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The Impact of Food Allergy Education for Nursing Students

By

Aleksandra J. Redko

A Thesis
Submitted to the Faculty of Graduate Studies
through the Department of Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts
at the University of Windsor

Windsor, Ontario, Canada

2022

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The Impact of Food Allergy Education for Nursing Students

by

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ABSTRACT

In community food allergy-related emergency situations, students from health, science and criminal justice-related programs are more willing and ready to act than those from other programs (Kagan, 2019). However, despite training in dietary needs and food allergies (FA), healthcare professionals such as physicians often request additional education and resources to assist patients (Carlisle et al., 2010; Kumar et al., 2006). An allergy-related magazine article by Gagné (2018), highlighted the experiences of patients whose hospital care was impacted by overlooked FA needs. Sources for hospital dietary mistakes included patient records not being followed and errors in recording patient allergy information (Wallace, 2015). Absent from literature is an understanding of how FA nursing instruction affects general care patients with FA receive. The goal of the present study was to address this lacuna as it relates to nursing students' education and to understand how competency and knowledge interact with FA education. Nursing students in Years 1-4 at a university in Southern Ontario responded to an 18-item modified Willingness & Readiness to React in a Food Allergic Emergency in a community setting questionnaire (Kagan, 2018), and to open-ended questions about a patient care vignette involving a patient with FA in hospital. Conventional Content Analysis (Hsieh & Shannon, 2005) was used to develop themes from the vignette, that identified how student nurses anticipated providing care to the patient. Findings identify areas to support nursing students regarding FA education and will add to current literature around FA education for health care workers.

Keywords: food allergies, nursing students, food allergy education, allergy prevention, shared responsibilities

DEDICATION

Thanks goes out to all the nurses and health professionals working tirelessly during the COVID-19 pandemic, and for all those who help provide care for patients with food allergies.

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Thank you to my committee for their support and guidance. Thank you to my family for their support throughout all my education. And a very special thank you goes to everyone that has helped shape this thesis. And thank you to the participants of this study, this could not be possible without you.

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LIST OF ABBREVIATIONS/SYMBOLS

FA = Food Allergy, Food Allergies

vpLCJR = Virtual Patient Lasater of Clinical Judgement Rubric

FAE = Food Allergy Emergency

WilRAFAE = Willingness and Readiness to Act in a Food Allergic Emergency

EAI = Epinephrine Auto-Injector

CHAPTER 1

LITERATURE REVIEW

Hospital visits are stressful at any time, and as Schwappach (2008) explains, safety is often a main concern for patients. This stress is amplified when patients have food allergies (FA) because such patients have additional risk associated with the possibility of having an allergic reaction to foods provided to them due to mistakes by hospitals (Gagné, 2018). This study will provide insight into the extent that nursing education regarding the understanding and knowledge of FA and caring for a patient with FA reduces that risk.

In Canada, 2.6 million individuals live with food allergies. That number includes both children and adults and demonstrates the extent that FA are a real public health concern (Food Allergy Canada [FAC], 2019a). In Canada, the list of common allergens or items that produce physical reactions include peanuts, tree nuts, sesame, milk, egg, fish, crustaceans, molluscs, soy, wheat and triticale, and mustard (Health Canada, 2018). These physical reactions can be either food intolerance or allergic reactions and these two response types are frequently confused.

Food intolerances are a problem with the digestion of the food often resulting in abdominal and intestinal issues and symptoms of diarrhea and nausea (Asero et al., 2007; see also American Academy of Allergy, Asthma & Immunology [AAAAI], n.d.). Intolerance responses can sometimes be prevented in ways other than strict avoidance. For example, lactose intolerance can be treated with enzymes to help the body process lactose (Fisher, 2018).

In contrast to intolerances, food allergies are the result of multiple organs in the body incorrectly reacting to food or food proteins to protect the body from items that the body identifies as a threat. As a result, an immune response is generated to guard against this threat, and can cause narrowed or blocked airways, nausea, and histamine production resulting in itchy hives on the body, and/or swelling. The severity of FA can range from mild to severe symptoms (Branum et al., 2012) and if left untreated (i.e., without epinephrine, an artificially made dose of adrenaline), can result in anaphylaxis, a severe reaction that can lead to death, due to low blood pressure or narrowed airways (Asero et al., 2007; FAC, 2019b; FAC, 2019c). An allergy is the immune system responding with antibodies (IgEs) to protect the body and often requires medical treatment i.e., in the case of anaphylaxis (Asero et al., 2007). Currently, the primary way to prevent a reaction is to avoid contact with the allergen (Asero et al., 2007).

Sources of Procedural Dietary Errors

Because of the potentially severe consequences of allergen exposure, individuals living with FA need to be alert to potential allergy threats in all circumstances including hospital visits. As Wallace (2015) reported on American hospital experiences, patients' safety may be put at risk by dietary mistakes while at the hospital. Wallace (2015) identified a number of ways these errors can occur. They could occur when the patient is admitted into hospital and the allergies are not accurately reported by the patient or caregiver, or when allergies are correctly identified, but allergens are not always consistently considered, for example, when a staff member orders the patient's food or even during food preparation (see Appendix A).

There are a myriad of ways that a hospital patient can come in contact with a food allergen (Wallace, 2015) and the actors in such scenarios range from the kitchen staff to the nursing staff. As a result of these mistakes, patients can become more ill, their planned care may have to be adjusted, and they could have an allergic reaction or even anaphylaxis. To combat these mistakes Wallace (2015) described a need for proper procedural guidelines and more education. Similarly, Harari et al. (2021) have identified protocol policy strategies to help prevent food allergic reactions in an Israeli hospital system. Non-exhaustive examples of these include having hospital staff ask specifically about food allergies using consistent meal recipes and allergen identification. Australian and New Zealand allergy organizations have also developed food allergy resources and training for hospitals and healthcare institutions to aid with safe food service practices called All about Allergens Resource Hub (https://foodallergytraining.org.au/resources/, National Allergy Strategy, 2021a, 2021b).

Lack of Education

After consultation with nursing faculty at some American nursing schools, the Consortium of Food Allergy Research (CoFAR team – founded in 2005) examined the FA education of health professionals (e.g., school nurses) and developed resources for them based on an observed absence of official education on FA in the courses (Carlisle et al., 2010). It was found that 85% of the school nurses surveyed had "moderate to high proficiency" of general FA knowledge relevant to caring for students with FA in a school setting, while only 50% of these nurses received FA management training and only 35% had taught themselves about FA management (Carlisle et al., 2010, p. 363). Sources of training include nearly 37% from conferences, 29% from classes and 20% from

mentorship, as well as scholarly materials, conferences, internet, scholarly and "advocacy websites", and secondary-source articles for ongoing learning (Carlisle et al., 2010, pp. 363-364). School nurses indicated a need for additional resources to support students with allergy management despite having education about FA, with emphasis on educating school staff, food allergy emergency protocols, handling food avoidance, and school trips. CoFAR developed a program to provide education of FA to various audiences, including school nurses as Carlisle et al. (2010)'s study identified a need for additional education.

A similar study with United States-based registered dietitians found that dietitians had self-assessed "moderate proficiency" in FA knowledge, and that more online resources for managing patients would be helpful (Groetch et al., 2010, p. 262). A successful attempt to address this lack of education was a 2020 training campaign developed by the Food Allergy Research & Education (FARE) organization for dietitians to gain a *FARE Certificate in Pediatric Food Allergies* through specialized courses (FARE, n.d.).

Other observations of a lack of FA education feature physicians in urgent and primary care (Kumar et al., 2006; see also Gupta, 2010). Gupta et al. (2010) found that almost 60% of nearly 400 primary care physicians had FA knowledge but only 30% of those physicians reported confidence in their ability to interpret allergy-related lab results and manage FA. Moreover, some parents of allergy-patients claim that there were inconsistencies in the treatment recommendations they were given by various physicians from whom their child received care (Gupta et al., 2008).

Nutrition-Specialized Courses & Medication Administration "Rights"

In terms of providing educational resources to provide better knowledge and education, Bjerrum et al. (2012), determined that specialized short courses can provide more knowledge about nurses' role in nutrition and add to awareness but even these are inadequate in some respects. Although knowledge is gained, there was not always sufficient information to guide the appropriate implementation of that knowledge. For example, nurses found it difficult to prioritize nutrition with competing tasks, and considered it less worrying than those other tasks. The study concluded that incorporating knowledge on a regular basis is more helpful than just receiving one course.

Mortell (2019) identified two main patient safety concerns - the allergy at hand and the so-called *theory-practice-ethics gap*, meaning that while the medical staff have the competency to practice with the "theoretical knowledge and practical skills", there are errors that occur, due to a potential lack of ethical compliance (Mortell 2009; Mortell, 2012). This gap was illustrated in the case of a young child who had a penicillin allergy and nurses and medical professionals, such as physicians, did not properly acknowledge this health concern and provided amoxicillin, whereby the child experienced anaphylaxis as a result. Mortell (2019) suggested that drug allergies should be included in the medication administration "rights" that provides a general protocol for administering medication to patients. For context, in Canada, nurses in Ontario are expected to follow decision trees for the medication order (e.g., whether it is clear, complete and appropriate), for making a decision about administering and dispensing medication (e.g., whether there is appropriate authorization, competence, etc.) (College of Nurses of Ontario [CNO], 2019).

In the United States, there was the development of five "rights" for allergy information that included "the right drug allergy information" "presented to the right person" "in the right format using CDS [clinical decision support] tools" "through the right channel within the EHR [electronic health record]" and "at the right time in the workflow" (Institute for Safe Medication Practices, n.d). The main five "rights" for medication in the US include "right patient", "right drug" "right dose" "right route" and "right time" (Hughes & Blegen, 2008). There has been discussion about adding rights, wherein some areas have more than five rights, but there is the counterview that even consideration of more rights may not be useful in preventing medication errors (Smetzer, 2007). Although the present study does not evaluate ethical decision making and instead reviews anticipated response to a hypothetical clinical case, it is important to acknowledge this gap and the reality that clinical judgement has inherent ethical implications. Future research may address the ethical component, as this study is to create a foundational start to this area of research.

Current State of FA Topics Taught

Understanding where nursing students are currently situated in terms of their FA education is important to determine their educational needs. Specifically highlighted below are topics that have been considered as areas of FA knowledge covered in the nursing curriculum at a university in Southern Ontario (here forward known as The University) (Personal communication, April 5, 2020 & June 4, 2020). Additionally, an overview of the mention of allergies by nursing governing bodies is described.

General FA Knowledge

The topic of nutrition is taught with a textbook that refers to an "unusual response to food (including intolerances and allergies)" in terms of adverse reactions (Whitney et al., 2015/2016, Chapter 16 Glossary). This textbook also explains *food allergy* as "an adverse reaction to food that involves an immune response; also called food-hypersensitivity reaction" (Whitney et al., 2015/2016, Chapter 16 Glossary). While the text does discuss *anaphylaxis*, cross-contamination, and the use of *epinephrine*, the context is specifically with youth and in school settings (Whitney et al., 2015/2016, pp. 573-574). In addition, students also learn about adult health, which includes some allergy/sensitivity content. This restricted consideration of the breadth of FA relevant scenarios stops short of educating nurses about FA in certain hospital settings.

Medication and Allergies

When learning about medication administration and the mechanics behind pharmaceuticals, a recently used textbook (i.e., 2019-2020) teaches students about medication allergies, and how mistakes can be made, such as with the drug penicillin and use of its "trade name" which does not always indicate it is part of the drug group penicillins (Sealock et al., 2016). Sealock et al. (2016) also review procedures for checking for patient allergies before giving medication through the skin and nurses are instructed to exhaust every option available to find out about the patient's drug allergies as well as the type and severity of previous reactions.

Prioritizing Allergies in Care

The skills of thinking critically and assessing patients via informed evidence are taught and these identify for students the priorities of care for a patient based on

individualized principles and steps (Jarvis et al., 2018). For example, the first principle is to create a list of medications the patient is using at the time of the visit, along with their medical conditions, allergies the patient has, and why the patient has come to get care, all of which should be reviewed regularly as these items can impact the prioritization of care (Jarvis et al., 2018, Table 1.1). The three levels of priorities include the first, which involves airway obstruction, breathing, circulatory, and vital problems; the second includes unusual lab results, patient response, other medical conditions that are causing the patient distress, and the third level consists of issues that are not of immediate concern but are still important for overall patient care outcomes (Jarvis et al., 2018, Table 1.1). The manner in which nurses use the information about patient allergies with their competing priorities is an essential consideration in evaluating their ability to provide sufficient care. Additionally, a textbook that teaches about the use of holistic health assessments discusses allergies and highlights the benefits of systems to help nurses with patient care, such as the "Nursing Clinical Information System" as explained by Potter et al. (2017). As encouraged by Weis and Levy (2014), nurses should verify data about allergy and medications that are auto-updated from prior hospital visits and from different staffing shifts to ensure data is up-to-date and accurate to prevent patient safety risks and errors in records (as cited in Potter et al., 2017).

Simulations

Experiential learning with clinical simulations provides opportunities for students to gain skills. For example, students start out learning to ask about FA and intolerances with their patients, and their checklist used in simulations mentions allergies in relation to

medication (Personal communication, June 8, 2020). Assessing for FA, however, is not heavily covered.

