Comparisons: Total Sum Bystander's LTR by College Major

College Major	College Major	Mean Difference	Std. Error	Sig.
Health Sciences	Bus/Comp/Admin/Market/Polit.	2.912**	.589	.001
	Education	2.129*	.659	.028
	Criminal Justice	1.829	1.425	1
	Art/Music/Theater/Humanity	2.554*	.753	.016
	Physical/Bio Sciences	1.729	1.425	1
Bus/Comp/Admin/ Market/Polit.	Health Sciences	-2.912**	.589	.001
	Education	-.784	.788	1
	Criminal Justice	-1.084	1.489	1
	Art/Music/Theater/Humanity	-.359	.869	1
	Physical/Bio Sciences	-1.184	1.489	1
Education	Health Sciences	-2.129*	.659	.028
	Bus/Comp/Admin/Market/Polit.	.784	.788	1
	Criminal Justice	-.300	1.518	1
	Art/Music/Theater/Humanity	.425	.918	1
	Physical/Bio Sciences	-.400	1.518	1
Criminal Justice	Health Sciences	-1.829	1.425	1
	Bus/Comp/Admin/Market/Polit.	1.084	1.489	1
	Education	.300	1.518	1
	Art/Music/Theater/Humanity	.725	1.561	1
	Physical/Bio Sciences	-.100	1.975	1
Art/Music/Theater/ Humanity	Health Sciences	-2.554*	.753	.016
	Bus/Comp/Admin/Market/Polit.	.359	.869	1
	Education	-.425	.918	1
	Criminal Justice	-.725	1.561	1
	Physical/Bio Sciences	-.825	1.561	1
Physical/Bio Sciences	Health Sciences	-1.729	1.425	1
	Bus/Comp/Admin/Market/Polit.	1.184	1.489	1
	Education	.400	1.518	1
	Criminal Justice	.100	1.975	1
	Art/Music/Theater/Humanity	.825	1.561	1

*. The mean difference is significant at the 0.05 level.

** . The mean difference is significant at the 0.01 level.