Competencies

On the CNO's list of competencies for registered nurses to be licensed, there is no specific reference to *allergies* or *food allergies* in the "Entry to Practice Competencies for Registered Nurses" for September 2020 created by the CNO (2018), except for *adverse reactions* in the medication administration handbook of standards (CNO, 2019). Generally speaking, nurses are required to be mindful of patient risks that may arise and to coordinate with multiple areas of care to "make ongoing adjustments" (CNO, 2018, p. 7).

Additionally, the American- and Canadian-used National Council Licensure Examination (NCLEX) for nursing graduates to qualify as registered nurses (RN), (NCLEX-RN) refers to allergies thusly "…assess client for allergies and intervene as needed (e.g., food, latex, environmental allergies)" (National Council of State Boards of Nursing [NCSBN], 2019a, p. 13). The NCLEX-RN does deem this important and is part of required competencies for RNs, for example, a textbook for NCLEX-RN used in the local nursing program identified that nurses should be checking for allergies to dyes in diagnostic testing (Silvestri & Silvestri, 2018). However, the 2020 updated version of NCLEX-RN competencies (effective as of April 2020 until 2023) has removed the statement with examples of allergies and replaced it with "…identify client allergies and intervene as appropriate" and "…utilize facility client identification procedures (e.g., client name band, allergy bands)" (NCSBN, 2019b, p. 13). The overall lack of specificity

of allergies and their sources may impact how nurses interact with patients who have allergies.

FA competency is not standardized across countries (Skypala et al., 2018). For example, in the United Kingdom and Sweden, nurses and other health care professionals have allergy competencies that are part of their role of managing and handling allergies and are given more authority in providing care. Elsewhere, the nurses who specialize in allergies have a role that has been created “in an ad-hoc fashion”, and more competencies are needed, wherein it appears that in-depth allergy roles are in addition to general nursing (Skypala et al., 2018, p. 3; Upton et al., 2007). It is also important for other health care team members to have allergy knowledge when providing care for patients with allergies. This ties in quite nicely with the implementation of the certification modules for dietitians dealing with pediatric food allergies in the United States as mentioned previously (FARE, n.d.).

Despite the NCLEX-RN identifying allergy competency and the allergy coverage in the current nursing textbooks, a lack of specific FA competencies and focus indicate a need for continual and additional FA education besides a general understanding of allergies. A needs assessment of the education gaps would identify the starting place for research of how FA education is learned by nursing students and the context the in which the material is taught.

How well a nurse can do their job is important as there is a potential association between competency and the safety of patients (Kendall-Gallagher & Blegen, 2009). Reassuringly, college students are more willing and ready to engage in an FA emergency if they are in a health/science or justice-related program than other programs (Kagan,

2019). However, it is unclear from the topics covered in a nursing program whether the available information is enough to prepare current student nurses for clinical experiences with FA.

CHAPTER 2

PROGRAM EVALUATION

This study used the framework of a program evaluation to explore the current nursing education regarding general patient care and FA, and to determine if improvements in curriculum were needed.

Program Evaluation Framework

The framework for program evaluation by Milstein et al. (2000) formed the basis for this study of nursing education related to FA. This Center for Disease Control and Prevention (CDC) framework provides the steps for evaluating public health programs and describes best practices. The first step involves meeting with stakeholders and receiving their relevant insight. The next step is to identify the program, its goals, and objectives. The third establishes how the evaluation will be set up and what its main objective will be. The fourth involves collecting data that are valid, reliable and representative of the circumstances. The fifth involves analyzing and interpreting data and determining future directions. Finally, implementation and dissemination of the findings amongst the stakeholders completes the process.

In terms of the present study as an exploration using some program evaluation features as a guide, patient perspectives were taken loosely from the anecdotal cases detailed by Gagné (2018) whereas the perspective of a nursing program were gathered via personal communication and participant responses. This helped to establish an understanding of the nursing department with respect to this project, and of topics taught. The methodology will be described in Chapter 4, and the findings of the present study will lend themselves to set the stage for next steps of a program evaluation.

CHAPTER 3

PRESENT STUDY

The primary aim of this study was to determine whether nursing education increases nursing students' understanding and knowledge of FA across time in program.

Gaps Identified in Research

As discussed in the previous chapter, there were some identified gaps in the current literature covering FA. First, there is continually changing information about nurses' FA competencies, and there is a lack of clinical case studies covering FA. Finally, it is unclear how FA nursing education impacts understanding and knowledge. The present study addressed the latter gap and helped set the stage for addressing the former issues.

Theoretical Framework

The theories in order of most relevant to the project included the Tanner's model of clinical judgement (Tanner, 2006), the measurement of transfer of knowledge to achieve learning goals (Kraiger et al., 1993), and the theory of work performance (Blumberg & Pringle, 1982). Tanner's model of clinical judgement encapsulates the different clinical judging phases nurses process while providing care to a patient (Lasater, 2007; Tanner, 2006). How knowledge can be transferred to achieve learning goals and be measured helps explain the process of learning and know an individual takes knowledge and is able to apply what they have learned (Kraiger et al., 1993). The theory of work performance accounts for possible barriers or obstacles to being willing, able, and competent to perform a certain task (Blumberg & Pringle, 1982). While these theories were not tested, they were used as guiding principles. For example, the Tanner's model of

clinical judgement was incorporated in the clinical judgement component of the study via the clinical vignette (see Appendix B), and the concepts of how learning can be achieved was integrated in the project by acknowledging the ways people learn skills, how they can be evaluated, and how learners engage in various skills. Finally, although the theory of work performance is more specific to field work, how competing priorities like time and opportunity to perform allergy- and other health-related tasks apply to patient care involving FA was reviewed with the clinical vignette questions.

Tanner's Model of Clinical Judgement

The term *clinical judgement* has been identified by Benner et al. (1996) as how "nurses come to understand the problems, issues, or concerns of clients/patients, to attend to salient information and respond in concerned and involved ways" (p. 2, as cited in Lasater, 2007, p. 497).

The model of clinical judgement describes the different dimensions of clinical care judgement and outlines the clinical judgement that should be achieved by nursing students to be prepared for clinical settings (Lasater, 2007). There are four different "phases" that include *noticing, interpreting, responding,* and *reflecting. Noticing* is defined as "a perceptual grasp of the situation at hand", while *interpreting* is defined as "developing a sufficient understanding of the situation to respond" (Tanner, 2006, p. 208). *Responding* is defined as "deciding on a course of action deemed appropriate for the situation" or no action at all, while *reflecting* is defined as "attending to patients' responses to the nursing action while in the process of acting" (Tanner, 2006, p. 208). This model also highlights the importance of retroactively analyzing what transpired and determine the performance/quality.

The expectations that nursing students have of patients will influence their awareness of different aspects of the patient. This would be part of the *noticing* phase of the model (Tanner, 2006). These expectations are dependent on various factors that include knowing what the average patient will experience (based on how long they have worked with certain patients), as well as their classroom knowledge, patient-nurse relationship — where the nurse can anticipate how a particular patient will react to certain procedures, and the patient's demonstrated pain tolerance (Tanner, 2006). Besides the patient, department culture, norms for care procedures, "values related to the patient" and how nurses look at "excellent practice" guides the nurse's awareness of various details of patient care as do competing priorities in the department (Tanner, 2006, p. 208). Differences between patient and nurse expectations can influence both care and outcome, for example, if nurses do not have clinical experience with patients who have co-morbidities such as FA, but patients expect that they would, these differing expectations may complicate the care situation (Personal communication, June 4, 2020).

Expectation can also be considered in the context of customer-service such as patients viewing healthcare as a service with the levels of performance that view entails (Parasuraman et al., as cited in Blank et al., 2014). The current study examines nurses' expectations of shared responsibilities with their patients to prevent food allergic reactions. O'Connor et al. (2000) found that nursing students do not accurately anticipate their patients' expectations regarding customer service and responsivity. This finding further highlights the need for determining a way to better improve care for patients with FA.

Also important for clinical judgement are the patterns of reasoning to make decisions in clinical situations, that involve *analytic processes*, *intuition*, and *narrative thinking* (Tanner, 2006). The *analytic processes* involve dissecting a problem into various components and determining what the best course of action is based on information available; an example of when this process is used is during problem-solving situations when not enough information is present, or there are different approaches to choose from and a decision has to be made. *Intuition* is using past experience in a repertoire of knowledge to provide reasoning on how to manage a scenario, while *narrative thinking* involves using the "stories" of similar situations as a learning tool and deciding tool.

Decision making can be complicated by the nature of decisions that can be made by nurses as well as the communication involved with decisions that require additional consultation by physicians (Prescott et al., 1987). In the past, providing a proper chain of command to determine clinical decisions has been regarded as possibly useful, but there are mixed-feelings about responsibilities for decision making – some want the ability to make certain decisions, some want to provide input, and some prefer to not have input (Prescott et al., 1987). In sum, decision making involves considering many factors in order to come up with a solution.

Measuring Learning Outcomes

Much of learning by the transfer of knowledge using a construct-orientation involves cognitive processes that include being able to organize learned knowledge and then use strategies to sort through various tasks in order to act, such as using *mental models* (Rouse & Morris, 1986, see also Kraiger et al., 1993). Also relevant to achieving learning outcomes, is skill repertoire which involves the practice of certain tasks where,

with time and experience, become second nature and are done well. Learners also have *automaticity* that occurs once certain actions do not require as much cognitive capacity to complete (Kraiger et al., 1993, p. 312). Finally, there are *affective outcomes* that involve focusing on the attitude and motivation of the learner. With some of the learning, more *self-awareness* and *changing values* may arise. Depending on what outcome is the goal of the learning process, there are different ways to measure and evaluate the knowledge has actually been transferred to achieve learning. Metrics that capture achievement include the *amount of knowledge*, *error rates*, *generalization*, *discrimination*, *attentional requirements*, *attitude direction, attitude strength,* as well as *self-efficacy* (Kraiger et al., 1993).

Theory of Work Performance

The influence of potential barriers or competing priorities on preventing exposure to FA risks in hospital can provide insight into the nurse's mind while providing care to patients. The potential barriers or conflicting priorities relevant to this study can be conceptualized by the theory of work performance (Blumberg & Pringle, 1982) that describes factors along the dimension of *willingness to perform* such as an individual's attitude towards a task, satisfaction about their job, personality, norms, etc. Other considerations include having the capacity and opportunity to perform. In the literature, examples of barriers to performance among nursing students include the fact that information and ways of care are evolving due to new technologies and not having the opportunity and time to apply knowledge (Hughes, 2005; Santos, 2012; Wellings et al., 2017).

The identification of potential barriers has also been useful in highlighting discrepancies in knowledge transfer that may cause communication breakdown between nurses, physicians, and anesthetists (Nagpal et al., 2010). These potential barriers might also help to explain why there is a lack of adherence to protocols (i.e., in the case of patient resuscitation, Rutherford Hemming et al., 2003). Again, capacity, and opportunity to perform preventative measures to protect patients with allergies will be taken into consideration for the purpose of this study.

Hypotheses

Three hypotheses were developed for the present study, one pertaining to only Willingness and Readiness to Act in a Food Allergic Emergency (WilRAFAE) construct scores (Kagan, 2018), and the other two involved both the WilRAFAE scores and findings from the qualitative vignette. First, it was hypothesized that time in the program would predict knowledge and understanding (Willingness & Readiness to React to Food Allergic Emergencies) of FA, and it was further analyzed by differences between the four years of the program. The second hypothesis predicted that upper year students (3^{rd} & 4^{th} year students) with more personal food allergy experiences, along with higher scores on WilRAFAE would have a larger number of competing priorities than their junior counterparts. The last hypothesis is the prediction that food allergies would be listed in the top three to five actions when paired with greater personal food allergy experience, greater WilRAFAE construct scores, and for upper year students. Due to practicality and small sample sizes, WilRAFAE construct scores of respondents that met the hypothesized conditions were compared against the total number of themes of competing priorities, and the variable of mentioning *Allergy Actions* (hypothesis 3) developed from the data. In

addition to these quantitative hypotheses, vignette questions were qualitatively analyzed using conventional content analysis (Hsieh & Shannon, 2005) to assess performance.

Rationale for Hypotheses

When people have a personal investment in the topic, they have "affective-personal learning", where there is more knowledge achieved about themselves and others – they start to become aware of themselves and of others (Nehari & Bender, 1978, p. 3). Consideration of the effects of personal experience and meaningfulness harkens back to humanistic theories (e.g., Rogers, 1969; Stanford & Roark, 1974, as cited in Nehari & Bender, 1978). Additionally, as Kagan (2019, p. 6), found when students had a prior experience with FA, training, and confidence, they "have gone through some stages of readiness", referring to the transtheoretical model of behaviour change (Prochaska, 2008), and were more willing to act. This is also related to the bystander's likelihood to respond and fear factors, where health-/science-major students and criminology-related majors were less afraid of medical procedures, being held responsible, or harming someone than students in other programs (Kagan, 2019).

CHAPTER 4

METHODOLOGY & DATA ANALYSIS INFORMATION

The present Research Ethics Board (REB)-institution cleared study was conducted online with nursing students from the nursing department at The University, using survey software Qualtrics (https://www.qualtrics.com/).

Procedure

Recruitment

Participants were recruited from nursing students at The University by an emailed invitation to participate in the present study (see Appendix D). This email was sent out by the nursing department's undergraduate secretary twice between August 31st, 2020, and September 19th, 2020, before and at the beginning of the Fall 2020 semester.

Consent & Withdrawal

Interested participants clicked on the link provided in the email using any device except cellphones, and were brought to the study on the secure Qualtrics website. Participants were presented with a webpage containing an online consent form (see Appendix E) that explained the purpose of the study, contact information of the researcher, as well as information about risks, confidentiality, and withdrawal instructions.

Participants who consented were linked to the study's questionnaires, in the order as described below. Those not willing to consent would have clicked on "No, I do not consent." and would have been redirected to the letter of explanation exit landing page (see Appendix F).

Year of Study

Participants were asked to indicate their year of study that they are in or entering in the Fall 2020 semester.

Food Allergy Experience

The five questions asked participants to describe what they knew about FA, if they have or had FA and/or other types of allergies (besides seasonal allergies), or if they knew someone with food or other allergies (besides seasonal allergies). The response options included a single response and open-response.

Food Allergy Knowledge

Participants were asked three questions about FA knowledge that included listing the completed nursing courses that they believed covered FA in the curriculum and general details they remember from the specific content. Other (open-response) questions included asking if adults could have food allergies, and if all allergies disappeared as children get older.

Willingness and Readiness to Act in a Food Allergic Emergency (WilRAFAE)

Participants were presented the WilRAFAE 18- question self-report measure (Kagan, 2018). This measure was modified with permission from the author. This measure has been used to assess college students' knowledge of food allergies and willingness and readiness to react in a food allergy emergency, and bystander's likelihood to respond and fear. The measure also assesses knowledge and training about FA and how to treat FA in the community, along with a demographic question about the number of children participants have.

Response options for various questions in this measure included multiple response, single response check boxes, as well as open-response, true/false statements, and Likert-type scales also.

Clinical Vignette of Clinical Judgement

One clinical vignette was presented (see Appendix B, Parnell Scholtz et al., 2015). The vignette involved a youth with FA who was admitted to the hospital for appendicitis and who shared a room with another patient. The first part of the vignette asked participants to identify the top three to five priority-related actions that would be taken when interacting with a patient with FA. Participants were asked to identify potential competing priorities that may occur with and complicate caring for a patient with FA. This provided a snapshot of nursing students' current skills. Participants were also asked about the factors that would influence the shared responsibility when interacting with the patient, as different factors such as age, developmental stage, and knowledge would potentially influence steps nurses may take when caring for patients with FA (Personal communication, June 4, 2020). The vignette was adapted with permission from a pediatric case study used for teaching purposes, with some details tailored to center around FA. Additionally, the vignette had one question that verified participants' comprehension and attention. Participants were asked to rate the chance of a risk of an allergic reaction occurring with the patient, on a 10-point Likert-type scale with anchors of *Not at All* (1) to *Definitely* (10) and had to explain their choice. The second part of the vignette indicated that the patient may be having an allergic reaction, and participants had to pick all the relevant symptoms of an allergic reaction that they would check for and describe the steps they would take to treat the reaction.

Questions about Food Allergies

Participants were finally given an opportunity to ask any questions they wanted to about FA. This allowed an understanding about what nursing students may be thinking about FA. Participants were also asked to rate how they feel about the survey using a 7-point Likert-type scale with anchor points of *Extremely Satisfied* to *Extremely Dissatisfied* and were asked about their confidence with answering the questions with their current knowledge using a 5-option Likert-type scale with anchor points of *A great deal* to *None at all*. Additionally, participants were asked to explain/identify about any questions they felt were unfamiliar to them and had the opportunity to provide suggestions about improvement to the material or types of questions via open-response boxes.

Demographics

Ten demographic questions collected information such as whether participants had another major or minor they were taking concurrently with their nursing program, if they were in The University's university-only program site (Site A), or in two other college-partners' college-university mix nursing program sites (Site B), and (Site C), their age, ethnicity, gender, and types of nursing experiences. Participants were asked if they were a traditional student (direct from high-school), and if they came from a health-related program or job. Different response options included open-response, multi-select, and single-select.

Compensation & Withdrawal

Participants were given a Letter of Explanation and had the opportunity to proceed to fill out their information on a separate webpage to receive a $5.00 CAD

electronic gift card to be used at The University. This was applied to student accounts at The University.

The study took approximately 30 minutes to complete.

Measures

Willingness and Readiness to Act in a Food Allergy Emergency (Kagan, 2018)

This measure was originally a 24-item test of components that include demographics, current student status, knowledge, familiarity, level of contact and exposure to an epinephrine auto-injector. Also included in the original measure were experience and exposure to an emergency with an epinephrine auto-injector, training with allergic reactions and where training was received, confidence with using auto-injectors, bystander in an allergy emergency, fears about an allergy emergency, and a social desirability scale. For this study, only 18 items were used and permission to modify this measure has been obtained by the author. Items removed included the social desirability scale and the demographic questions (except for a question about the number of children the participant had), due to time constraints and redundancy.

The following are examples of WilRAFAE (Kagan, 2018) questions: an example of a knowledge question used was, “On a scale of 1 through 10, what is your overall knowledge about Food Allergies?”. In response to the bystander question, about a visit to a college cafeteria where you hear someone experiencing an allergic reaction to food, participants were asked: “What would best describe your response in this situation? Mark only one oval per row.” The options include “Definitely not; probably not; neutral; probably yes; definitely yes” for a statement like “I would help if no one else intervened”, “Someone else should intervene”. The bystander component of this measure dealt with a

more personal or social experience where food allergies may occur, rather than an actual clinical setting. This was beneficial to get a comparison of a response in a community setting against the clinical application question, wherein the latter setting was more representative of the training the nursing students being studied receive. Permission was received from the original author to use and modify the measure in writing, and findings were requested after completion of the study (see Appendix L).

This measure was initially evaluated in an American college with a small sample of first year students in a predominantly white population, with some ethnic diversity, with disciplines of business, criminal justice, and nursing (Kagan, 2018). The reliability of data from the subscales was acceptable, with Cronbach's alpha of $\alpha = .814$ for the Knowledge subscale and $\alpha = .874$ for the Bystander's Likelihood to Respond subscale (Kagan, 2018). Validity of the construct with data from nursing students and registered nurses showed strong validity as registered nurses performed (statistically, $p < .05$) higher on the knowledge component than nursing students. As well, the measure found statistical differences of a bystander's likelihood to respond between nursing students and business students by use of Bonferroni multiple comparisons analysis ($m = 6.373$, $p = .010$) (Kagan, 2018).

Current Data Analysis Approach

This study used a mixed-methods approach, using both qualitative and quantitative analyses as briefly discussed below.

Missing Responses

Two sets of missing data cut-offs were used to analyze the data. The first cut-offs of 75% or more completion of the entire study and time completion of more than 10

minutes were used to identify usable data-points for all hypothesis analyses, and to determine participants who would receive compensation. Participants who received compensation matched those whose data was used. When working with the remaining data after using the initial cut-off of 75% or more completion, missing data of participant responses was determined by completion of question sections: the WilRAFAE (and whether missing data could be imputed or not) and the vignette (15 questions which could not be imputed).

Using the open-source software, *R base* (R Core Team, 2021a, version 4.05), missing data were identified using the packages *finalfit* (Harrison et al., 2021, version 1.0.3), and *gmodels* (Warnes et al., 2018, version 2.18.1), as seen in Table K1. While some data were Missing Completely at Random (MCAR) (Little, 1988), some data were not, and instead were Missing at Random (MAR), because in the author's judgement, missing responses appeared to be directly tied to observed responses of missing data (Bennett, 2001) based on pattern charts and plots for missing data (i.e., *missing_pattern()* function via *finalfit* [Harrison et al., 2021, version 1.0.3]; *mice* [van Buuren & Groothuis-Oudshoorn, 2011).

In all the vignette-related questions, missing data were considered MAR because there was not a situation where one group of participants did not respond to the vignette questions only. For example, if participants did not respond to one question pertaining to the vignette, they did not respond to most or all the vignette questions, as they all had significant Chi-Square values ($p < .05$). In this situation, participants with missing data for the qualitative questions were identified, the number of missing responses per participant were counted, and a percentage out of the total number of questions was

calculated, and if the total percentage of missing questions was more than 40%, they were left out of the analyses (i.e., Jakobsen et al., 2017). Additionally, since these vignette question responses were qualitative, it would not have been feasible to use statistical methods to anticipate missing participant responses.

In some instances, there were other MAR issues with other questions of the survey, however because there were insufficient expected data for each category (missing/not missing), the chi-square test was interpreted with caution (Field et al., 2012, p. 823). Specifically, there were usually not enough missing data to meet the assumptions of a Chi-Square. In this situation, most were excluded from all qualitative analyses, with the exception of one case where data were missing for only one of the vignette questions. For the questions about the survey itself, many did not respond to the questions; however *No Responses* were acknowledged, and were either left out of the qualitative analyses, or were explicitly stated. In some situations, missing data were expected, such as in the demographic questions, since some participants responded in a way that would have allowed for the survey's skip logic to bypass the question, or if participants indicated that they did not have anything to contribute to the questions about the survey itself.

Additionally, due to the small sample size, data were typically kept or removed across analyses. Specifically, missing data was dealt with on a case-by-case basis. If analyses required two variables that had an inconsistent number of participants (because different participants had missing data between the two variables, like in the case of Hypotheses 1, 2, and 3), then all participants with missing data were removed before the analyses. During qualitative conventional content analysis, only one participant with missing data was kept because they missed less than 40% of the vignette questions,

which is determined after initially removing participants that had not completed over 75% of the entire study.

Another specific example of dealing with missing data involved the *Familiarity* factor, where all responses were included, beyond any that were associated with missing data elsewhere, because some responses could have been provided through misunderstanding. For example, in a few instances, some respondents indicated no known observation of an individual with a food allergy, but also indicated knowingly providing service to individuals with food allergies, or that they had some more personal connection. It is assumed that respondents misinterpreted the statement as "no known observation of an individual experiencing an allergic reaction" with a food allergic reaction, and indeed they had a more personal connection with food allergies. As a result, this low response did not impact the score used in developing the construct's overall score, as only the highest score from this factor was used. Another relevant note is that since all respondents endorsed the same response for additional FA Knowledge questions, specifically that adults can have allergies and that allergies don't always disappear with age, these scores were removed from analysis for hypothesis 1. Additionally, hypothesis 2 was clarified and was more specific to scores on the WilRAFAE rather than performance on the entire study. Details about assumption tests and specific analyses will be discussed in Chapter 6: Results per hypothesis.

Quantitative Analysis Approach

Some data were missing from participants' responses and were thus excluded from the results. As a result, the number of participants included in some analyses do not reflect the total (n = 39). Due to the low sample size, and the nature of this missing data,

responses were used as is, and were not imputed to fill in the missing information. However, there was one instance where one missing response did not impact a qualitative analysis as quantitative and qualitative responses were considered independently, and the rest of the data was kept for future interpretation of other questions. The sample size for each analysis will be included at the beginning of the detailed description, or in tables and figures accompanying the data. Some packages used for analyses of the hypotheses included *psych* (Revelle, 2021, version 2.1.6), *dplyr* (Wickham et al., 2021, version 1.0.7), *base* (R Core Team, version 4.0.5), *pastecs* (Grosjean & Ibanez, 2018, version 1.3.21), *ggplot2* (Wickham, 2016), *car* (Fox & Weisberg, 2019), *carData* (Fox et al., 2020, version 3.0-4), *stats* (R Core Team, 2021), and *gmodels* (Warnes et al., 2018, version, 2.18.1). Additional R packages and resources used can be found in Appendix K.

Coding & Scoring.

Willingness & Readiness to Act in a Food Allergic Emergency. Scoring of the WilRAFAE used the instructions as described in Kagan (2019); however, with modifications as described below.

The Readiness to Act (RTA) construct is comprised of the following factors: Knowledge, Familiarity, Experience, and Confidence. *Knowledge* involved summing the 10-item scale about overall FA Knowledge, a 10-item scale about overall Epinephrine Auto-Injectors, and 15 questions with *True*, *False*, and *Don't Know* options for overall FA knowledge statements, where the correct response was scored as 1, and incorrect responses as 0 (Personal communication, November 3, 2020). *Familiarity* involved the rank of 12 statements on familiarity with FA, and responses were ranked from 1 to 12, with 1 being the least intimate, or closely connected, and 12 being the most intimate

familiarity, or closely connected, with FA. The highest ranked statement contributed to the RTA score as determined by the original coding scheme (Kagan 2018).

The RTA construct's *Experience* factor included 10 self-reported experience with an Epinephrine Auto-Injector, with Yes or No as options. In Kagan (2019), these items are coded as Yes equals 1, and No equals 2 (Personal communication, November 3, 2020). However, this item was recoded as No equals 0 in this present study, due to an inconsistency in the overall summing of responses for the overall score, that at times exceeded the highest possible score according to Kagan (2019). Also included in the *Experience* sub-scale were two 10-item scales, one that focused on personal experience using an Epinephrine Auto-Injector, and the second on personal experience with other medications that are not related to Epinephrine. The responses from these three items were summed.

Finally, the factor of *Confidence* in the RTA construct was composed by using the scores from two 10-item scales about recognizing an allergic reaction, and confidence in one's ability to inject Epinephrine Auto-Injector in an emergency. Total sum scores from each factor were summed to create the overall *Readiness to Act* construct that ranged from the lowest possible score of 8, to the highest possible score of 97.

The Willingness to Act (WTA) construct consisted of the following factors: *Bystander* and likelihood to respond, and *Fears*. *Bystander* factor involved ten 5-item Likert-type scale questions about a scenario where the reader observes the onset of an allergic reaction and their responses to statements about the situation. Anchor points include 1 as *Definitely Not*, and 5 as *Definitely Yes*, with items 2 and 8 reverse coded (Personal communication, November 3, 2020). Each response score is summed to create

the Bystander factor. The *Fears* factor involves three 10-item scale, ranging from *Not at all* to *Always*, about administering an Epinephrine Auto-Injector. The specific questions address fear of blood or needle, being legally responsible or sued, and causing injury or death, as a result of providing aid to the individual in distress. These scores were summed and made the overall *Willingness to Act* construct, ranging from the lowest possible score of 13 to the highest of 80. Higher scores on this construct indicated less willingness to act, while lower scores indicated more willingness to act.

Qualitative Analysis Approach

Content Analysis (CA) is often used in health research (Hsieh & Shannon, 2005; see also Erlingsson & Brysiewicz, 2017; Graneheim & Lundman, 2004) and was used in the present study. Specifically, conventional CA, as described by Hsieh and Shannon (2005) was used, because it allows for an open coding experience whereby the codes were developed as they were read. Conventional CA is typically focused on describing phenomena (Hsieh & Shannon, 2005), especially when there is a shortage of prior theory or research in a particular area. For the present study, understanding the impact of FA knowledge on nursing students is an important but niche area of study with little extant research so conventional CA is an appropriate tool. Additionally, conventional CA supported concept development (Lindkvist, 1981) and lived experiences, as this study was to conceptualize current impact of FA knowledge in nursing care among nursing students.

Although the Lasater Clinical Judgement Rubric LCJR (Lasater, 2007) and the Tanner Model (Tanner, 2006) could have been beneficial as frameworks for analyzing specific performance of the nurses, in terms of how they used knowledge, etc., it would

not have captured the main phenomenon that was of interest, which was how nursing students used their current FA knowledge to handle a simulated scenario involving a patient with FA in general care and while treating an allergic reaction. As a result, no prior theory-based categories were used during analysis. The qualitative question asked of participants acted as a guide for framing the themes and categories; however, the final result of the categories and themes were based on the responses that were consistent with conventional CA (Kondracki et al., 2002; see also Hsieh & Shannon, 2005).

Some assumptions that set the lens used during the review of data were similar to those described by Erlingsson and Brysiewicz (2017), and others (i.e., Tesch, 1990; see also Coffey & Atkinson, 1996; Miles & Huberman, 1994; Morgan, 1993; Morse & Field, 1995;). Specifically, *codes* were defined by the author as a unit of meaning, and were typically only a few words, or short phrases, and were related to the question (Erlingsson & Brysiewicz, 2017; see also Braun & Clarke, 2013; Hsieh & Shannon, 2005;). When participant responses were very brief or included multiple thoughts that involved numerous codes, some implicit contextual information was inferred where necessary to comprehend the participants' response meanings. The codes were classified into *categories* that best represented items that were related to one another (Erlingsson & Brysiewicz, 2017; see also Hsieh & Shannon, 2005). Although most codes that fell into multiple categories were easily isolated into their respective categories, some had to be linked using superscripts when codes were complex. From these categories, overarching *themes*, or general ideas that linked codes together were used to explain the responses in relation to each question (Erlingsson & Brysiewicz, 2017; see also Hsieh & Shannon, 2005). Because the codes were quite complex and multiple codes were identified in the

responses, the author provided indication of meaningful units during the collaborative coding review process (Campbell et al. 2013). Descriptions of themes are located throughout Chapters 5 and 6, with themes, categories and example codes of each question and additional information are located in Appendix H.

Other assumptions included the notion that because all participants were students of the nursing program (specifically those from Year 2 to Year 4), they would have had a basic understanding of medical care from their first year of nursing. It was also assumed that participants would have been likely to come across someone with FA at some point in their life. This assumption is likely to be sound given that 2.6 million Canadians have FA (FAC, 2019a), and 32 million Americans have FA (FARE, 2021). It was also assumed that there may be potential errors in the care of a patient with FA, as identified in the dietary error model created by Wallace (2015), which pointed out the many sources of dietary error that can be related to allergy concerns. The final assumption expected that Year 1 students may not have had sufficient knowledge to answer the questions, as they would have had no formal nursing experience, especially if they did not work in a health care setting before entering the program, and it was expected that students may not have known everything about FA, as they are still students learning.

Author's Perspective

I (the author) bring lived experience of food allergies, that guides the positioning of this work. This provides a unique in-group perspective as an individual living with food allergies, who understands navigating daily life with food allergies, however, this is not representative of all people living with food allergies. To enhance the complex nature of interpreting participants' qualitative responses, an individual considered out-group to

the food allergy community and with personal connections to individuals with food allergies assisted in reviewing participant responses.

Quality and Rigour Statement

The process of coding and analysis for the qualitative data was as follows: the author reviewed text documents containing the original responses in a table, with typical columns subject ID and codes. Responses were individually reviewed and were paraphrased or partially paraphrased (when responses were too unique to be paraphrased) for future use in the findings. Units of meaning were identified and coded generally by their explicit meaning, for example, "adverse reaction" was coded as *[adverse reaction]*; in the case that little contextual information were given and responses unclear, assumptions were made, and notes were created as part of the audit trail (i.e., Morse & Field, 1995). Some items used similar codes across all responses in a question, while other codes were more specific to the context that the respondent was discussing, and the code reflected this as such. Codes were then sorted by similar topics, and were placed in a category, followed by being grouped into an overarching theme. The responses and their codes, categories, and themes were all reviewed at least once by the author, on occasion twice, as a coding process was developed. To sort into categories, codes were either written by hand on paper or placed into square boxes on a PowerPoint slide with suspected category headings. On occasion, some categories overlapped too much and were combined. From this, themes were developed by referring back to the relevant question.

To ensure more objective codes, categories, and themes, a second reviewer viewed de-identified responses and coded data collaboratively with the author virtually

using research-institution approved and secure videoconferencing. This second reviewer was a clinical psychology PhD student, who personally knew people living with allergies and FA. Having a second reviewer to discuss the best placement for the codes and determine consensus is one of the recommended ways to promote trustworthiness and validation of data in conventional content analysis (i.e., Graneheim and Lundman, 2004; Saldaña, 2011). The second reviewer was provided general information about the study, such as the purpose of the study, the vignette and the open-response question, as well as some brief points about conventional CA to review prior to the first meeting. All open-response question responses were reviewed individually, except for two questions about the survey itself: familiarity with the questions asked, and suggestions for the survey. Year of Study was not provided with responses during coding, and codes were verified against the response and confirmed against the categories and themes. Some codes were added upon further review when prompted by the second reviewer, or due to newly identified codes in other responses when similar units of meaning were coded. Some codes were renamed or removed when contested by the second reviewer. Codes, themes, and categories used in the findings and appendix are the final version agreed upon by the author and reviewer, with final discretion by the author. Notes were also taken by hand by the author when codes were questioned or negotiated; examples of the audit trail are available in Figures I1-I3. No interrater reliability agreement was calculated because the collaborative review process meant that disagreements were negotiated on the spot. The author was also in consultation with an experienced qualitative analysis researcher. The second reviewer's role was to help achieve dependability in that someone who is

somewhat familiar with the material but not part of the main research could achieve similar codes and findings from the analysis (i.e., Thomas & Magilvy, 2011).

CHAPTER 5

PARTICIPANT MAKE-UP

Participants

Participants were students, at least 18 years old, from a mid-sized Southern Ontario university nursing program (The University) and were registered in that program in Fall 2020 that includes three program sites.

During the first month of the Fall Semester of 2020, nursing students ($N = 70$) participated in this study, including three who withdrew. To be included in any analyses, and receive compensation for their time, participants had to complete more than 75% of the study and take longer than 10 minutes to complete the study. A total of 39 participants were initially retained for analyses. Participants enrolled at The University for this semester included those from Site A, a university nursing site (≈72%), Site B (≈23%), and Site C (≈5%), both college collaborative sites.

Participants' ages ranged from 18 to 44 ($M = 22.28$, $SD = 6.22$, $Mdn = 20.00$, $IQR = 3.50$) with ≈15% in Year 1 ($n = 6$), with ≈23% in Year 2 ($n = 9$) , with ≈39% in Year 3 ($n = 15$), and with ≈23% in Year 4 ($n = 9$). All Year 2, Year 3, and Year 4 students had completed a clinical placement, while none had in Year 1 ($n = 6$). Year 1 all came directly from high school. Year 3 (≈26%) and Year 4 (≈8%) students had a health-related job before or concurrently while in the nursing program. Approximately 87% of participants self-identified as female. Although the self-reported participant ethnicity breakdown was diverse, most of the participants were White (≈47%), European Canadian (≈5%), or White & European Canadian (≈5%). The other two most common ethnicities

include Arab Canadian (≈18%), and Asian Canadian (≈13%), while the full list of ethnicities can be found in Table 1.

Table 1

Distribution of Ethnicities Among Participants

Ethnicity	Percentage (%)
White	≈47%
Arab Canadian	≈18%
Asian Canadian	≈13%
European Canadian	≈5%
White + European Canadian	≈5%
Black	≈3%
Black + Ethnicity Not Listed (African)	≈3%
Ethnicity Not Listed (South Asian)	≈3%
Pakistani Canadian	≈3%

Note. n = 39. Ethnicities in order by highest percentage to lowest and by alphabetical order. Each percentage is representative of a unique ethnicity combination. Ethnicities in brackets were manually added from participant responses.

Nursing Topics Covered

The goal of the topics covered in The University's nursing education is to train students to be licensed Registered Nurses. While food-related allergies are not explicitly covered in hands-on practice, students gain skills to assess for FA, and have many opportunities to practice these skills throughout their four-year program that covers topics of allergies (Personal communication, April 5, 2020; June 8, 2020). These include those

mentioned in Chapter 1, such as understanding the difference between FA and intolerances. Other topics include pediatrics-related health skills such as when foods should be introduced to children at a young age, while students learn holistic health assessment skills like asking about allergies in patients.

Although curriculum and courses are the same across sites, this study is based on The University (Site A); topics covered in the first two years include nutrition, digestion and the immune system, health changes, pharmacology, managing medication, and maternal and newborn care (Personal communication[1]). These first two years typically include students who are in Site A, while Year 3 and Year 4 students include students from Sites A, B, and C. Topics covered in the last two years of the program include complex health-related problems (e.g., integrating various pieces of information such as patient's culture with the current care provided), and students learn about transitioning into practicing as a professional nurse (Personal communication). In all years of the program, nursing students get experience in clinical placements in the community, at local hospitals in various departments, long term care facilities etc., to gain hands-on experience.

The recruitment of students from each year of the nursing program at the same time aimed to allow for comparisons to be made between each year of study.

[1] The type of personal communication will be used in order to preserve the anonymity of the nursing program.

FA in Nursing Topics Taught

The top three topics about FA participants said they learned either before entering the program in high school or during the program included the structures of the body, how the body works and functions, nutrition care, and pediatric care.

Most participants also provided details of the FA related information they learned in each course, that are explained below by two main themes.

Theme 1: Food Allergies, Body Response, and How They Differ from Other Intolerances/Diseases

Theme 1 was the most mentioned theme by all participants (≈72%). Participants discussed the differential diagnosis between FA and intolerances such as Celiac, or lactose, and this demonstrated that going into this study, they were aware that an intolerance is not the same as a food allergy and were aware of food allergies being more of an immune response.

Other respondents mention basic food allergy information, learning that there are many different allergies and referenced other similar diseases such as Celiac disease. Participants also discussed the long-term prevalence of food allergies, such as how some allergies “are common in kids”, while “some outgrow” them, and some allergies are “life-long”, even with onset of allergies as an adult (see Table H1).

Participants explained the immune system response of allergies, and how severity can vary. One participant mentioned that histamine is part of the immune system response of the body, while another highlighted that the immune system responds during a reaction to a “specific part of food”, and that different reactions can occur. Food allergies were also considered “unpredictable” and can be “life-threatening” (see Table

H6). The symptoms that were taught about often included a swollen tongue, swelling throat, hives, and “itchiness in the throat, mouth, and ears”.

Theme 2: How to Treat, and How to Care for FA Allergens

Participants (≈56%) highlighted different aspects of treatment, care, and allergens within this theme, where some focused on patient care, such as finding dietary substitutions for patients, and ensuring that while patients cannot eat certain foods, they can maintain their nutrition. Other patient care mentioned was specific to patient assessments, for example, indicating the importance of gathering allergy information from the patient to be aware of their allergies and to prevent an allergic reaction from happening. Some participants even highlighted the types of allergies to ask patients about such as “medication allergies, food allergies, and environmental allergies”. Others highlighted specific common allergens that were taught, such as peanuts, nuts, milk, shellfish, and eggs, and indicated with “etc.” that there were more allergies beyond that.

Participants also explained the treatment for allergic reactions that they were taught in class including the epinephrine auto-injector. Participants typically either mentioned “epinephrine”, “epinephrine auto-injector”, or the brand EpiPen, that is the most common brand of epinephrine auto-injector that has been around for at least 25 years (Mylan Inc., Mylan Specialty, L.P., Pfizer Canada ULC, 2021). These references to epinephrine were apparent across all participant responses. For context, there are additional versions of the auto-injector in recent years, and it is unclear based on the findings at this point, whether participants knew about the alternatives to EpiPen. On a final note, some participants did acknowledge the fact that “treatment is required

immediately", and that post auto-injector administration care does require a trip to the hospital for follow-up.

Participants' Understanding of FA

When asked *What do food allergies mean to you?*, participants provided responses that fell into three main themes: Theme 1: *Food Allergies involve a varied response in the body after an interaction with food*, Theme 2: *Food Allergies from a relational perspective*, and Theme 3: *Food Allergies Described as What Cannot be Done*, as seen in Table H2.

Theme 1: Food Allergies Involve a Varied Response in the Body After an Interaction with Food

Participants referred to FA as a sensitivity, as anaphylaxis, as a response or reaction of the body and the immune system, how FA involves the body, such as by causing "illness", or experiencing a "reaction" after recognizing a "foreign object". FA was explained by its symptoms, such as "hives, vomit, throat tightness" and "shock", and described as being "minor", "life-threatening", "unpredictable", and as having "varied degrees", among other descriptors, as seen in Table H2. For example, "Food allergies are a reaction to a specific food that triggers an immune response in the body." Additionally, some participants identified particular sources or types of allergies, such as "food" or "proteins" and being exposed to the source, and the type of allergies that can occur as a result of being exposed, such as airborne allergies from "inhalation", or ingestion from "a specific food being eaten…". Theme 1 was the most common theme mentioned across all years of study (≈ 97.3%).

Theme 2: Food Allergies from a Relational Perspective

Theme 2, mentioned by approximately 10.5% of all participants encompassed responses from participants that reflected general FA comments as to how the participant view the importance of FA, such as in "food services" and how it impacts consumers' health. Also discussed was how participants saw FA in relation to their personal lives that ranged from interactions with loved ones to caring for patients, and that FA are "relevant", and a self-reflection of how FA may not be part of their life.

Theme 3: Food Allergies Described as What Cannot be Done

Theme 3 involved the category of FA as a limitation as the defining feature of what FA means to participants. This included coded items like mentioning the "inability to eat" certain foods, how FA may "alter life" and "impact daily life", while engaging in "avoidance" of allergens (see Table H2). This theme was mentioned by a small portion of participants (≈13.2%).

Participants' Relationship with FA

Only ≈5.1% of respondents indicated they personally had FA *(Yes)*, while most said they did not (*No*), with ≈89.7%. Due to a small sample size of detailed responses regarding personal FA, details will not be disclosed as anonymity would be breached.

From the approximately 67% of participants who provided responses to the question about knowing someone with FA, connections to food allergies were through family, friends, and significant others, those that are more distantly connected, and those not identified. Participants described their feelings of allergies with most expressing some frustration, stress, or difficulty, along with actions they engage in to keep the individual with food allergies safe.

Knowing that many participants had some personal interaction with people who have FA, it provides an additional sense of who is represented in the following results for the hypotheses and vignette questions. Many of these individuals have seen the day-to-day considerations that are part of life for someone with FA.

Allergy Knowledge

Please note that all participants accurately responded to two FA Knowledge questions to indicate their initial knowledge of FA.

Adults and Food Allergies

When asked *Can adults have food allergies*, all participants in this sample (*n* = 37) from all participants accurately responded *Yes* (100%).

Food Allergies and Aging

When asked *if all allergies disappear as children get older*, participants in this sample (*n* = 37) responded *No* (≈54%), and *Maybe* (≈46%). Food allergies can but do not always disappear as children age and they can also develop with age into late adulthood (i.e., Burks et al., 2012; Kamdar et al., 2015; Ramesh & Lieberman, 2017). This question also indicated that participants were paying attention to the questions, as this question focused on the long-term prevalence of food allergies, but focused on outgrowing food allergies, different than adults developing food allergies.

CHAPTER 6

RESULTS AND FINDINGS

Hypothesis 1

Hypothesis 1 tested whether Year 4 students scored higher than Year 1 and 2 students on the *Readiness to Act* and *Willingness to Act* constructs of the WilRAFAE measure, a total of (n = 37) participants were included, while two participant responses were missing (≈5% of the data). Hypothesis 1 also tested if a) Year 2 students scored higher on the *WilRAFAE* constructs than Year 1, and b) Year 4 students scored higher on the *WilRAFAE* constructs than Year 3.

Skewness and kurtosis for both *Readiness to Act* and *Willingness to Act* scores were not overly influencing, with values below +/- 1, and histograms were reviewed that indicated relatively normal distribution except for Year 3 *Willingness to Act* some scores concentrated a bit bimodally. Additionally, all Shapiro-Wilk tests of normality for both construct scores were not significant. Although normality could not be assumed when assessed by Year of Study, a one-way ANOVA was used.

Willingness to Act

Willingness to Act scores were based on participants' summed scores from the *Bystander's Likelihood to React* and *Fears* factors, as seen in Table 2. Levene's test of Homogeneity of Variances was found significant, and indicated variances were different between the Years of Study, as did the Residuals vs Fitted plot output. Additionally, the Q-Q plot indicated some issues with the normality of errors that resulted in using Welch's F where there was a significant influence of Year of Study on *Willingness to Act* scores, with the original model of $F(3, 33) = 2.33$, $p = .091$, $\omega^2 = .10$. However, Welch's F ratio

with adjusted error of degrees of freedom demonstrated a significant influence of Year of Study on *Willingness to Act, F*(3, 14.906) = 7.58, $p = .003$. A decline, followed by an upward direction of scores were observed, where Willingness scores did not always increase with time in the program, $F(3, 33) = 47.05$, $p < .001$, as tested using an ANOVA and planned contrasts and explained below. Due to a low N value, the trimmed means approach was not used to avoid unnecessary trimming and to preserve power.

With one set of planned contrasts from the ANOVA, testing Year 4 against Year 1 and Year 2 separately, it was unexpectedly found that Year 4 students had lower *Willingness to Act* scores (*Mdn* = 73.00) than Year 1 students, $t(33) = -1.77$, $p < .05$ (one-tailed). However, as expected, Year 4 students had higher *Willingness to Act* scores than Year 2 (*Mdn* = 67.50) students, $t(33) = 1.73$, $p < .05$ (one-tailed).

In another set of planned contrasts, it was demonstrated that being in Year 4 did not significantly increase *Willingness to Act* scores more than Years 1 and 2 together, which is consistent with the first set of findings.

Year 2 vs Year 1. *Willingness to Act* scores in Year 2 students (*Mdn* = 67.50, *IQR* = 13.25) were lower than Year 1 students (*Mdn* = 77.00, *IQR* = 2.25), which indicated that Year 2 students were less willing to act in a food allergic emergency than Year 1 students, $t(33) = -2.00$, $p < .05$ (one-tailed).

Year 4 vs Year 3. As expected, Year 4 students had higher *Willingness to Act* scores (*Mdn* = 73.00, *IQR* = 10.25) than Year 3 students (*Mdn* = 70.00, *IQR* = 14.50), $t(33) = 1.89$, $p < .05$ (one-tailed).

Table 2

Descriptive Statistics of Willingness to Act Bystander (LTR) & Fears Factors Sums

Year	Bystander (LTR)				Fears				*n*
	M	*SD*	*Mdn*	Actual Score	*M*	*SD*	*Mdn*	Actual Score	
1	47.33	.82	47.50	46-48	29.33	1.21	30.00	27-30	6
2	46.00	1.93	46.00	44-48	21.38	8.62	22.00	7-30	8
3	44.33	4.47	46.00	35-49	22.00	7.95	24.00	3-30	15
4	45.50	2.98	46.00	41-49	25.88	5.03	28.00	17-30	8

Note. n = 37.; Actual Score = actual score range recorded; Fears = Sum of three fear-related items. Possible Scores: LTR: 10-50; Fears: 3-30 (Kagan, 2019). Higher scores for *Fears* factor contribute to higher *Willingness to Act*, while higher scores for the *Bystander* (likelihood to respond) factor contribute to higher *Willingness to Act.*

Readiness to Act

Levene's test of Homogeneity of Variances for *Readiness to Act* was not significant and indicated that variances were not different between the Years of Study. However, the residuals vs fitted plot output showed that data points were not evenly distributed across different scores but clustered in vertical lines at four different fitted values that correspond the Years of Study. Although an ANOVA showed there was a brief numerical increase in scores across time in program, it leveled off at Year 3, and therefore, time in program had no effect on *Readiness to Act* scores, which was unexpected. Planned contrasts of these also identified no difference in *Readiness to Act* scores between Year 4 (*Mdn* = 65.50) against both Year 1 (*Mdn* = 59.00) and 2 (*Mdn* = 62.50) together, and separately ($p > .05$), as seen in Table 3.

Year 2 vs. Year 1 and Year 4 vs. Year 3. Contrary to the hypothesis and based on planned contrasts, *Readiness to Act* scores in Year 2 students (*Mdn* = 62.50, *IQR* = 23.25) were not higher than Year 1 students (*Mdn* = 59.00, *IQR* = 18.75), ($p > .05$). However, based on planned contrasts, *Readiness to Act* scores for Year 4 (*Mdn* = 65.50, *IQR* = 14.50) and Year 3 (*Mdn* = 67.00, *IQR* = 11.00) were relatively the same.

Again, due to a low *n* value, trimmed means were not used to avoid unnecessary trimming and to preserve power.

Additional WilRAFAE Components

Additional components of WilRAFAE beyond the two major constructs of *Willingness* and *Readiness to Act,* like the allergy-training students had experienced, their willingness to be trained for allergy-related emergencies, and their confidence to respond to an allergy-related emergency, were tested to determine if there was a difference between student responses and time in the program.

Past Training Experience & Willingness to Train. A Chi-Square test was used to determine if there was a difference between year of study and past allergy-related training experience. All responses were mutually exclusive of one another, meeting the assumption of the Chi-Square test. There was no difference in past training experience, and time in the program ($p > .05$), where of 37 participants, only 81 % ($n = 30$) indicated they had received past allergy-related experience, due to missing data. Experience was gained from Basic Life Support (BLS)/ Advanced Cardiac Life Support (ACLS) (40 %), First Aid Class (36.67%), Job Responsibility (6.67 %), or being a Parent/Caregiver (16.67%).

To determine differences in time in the program and students' willingness to be trained to respond to allergy-related emergencies (measured on a scale of 1 to 10, with 1 being not at all willing to very willing), an ANOVA was used. The Levene's test of Variance indicated no significant differences in variances, and the residuals vs fitted plot indicated an unequal distribution of ratings between the Year of Study. There was no difference in willingness to be trained to respond to allergy-related emergencies due to the time in the program ($p > .05$), with Year 1 (*Mdn* = 10.00, *IQR* = 0), Year 2 (*Mdn* = 10.00, *IQR* = 0.25), Year 3 (*Mdn* = 10.00, *IQR* = 2.00), and Year 4 (*Mdn* = 10.00, *IQR* = 1.50). Note that one participant was not included due to a missing response.

Confidence. To test for confidence responding to an FAE, the following two items were summed: confidence in recognizing an allergic reaction and confidence injecting an Epinephrine Auto Injector (EAI) during an emergency, both on a scale of 1 (not at all confident) to 10 (very confident) that provided the sum score. To test for a difference in confidence based on time in the program, an ANOVA was performed, where a Levene's test of Variance indicated non-significance, and the plot of residuals vs fitted demonstrated unequal distribution of scores based on Year of Study. No difference was found between time in the program and confidence level ($p > .05$), Year 1 (*M* = 14.67, *SD* = 4.63, *Mdn* = 15.00, *IQR* = 6.75), Year 2 (*M* = 14.75, *SD* = 4.03, *Mdn* = 16.00, *IQR* = 5.50), Year 3 (*M* = 15.00, *SD* = 4.63, *Mdn* = 14.00, *IQR* = 2.50), Year 4 (*M* = 16.00, *SD* = 3.34, *Mdn* = 17.50, *IQR* = 4.25), with ($n = 37$).

To conclude, hypothesis 1 was only partially supported by the findings, with *Willingness to Act* not being entirely supported for Year 4 vs Year 1 and 2 but supported for Year 4 vs Year 3; while Year 2 vs Year 1 scores were different, but not as

hypothesized. For *Readiness to Act*, the hypothesis was also not supported by the findings.

Table 3

Descriptive Statistics of Willingness to Act & Readiness to Act Constructs Each Year

Year	Willingness to Act				Readiness to Act				*n*
	M	*SD*	*Md*	Actual Score	*M*	*SD*	*Md*	Actual Score	
1	76.67	1.37	77.00	75-78	56.67	12.11	59.00	40-69	6
2	67.38	9.77	67.50	51-78	62.50	14.71	62.50	44-86	8
3	66.33	9.98	70.00	47-79	64.60	12.37	67.00	34-81	15
4	71.38	7.35	73.00	61-79	64.88	9.48	65.50	54-80	8

Note. $n = 37$. Possible Score = potential score range (Kagan, 2019); Actual Score = actual score range recorded. *Willingness to Act* possible score: 13-80; *Readiness to Act* possible score: 8-97.

Hypothesis 2

In the vignette portion of the study, using content analysis, five categories were developed from competing priorities for providing care to a youth patient receiving medical care for an appendectomy, while also having food allergies. Some participants mentioned more than one theme or category and are highlighted in Table H3.

Theme 1: Priorities Related to Allergies

Competing priorities that were raised by participants that focused around allergies, involved the patient's (Patient 1) allergen-free diet, allergy prevention, and interactions with the other patient (Patient 2). Some said that "finding allergy-safe foods" was a priority, as was the concern that what would be allergy-safe for the patient may not be "suitable" after their surgery. An example of a participant's response is: "Since the patient is on a restricted diet, it may be difficult to find foods they like that do not overlap

with any of their allergies." Other participants mentioned that preventing allergies was a priority and gave examples of ways that this would be achieved, such as by having separate eating spaces for both patients. Patient 1's level of allergy competence was considered a priority, and was classified as allergy prevention, as was the severity level of their allergy, the risk of cross-contamination to Patient 1, and the difficulty in avoiding this. Additionally, how the patients interacted was considered another competing priority, specifically taking into consideration that it would be difficult to keep the two kids separate, and that there should be no sharing in general, and especially no sharing of food between the two patients.

Theme 2: Priorities Related to Patient 1's General Care Regarding Admission

Other priorities mentioned by participants surrounded Patient 1's post-operation care, citing "infection risk", and the need to "monitor" for this, as well as the concern of preventing a reaction to the antibiotics Patient 1 would have been given. Another priority was that there are similarities between allergies and infections, and how to differentially diagnose between the two, as well as the compliance of Patient 1 with their treatment if there was an allergic reaction during their post-op care. An example of a participant's response is: "As he is recovering from an appendectomy, ensuring that there is no infection and everything is healing well, would be top priority for Jake. Infection and an allergic reaction share some similarities, such as swelling and redness." Finally, Patient 1's post-operation pain levels were also considered a priority. Additionally, other aspects of the Patient's care were considered to be a priority, that included "airways, breathing, and circulatory", which are considered the basics of care, as well as the relationship between the patients and their nurse, if the nurses have to restrict certain activities due to

allergies. It was recognized that in an emergency, responding quickly would supersede any allergy prevention, such as in the case of Patient 1 requiring immediate support while nurses were providing care to Patient 2.

Testing the Hypothesis

To identify if certain factors predicted the themes mentioned in Table H3, year of study, personal food allergy experience (self and with others), *Readiness to Act* and *Willingness to Act* scores were used as the independent variables against the total number of categories mentioned (1 category or 2 or more categories), as there were only two themes in total. Some categories were not mutually exclusive, as some participants only mentioned one category, and others mentioned many, which fell into the two themes. To handle missing data, eight additional participant data were removed, along with the two removed from hypothesis 1 and 2 analyses, as the WilRAFAE construct data were used in this analysis. Upper year students (Years 3 and 4) who personally had FA, and personally knew someone with FA were grouped and *Willingness to Act* and *Readiness to Act* scores were placed against the total number of categories to identify a correlation using Kendall's Tau, due to non-normality.

Other components of WilRAFAE besides the two major constructs of *Willingness* and *Readiness to Act,* like allergy-training students had experienced, willingness to be trained for allergy-related emergencies, and confidence to respond to an allergy-related emergency, were tested to determine if there was an association between time in the program, personal FA experience, and the number of competing categories mentioned. As such, a Chi-Square test was used to identify a correlation for both past allergy experience and types of past allergy experience, and Kendall's rank-order correlation

coefficient was used for both willingness to be trained and confidence in recognizing and injecting an EAI. Note that for willingness to be trained, one additional participant was removed with the additional 8 participants for all vignette questions of the WilRAFAE-related analyses due to missing data (n = 29), with Upper Years (n = 16), and Lower Years (n = 6).

Upper Year Students' *Willingness to Act* Scores and Number of Categories. No association was found for either Upper (Year 3 and 4) and Lower (Years 1 and 2) Years after comparing their *Willingness to Act* scores and the number of *Competing Priorities* categories mentioned, (p > .05).

Upper Year Students' *Readiness to Act* Scores and Number of Categories. No association between *Readiness to Act* scores and the number of *Competing Priorities* categories mentioned (p > .05), for both Upper (Years 3 and 4) and Lower (Years 1 and 2) Years was found.

Past Training Experience & Willingness to Train. No association between *receiving past training experience* and the number of *Competing Priorities* categories mentioned (p > .05), was found for both Upper Years (Year 3 and 4) at 12.50% (n = *16)* and Lower Years (Years 1 and 2), with no differences in scores (n = 6). Additionally, no association between *type of past training experience* and the number of categories mentioned (p > .05), was found for both Upper Years (Year 3 and 4) Basic Life Support (BLS)/ Advanced Cardiac Life Support (ACLS) (7.69 %), First Aid Class (7.69%), Job Responsibility (0 %), or being a Parent/Caregiver (0%), where only (n = 13) responses were analyzed, and Lower (Years 1 and 2) BLS / ACLS (16.67%, and First Aid Class (16.67%) (n = 6).

No association between *willingness to be trained,* and the number of *Competing Priorities* categories mentioned ($p > .05$), was found for both Upper Years (Years 3 and 4) and Lower Years (Years 1 and 2). Note that one additional participant was not included due to a missing response.

Confidence. Additionally, no association between the total confidence to handle FAE and the number of *Competing Priorities* categories mentioned ($p > .05$), was found for both Upper years (Years 3 and 4) and Lower Years (Years 1 and 2).

To conclude, having mentioned more *Competing Priorities* was not associated with higher *Willingness* and *Readiness to Act* scores in students that were in Years 3 and 4, with personal FA experience, which did not support the hypothesis.

Hypothesis 3

Three main themes were developed from priority-related actions that would be taken when caring for a youth patient with food allergies, where some participants mentioned more than one theme and/or category and are described below and in Table H4.

Theme 1: Actions Related to Patient 1's Allergy

Participants identified some of the top actions they would take when caring for a patient with FA and these included the categories like *Allergy Prevention, Patient Interaction, Hygiene/PPE, Diet, Allergy Education* and *Allergy Assessment.*

Allergy Prevention involved checking for an "allergy band" and putting signs up around Patient 1's bed that alert that a patient with an allergy is present. Other participants mentioned cleaning the room, cleaning toys that are shared between the patients, and observing mealtime, as well as removing food when patients are not eating.

Participants also focused on the *Patient Interaction* that entailed actions of avoiding food sharing, and the sharing of toys, as well as keeping the kids separate, and observing patient interactions.

Hand Hygiene was also a priority action to take, as participants mentioned engaging in "hand hygiene between patients", and for both patients to engage in as well, such as after Patient 2 has eaten. Using fresh PPE between patients and sterilizing shared medical equipment between patients were also identified, along with sanitizing hands as top actions to take when caring for a patient with FA. An example of a participant's response is: "Ensure no cross-contamination[.] Remove all PPE and gloves before checking on Jake [Patient 1][.] Make sure Jake knows what he can and cant [*sic*] eat[.]"

Regarding mealtimes, some participants mentioned "checking Patient 1's dietary restrictions" to maintain them, while also saying that due to Patient 1's age, it is the nurse's responsibility to "check for and order safe foods for Patient 1", and to observe the diet. Additionally, it was suggested to make changes to Patient 2's food based on what Patient 1 can have to avoid cross-contamination.

Participants also mentioned taking actions related to the patient's allergy by assessing for allergies, such as by check "for an allergy in Patient 1", along with "antibiotic allergies", and to "assess allergy severity". Other actions involved gathering "further information about allergies" from both Patient 1 and their "mother", regarding how they will react. Other actions included allergy education, such as by advising "Patient 2 about Patient 1's allergy alert", and to educate both Patient 2 and his parents about the signs of an allergic reaction and what to do if they see Patient 1 having a reaction. Another participant recommended focusing on educating Patient 1 about their

allergies such as “health development and general care regarding allergies”, and “on not sharing food”, and to teach both Patient 1 and 2 about “how to use an auto-injector”. When referring to teaching Patient 1, multiple participants mentioned tailoring the education based on his comprehension level. Another participant even suggested gathering information to find out “Patient 2’s allergies”, and to educate themselves on knowing about Patient 1’s auto-injector, and how to recognize an allergic reaction.

Finally, some participants discussed actions they would take if Patient 1 was experiencing an allergic reaction and these involved “checking for the administration of an epinephrine auto-injector”, and “administering the auto-injector”, as well as “Calling 911”, and “comforting Patient 1 and his family about the allergic reaction”.

Theme 2: Actions Related to Regular Care as Being a Patient in Hospital

Actions mentioned by participants pertained to the *General Care* of Patient 1, as well as *Main Care Surrounding* his *Admission,* and *Non-Allergy Education* that were all related to the care of being a patient in hospital, as demonstrated by an example of a participant’s response: “Assessing the wound site for signs of infection. Assessing the patient's pain level. Assessing the patient's diet/diet maintenance. Assess for allergies.” Full descriptions of these actions can be found in Table H4.

Specifically, participants mentioned that it is important to “check for changes in Patient 1’s condition”, along with “checking medications that Patient 1 takes”, and their general care, as well as safety. Assessing vitals and “well-being” were also *General Care* actions to take.

Monitoring antibiotics, “infection”, “pain”, and “intake and output”, as well as checking for “Patient 1’s diet in the last few hours,”, their “pain”, and assessing their

"bowel sounds" were actions that appeared to surround Patient 1's care in relation to the reason for his initial admission. Additionally, one participant even mentioned the concern of providing too many antibiotics as it can contribute to "future resistance" of antibiotics.

Theme 3: Couldn't Respond

At least one participant found difficulty in coming up with an answer to this question, as they did not know how to respond, as seen in Table H4.

Testing the Hypothesis

To identify if upper year students (Years 3 and 4), who had more personal FA experience – that included both having FA and knowing someone personally with FA –, and greater *Willingness to Act* and *Readiness to Act* scores predicted the mention of an action related to FA, a point-biserial correlation was performed against the *Allergy Actions* theme. Data were non-normal, however that is expected when working with one dichotomous variable, with some minor skew and high kurtosis; since coding was binary (Absent/Present), there was little variance observed, and no Shapiro-Wilks test of normality was produced. As with hypothesis 2, the same eight participants removed for hypothesis 2 were not included in hypothesis 3 analyses due to missing data. Upper year students (Years 3 and 4) who personally had FA, and personally knew someone with FA were grouped and *Willingness to Act* and *Readiness to Act* scores were placed against the theme *Allergy Actions* to test for associations.

Again, additional components of WilRAFAE besides the two major constructs of *Willingness* and *Readiness to Act*, like the allergy-training students had experienced, willingness to be trained for allergy-related emergencies, and confidence to respond to an allergy-related emergency, were tested to determine if there was an association between

time in the program, personal FA experience, and the number of competing categories mentioned. As such, a Chi-Square test was used to identify a correlation for both past allergy experience and types of past allergy experience, and Kendall's rank-order correlation coefficient was used for both willingness to be trained and confidence in recognizing and injecting an EAI. Note that for willingness to be trained, one additional participant was removed with the additional eight participants for all vignette questions of the WilRAFAE-related analyses due to missing data (n = 29), with Upper Years (n = 16), and Lower Years (n = 6).

Upper Year Students' *Willingness to Act* Scores and Allergy Actions. No association was found between *Willingness to Act* scores and mentioning the theme *Allergy* Actions ($p > .05$) for both Upper (Years 3 & 4) and Lower Years (Years 1 & 2) and did not support the hypothesis.

Upper Year Students *Readiness to Act* Scores and *Allergy Actions*. No association between Upper- and Lower-Year Students' *Readiness to Act* scores and mentioning *Allergy Actions*, ($p > .05$). Therefore, having mentioned *Allergy Actions* did not appear to be associated with higher *Readiness to Act* scores in students that were in Years 3 and 4, with personal FA experience, and did not support the hypothesis.

Past Training Experience & Willingness to Train and *Allergy Actions*. No association between *receiving past training experience* and mentioning *allergy actions* ($p > .05$), was found for both Upper Years (Year 3 and 4) at 75% ($n = 16$) and Lower Years (Years 1 and 2), where scores did not differ (n = 6). Additionally, no association between *type of past training experience* and mentioning *allergy actions* ($p > .05$), was found for both Upper Years (Year 3 and 4), and Lower (Years 1 and 2).

No association between *willingness to be trained,* and mentioning *allergy actions* ($p > .05$), was found for both Upper Years (Years 3 and 4) and Lower Years (Years 1 and 2).

Confidence. Upper Year students had a slightly skewed distribution curve to the right, and no association between the total confidence to handle FAE and mentioning *allergy actions* ($p > .05$), was found for both Upper years (Years 3 and 4) and Lower Years (Years 1 and 2).

Preventing and Estimating Risk of an Allergic Reaction in Hospital Care

Shared Responsibility

Although some respondents appeared to not understand the question, only those that explicitly indication of confusion, and had completed the rest of the vignette questions were included in this analysis; blank responses did not count towards this.

Three themes were developed from the responses when asked about the factors that affected shared responsibility while caring for Patient 1. These include *Theme 1: Factors that pertain to the patient's care and responsibility; Theme 2: Factors that pertain to the hospital's responsibility and care;* and *Theme 3: Responses that indicate confusion about shared responsibility,* which are detailed in Table H5.

Theme 1: Factors that Pertain to the Patient's Care and Responsibility. In terms of the patient's responsibility and their care, Patient 1's comprehension was often mentioned by participants, specifically with the "understanding" of his "diagnosis", and his "diet limitations" that was also specific to his current condition as a result of his surgery. At least one participant also suggested that Patient 1 was responsible for being educated (without further context), while another focused on education about his auto-

injector. Participants said Patient 2 has responsibility surrounding his interactions with Patient 1, for example, being educated, and taking "preventative allergy actions", like "avoid sharing food or close contact of food with Patient 1". At least one participant had even acknowledged Patient 2 had the right to "eat without limitations". An example of a participant's response includes: "Jake has the responsibility to not continue his normal diet until he gets better and micheal [*sic*] should keep his food away from jake [*sic*]. Also jakes [*sic*] responsibility to be aware of how to use an auto injector".

Parents of these two patients were also given responsibility in this scenario, where both patients' parents were "responsible for allergy prevention in the patient interactions", and to ensure the "allergen is not near patients". One participant even focused the responsibility on Patient 2's parents to "take preventative actions" in regards to Patient 1's allergy.

Other issues raised included the "likelihood of cross contamination" occurring during the hospital stay and recognized the fact that "conflict may arise from patient needs", however to whom that was directed was unclear.

Theme 2: Factors that Pertain to the Hospital's Responsibility and Care. Participants addressed the responsibilities of hospital staff and types of care to be given that are part of the shared responsibility in dealing with care of patients with food allergies, such as "following hand hygiene protocols" with both "food handling" and between both patients. Other responsibility pertained to the accessibility of the auto-injector and having nurses and care teams that had "allergy awareness and knowledge", such as "avoiding the allergen prior to care for Patient 1" or "near patients", communicating with the patient and using "age appropriate" methods, and correctly

delivering food. Others mentioned aspects of care like medication, general "patient care", and the "primary care provider" as part of the responsibility that was assumed as directed towards the hospital and its staff. Additionally, the nurse was identified as the individual responsible to provide "additional supervision to Patient 1 that is dependent on age and comprehension", while another participant identified the patient's care team as responsible for "managing allergy prevention to allow for both patients to interact". An example of a participant's response is: "Anyone in Jake's circle of care needs to be aware of his allergy and avoid eating eggs before caring for him."

Theme 3: Responses that Indicate Confusion About Shared Responsibility. As with another question, some participants indicated confusion when responding to this question, as they did not understand what was being asked. This was highlighted clarified by feedback about the survey (see further Chapter 6: Results: What Still Needs to be Known? and Table H9).

Verification of Understanding

To verify if participants (n = 29) understood the vignette, an open response question that asked whether the patient received medication for pain was included. Most participants responded No (≈72%), or some variation of a *No,* that included some uncertainty (≈21%), and these were accepted as correct. Responses that included items irrelevant to the question or no clear direction were coded as incorrect (≈7%). Although data were non-normal, it was expected as this question had only one right answer. Participants that mentioned *No* provided a reason that often related to the patient's condition and identified what they expect happened that led to this event about no pain.

Risk of Allergic Reaction

Theme 1: Risk Related to Factors Other Than Allergies, or Allergies Not of Concern. Some participants suggested that there were other health concerns that were of risk for Patient 1 beyond just the risk of allergies, such as "infections after surgery", "recovery", and "complications", as well as his appendix bursting, and the fact that he is "immunocompromised from [the] medication" he is taking. At least one participant that suggested other health concerns as a greater risk did acknowledge that having a reaction is still just as risky and important. An example of a participant's response is:

> The patient just had an appendectomy, so there are other health factors that are of a higher priority, such as post-op infections, possible surgery complications, recovery process, etc. However, the risk is far from negligible because this young child who is probably unaware about this risk around him can accidentally put himself in serious danger if he happens to share food with Micheal [*sic*] and/or touch the same surfaces, etc.

Other participants did suggest that allergies were not of concern if proper precautionary measures such as "proper hand-hygiene" is taken, and the risk would be around "medium to low". If Patient 1 did not consume the allergen, then there is not a risk for him, and at least one participant mentioned that there should be little difficulty avoiding eggs. It was also suggested that if the two patients are educated about allergies, then they should have a good understanding of how to keep safe.

Theme 2: Kids & Knowledge/Understanding/Awareness of Allergies. Participants acknowledged that there are multiple categories of risks at play for Patient 1 (Jake) based on the different categories their responses were classified by. These risks

were due to the likelihood of having an allergic reaction. Some of this risk pertains to how children typically behave, such as children not understanding the risk of allergies, and children not being ready for responsibility, especially when dealing with this serious circumstance.

Theme 3: Other Allergy Related. Other reasons for the allergy risk pertained to the patient's previous allergy history, such as the fact that" severity increases each time individuals are exposed to the allergen". Other participants turned to allergies and medications as reasons for their risk score, specifically that in the scenario, it was not determined if the patient's medication allergies were verified, and antibiotics had been given without verification of this. As a result, risk of having an allergic reaction to the antibiotics was very possible. For example, one participant said: "Jake is given a broad spectrum of antibiotics without knowing if he has any allergies. As well as the risk of him and his roommate sharing/trading food." Additionally, some participants acknowledged that if the patient has an allergic reaction, it would aggravate the patient's current health situation.

Theme 4: Cross-Contamination & Patients Interacting/Eating. Some participants mentioned how Patient 1's potential allergy puts him at risk for an allergic reaction, due to the fact that source of his allergy is unknown, whether it be airborne, contact, or ingestion driven. For example, one participant said: "I don't know if the reaction only comes from ingestion." Others mentioned the risk of cross-contamination, because if there is food in the room that Patient 1 (Jake) is allergic to, then when he and the other patient he shares a room with (Patient 2 or Michael) play together, there is a

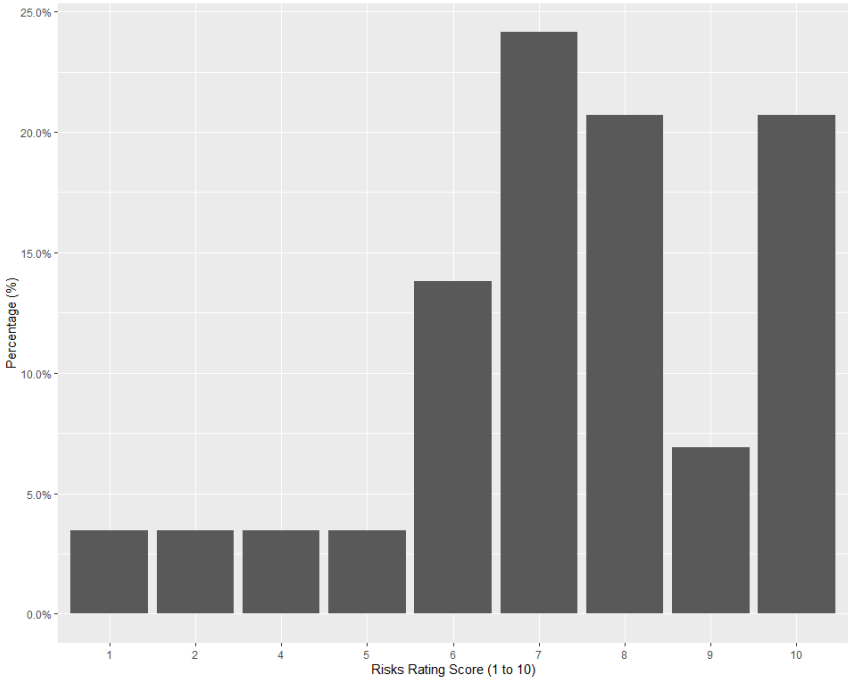
greater risk for a reaction to occur, especially depending on how the staff and family members of the patients handle the allergy and observe the children (see Table H6).

In situations where responses regarding patient diet were unclear due to no specification, for example, if it was allergy-friendly diet, or diet as a result of the appendectomy, then only in cases where *allergy* was included in responses about diet, it was understood as important to the diet/allergy and was coded as such.

On a scale of 1 (Not at all) to 10 (Absolutely), participants' rating risk of the patient in the vignette experiencing an allergic reaction ranged between 1 and 10, (*Mdn* = 7, *IQR* = 3.00), as seen in Figure 1.

Figure 1

Percentage of Respondents for Each Rating Score



Note. n = 29. Scale of 1 (Not at all) to 10 (Absolutely). The figure represents the percentage of participants who chose each rating score.

Responding to an Allergic Reaction in Hospital

Identification of Allergy Symptoms

It can be seen from Table 4 that many participants did not identify dizzy or light-headedness, weak pulse, diarrhea, and a drop in blood pressure as a sign of allergic reaction in Patient 1 (Jake).

Table 4

Correct Symptoms Identified that Indicate an Allergic Reaction

Symptoms	Correctly Identified *n* (%)
Hives	29 (100.00)
Swelling of tongue, lips, face	26 (89.66)
Throat Tightness	25 (86.2)
Itching	23 (79.31)
Shortness of Breath	23 (79.31)
Coughing	21(72.41)
Nausea	13 (44.83)
Watery eyes, sneezing	12 (41.38)
Warmth	8 (27.59)
Skin with a blueish colour	7 (24.14)
Pain or cramps	5 (17.24)
Weak pulse	5 (17.24)
Diarrhea	3(10.34)
Drop in blood pressure	3 (10.34)
Dizzy or lightheaded	2 (6.90)

Note. $n = 29$. Ordered from highest correctly identified to lowest. Correctly identified only refers to the number (percentage) out of the total number of participants that correctly identified each correct symptom of an allergic reaction (i.e., Food Allergy Canada, 2019b).

Table 5

Incorrect Symptoms Identified that Do Not Indicate an Allergic Reaction

Symptoms	Incorrectly Identified *n* (%)
Swollen Ankles & Feet	3 (10.34)
Unusual Thirst	2 (6.90)
Blurred Vision	1 (3.45)
Distended Abdomen	1 (3.45)
Loss of Appetite	1 (3.45)
Low Blood Sugar	1 (3.45)
Blue Urine	0 (0.00)
Foamy Urine	0 (0.00)
Weight Loss or Gain	0 (0.00)

Note. n = 29. Ordered from highest incorrectly identified to lowest. Incorrectly identified only refers to the number (percentage) out of the total number of participants responses to incorrect symptoms of an allergic reaction.

Except for symptoms of unusual thirst, swollen ankles and feet, loss of appetite, low blood sugar, blurred vision, and distended abdomen, most participants from all years did not select these symptoms in Table 5, as a symptom of an allergic reaction. These symptoms instead were all symptoms of health conditions other than an allergic reaction (i.e., Canadian Diabetes Association, n.d.; Mayo Foundation for Medication Education and Research, n.d.-a, n.d.-b; National Kidney Foundation, 2020). Approximately 3% of participants incorrectly chose these symptoms to look for during an allergic reaction.

Steps to Take to Treat an Allergic Reaction During Patient Care

Participants were asked to identify the steps they would take to treat Patient 1 (Jake) if they suspected he was experiencing an allergic reaction. Participant responses can be found in Table H7, and the percentage of participants that mentioned each theme is located in Figure 2.

Participants discussed treatment steps in the following themes: *Theme 1: Providing medical treatment to the patient, Theme 2: Working with the patient via communication and preparation for treatment, Theme 3: Getting assistance from others,* and *Theme 4: Discussion of how severity impacts actions*, which are briefly explained below.

Steps Theme 1: Providing Medical Treatment to the Patient. Participants identified steps to take when they first came upon the patient and they suspected a possible allergic reaction and these included identifying the patient was able to

communicate and if so, to ask him if he had ingested eggs, as well as to identify the source of the allergic reaction, after assessing, such as using the "ABC's [Airways, Breathing, Circulation" and determining if an allergic reaction, or if anaphylaxis is indeed happening. At least one participant mentioned providing the patient with oxygen at this time point, and another indicated reviewing the patient's chart to sort out the situation.

Participants also discussed locating the epinephrine auto-injector, and at least one participant mentioned verifying that the injector is appropriate for the patient, as well as to have another nurse find the injector.

During treatment, participants said to inject the epinephrine auto-injector, specifically on the outside of the thigh, and to hold for 5 seconds, or to just provide epinephrine, and medical treatment. Some participants mentioned treating with antihistamines, where at least one specified that antihistamines should be given if it was determined that the patient was not experiencing anaphylaxis.

After providing the initial treatment for an allergic reaction, participants recommended administering extra oxygen if the patient didn't have enough, as well as following allergy protocols, and to engage in follow-up care (without specifying what that entailed). At least one participant mentioned providing an epinephrine auto-injector refill for the patient when he is discharged from the hospital.

After administering epinephrine, participants indicated that they would then check for the source of the reaction (if they did not do so before treatment), and engage in re-assessing the patient, such as with their vitals, monitoring for any changes in the patient's condition, and at least one participant mentioned identifying if the antihistamines worked. One example of a participant's response includes:

> Assess the signs& [*sic*] symptoms to confirm allergic reaction. Call for help[.] If he has an epipen [*sic*] will administer that immediately If he had other medications will administer those (depends on severity). Continue to monitor condition[.] Look for source of allergic rxn [*sic*].

Another example of a response is:

> To treat this allergic reaction we evaluate the root of the cause and provide medical relief, alert the physician and provide the patient with their auto-injection[.] [T]hey are not specific to allergic reaction severity[.]

These responses encompass Theme 1 and the next theme of working with the patient via communication and preparation for treatment.

Steps Theme 2: Working with the Patient Via Communication and Preparation for Treatment. Participants discussed having communication with the patient while treating them, such as narrating what they are doing to calm the patient, as well as to engage in deep breathing with the patient to keep him relaxed. It was also mentioned to communicate to Patient 2 that he should avoid Patient 1's side.

How the patient was positioned, and his environment was of participants' concerns during this situation, as some participants focused on having the patient sit to prevent falling if he passed out, or to have him not move and to "keep him down" with the help of others. Another suggested putting the patient in tripod position or lay the patient on his back or in a comfortable position. Some patients also mentioned clearing the air or bringing the patient to a different area.

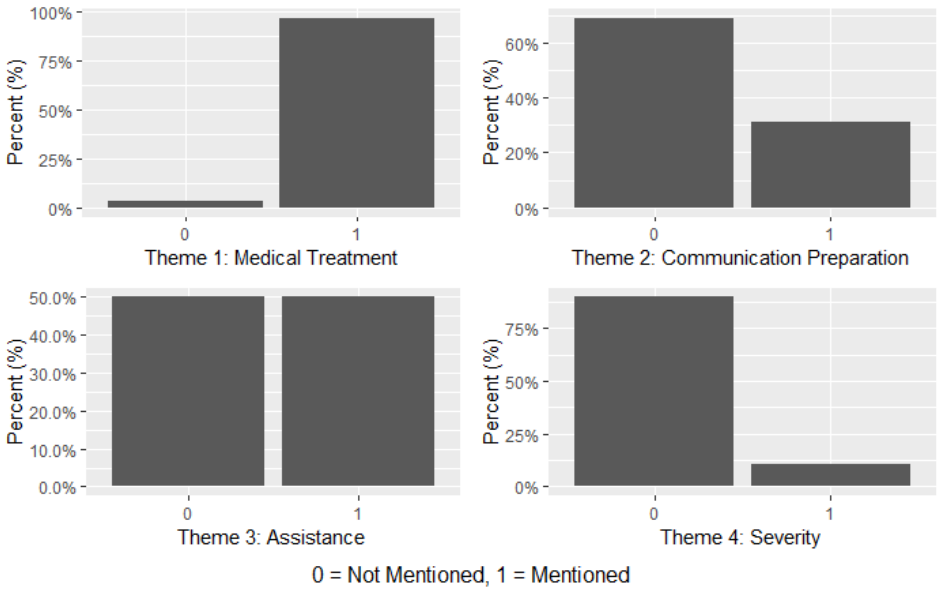
Steps Theme 3: Getting Assistance from Others. A few participants mentioned calling 911 (the regional emergency number), especially if the patient was experiencing an allergic reaction.

As well, others mentioned calling upon a doctor, or additional nursing members to assist them. At least one participant highlighted the need to not leave the patient's side during the allergic reaction and indicated they would use the call bell to get assistance from another nurse. Additionally, at least one participant said they would alert the patient's primary care provider.

Steps Theme 4: Discussion for How Severity Impacts Actions. Some participants specified when severity of the reaction would change how they would respond (beyond basic treatment), and this included responses such as that steps used are for any severity.

Figure 2

Percentage of Respondents that Mentioned Themes of Steps Taken if Suspected Allergic Reaction with Patient



Note. n = 29. Many participants mentioned more than one theme, and more than one item within a theme. These themes are only counted once in analyses for just mentioning the theme. Medical Treatment = Theme 1: Providing Medical Treatment to the Patient; Communication Preparation = Theme 2: Working with the Patient Via Communication and Preparation for Treatment; Assistance = Theme 3: Getting Assistance from Others; Severity = Theme 4: Discussion of How Severity Impacts Actions.

What Still Needs to be Known? – End of Survey Opinions

At the end of the survey, respondents had the opportunity to provide their opinion about the survey itself and on their own knowledge.

What Questions Do You Have about FA?

While most participants (≈51%) did not provide a response about any questions they had about FA, 20% asked at least one question about FA. Participants (n = 12) that provided questions were from all years of study, and these questions pertained to one main theme: *Epidemiological, diagnostics, and long-term prevalence.*

Theme 1: Epidemiological, Diagnostics, Long-term Prevalence. Participant questions pertained to the incidence rate of FA, specifically with contact allergies, and why there are differences in incidence as well as an increase in it. At least one participant asked about general allergy safety precautions that should be taken outside of the nursing realm, while another asked about coping with FA, especially when the allergen is a favoured food. Other questions asked about differential diagnosis of allergies and other conditions, specifically how to differentiate between an allergic reaction and something like choking, as well as how to safely diagnose allergies. Additionally, questions were asked about outgrowing FA, adult onset of allergies, and if there were ways to "cure" allergies (as seen in Table H8). An example of a participant's response includes: "Why do some people grow out of their food allergies[?]".

Confidence Answering the Survey with Current Knowledge

When asked to self-report confidence with current knowledge using a 5-item scale with anchor points *A great deal* to *None at all*, most participants (≈59%) reported confidence *A Moderate Amount*. Approximately 15% of participants reported their confidence in their amount of knowledge "a little".

Familiarity with Survey Questions

Of all the questions asked, most participants indicated that *Yes*, there were questions in the survey that they were not familiar with (≈56%), while only ≈5% did not respond to the question.

Familiarity issues with the survey surrounded the following themes: *Theme 1: It was unfamiliar, and I wasn't sure how to answer because…*, and *Theme 2: I don't know about it (yet)…*. These themes covered comments beyond no responses from participants,

and those that indicated that nothing was unfamiliar. Sometimes, multiple themes were identified in participant responses, as represented in Table H9.

Theme 1: It was unfamiliar, and I wasn't sure how to answer because… Participants found the vignette to be a common source of unfamiliarity, while others had more specific sources of unfamiliarity. At least one participant mentioned unfamiliarity regarding questions about the epinephrine auto-injectors. Another area of unfamiliarity was some of the questions about allergy knowledge and prioritizing symptoms. An example of a participant's response includes:

> I feel like when I was asked to provide a step-by-step list of what I would do if I suspect someone is having an allergic reaction, I wasn't quite sure how to answer. In the scenario the patient did have an epinephrine pen, but for hives not anaphylaxis, so I wasn't sure how urgent it was to inject the patient.

Some participants also discussed uncertainty surrounding how to answer some of the questions, or that they didn't know the answer. Examples of this include the True and False questions, the steps for treating an allergic reaction, the correct timing for injecting epinephrine, and how the situation should be handled in relation to current knowledge about the use of an auto-injector. One participant indicated uncertainty about symptoms they should be looking for, technical information, use of the auto-injector, and some of the knowledge questions. Another indicated self-doubt and uncertainty about the shared responsibility question. At least one participant indicated using general knowledge to complete the survey as they did not have personal experience with FA.

Theme 2: I don't know about it (yet)… Other participants acknowledged that they lacked education about FA, or how to identify and treat FA related cases. Most of

this was because they had not taken any classes in the nursing program, while some said they had not learned about certain content yet. Another recognized a need for additional information about the patient in order to make judgements about the patient, and as well at least one other indicated having difficulty recalling procedural information.

CHAPTER 7

DISCUSSION

Hypothesis 1

The first hypothesis proposed that Year 4 students had higher *Willingness* and *Readiness to Act* scores than Years 1 and 2. It was found that while Year 4 students differed from Year 1 for *Willingness to Act* scores, contrary to the hypothesis, it was Year 4 students who had lower scores than Year 1 students. However, Year 4 students had higher scores than Year 2 students, which was expected. When both Years 1 and 2 were compared against Year 4, Year 4 did not score higher on *Willingness to Act.*

Similarly, Year 4 students did not differ from Year 1 and 2 combined and there was no difference between Year 4 and 2 and Year 4 and 1 in their *Readiness to Act* scores. This meant that Year 4 students did not have higher scores than Year 1 and Year 2, separately or combined, and this finding did not support the hypothesis.

Data related to hypothesis 1 indicated that a student was less willing to act in a FA emergency in a community setting when they had received more nursing education compared to students in the early stages of the nursing program, but more willing than those who had only completed one year of the nursing program (Year 2 students). In Year 1, students were more willing to act in a FA emergency in a community setting compared to all years, however in Year 2, the *Willingness to Act* scores dropped to the lowest out of all the years, followed by an increase in Year 3 and another in Year 4. While Year 4 students had a higher numerical *Willingness to Act* score than Year 2 and 3, they were not more willing to act than Year 1 students, as it can be seen in Chapter 6: Results: Hypothesis 1.

Hypothesis 1 proposed that Year 2 students had higher *Willingness* and *Readiness to Act* scores than Year 1 students but that was not supported by the findings, as *Year* 2 students scored lower on the *Willingness to Act* construct than Year 1 students. This meant that Year 2 students were *less* willing to act in a community-setting FA emergency than their Year 1 counterparts who had not yet taken any nursing courses in this program. Unexpectedly, Year 2 students were not more *ready to act* than Year 1 students, although they numerically had higher *Readiness to Act* scores.

This hypothesis also proposed Year 4 students had higher *Willingness* and *Readiness to Act* scores than Year 3 students, and it was found that Year 3 and 4 students differed in their *Willingness to Act* scores at $p < .05$, but not in their *Readiness to Act* scores. Year 4 students scores were higher for *Willingness to Act* compared to their Year 3 counterparts, meaning that Year 4 students were more willing than Year 3 students to act in a community-setting food allergic emergency, as was expected. However, Year 4 students only had scores numerically higher than their Year 3 counterparts for *Readiness to Act*. This part of the hypothesis was also only partially supported.

Contrary to expectations and despite their clinical experience, while Year 4 students were numerically more ready than the other three years to act in a community-setting FA emergency, they were not more ready at a statistically significant level. At the same time, Year 4 were more willing than Year 2 and 3 to act in a community-setting FA emergency but not more than Year 1 students. Due to a small overall sample size, study unequal sample sizes from each year of study, the comparison may be skewed. Additionally, Year 1 students participating in this survey despite their lack of nursing experience may have a higher motivation to want to help and want to participate in acts

of care in general. Possible other reasons may be due to COVID-19 which has had a negative impact on nurses globally (i.e., De los Santos et al., 2021), or due to an inaccurate greater estimation of what an individual can do, especially those with little previous competency and knowledge compared to those with greater competency, also known as the Dunning-Kruger effect (Kruger & Dunning, 1999). Additional research would be necessary to further understand this phenomenon.

Hypothesis 2

Hypothesis 2 proposed being an Upper Year student (Years 3 and 4), having personal FA experience (personally having FA or knowing someone with FA), and *Willingness* and *Readiness to Act* scores was associated with the number of competing priorities mentioned regarding the care of a patient with FA. It was found that the number of competing priorities listed by participants was neither affected by time in the program nor by having personal FA experience for both *Willingness to Act* and *Readiness to Act*, and the hypothesis was not supported.

Hypothesis 3

Hypothesis 3 proposed being an Upper Year student (Years 3 and 4), having personal FA experience (personally having FA or knowing someone with FA), and higher *Willingness* and *Readiness to Act* scores was associated with participants mentioning FA-related priority actions that would be taken by participants when caring for the patient with FA. It was found that time in the program, personal FA experience, and *Willingness* and *Readiness to Act* scores were not associated with Allergy-Related priority actions that were mentioned by participants, and thus the hypothesis was not supported. Additionally, these same factors did not affect the total number of categories

mentioned, except for a negative association with the mention of the theme Regular Care Actions.

Because the present study did not include equal sample sizes from each year of study, had a small sample size, and resulted in unusual findings the author lacks confidence in the findings. Further research with a larger and more representative sample is warranted.

Notable Qualitative Findings

Despite unusual findings from the first part of the study, the qualitative findings from participant responses have provided insightful observations that can lend themselves to further consideration and research. These findings will be discussed in the next few sections. First, contextual information will be discussed in relation to some points raised by participants, then discussion of comments by participants regarding the prevention of-, assessing the risk of-, and responding to an allergic reaction in hospital will follow.

Contextual Information

Sanitizing Hands. For contextual purposes, the sanitizing of hands is a bit problematic because while sanitizing hands is a common healthcare practice for infection control, alcohol-based hand sanitizer still leaves peanut residue on hands, although possibly not at an amount that could induce potential reaction (Perry et al., 2004), that can contribute to cross-contamination when dealing with FA. Soap and water, among other cleaning wipes for example, have been verified in their ability to remove peanut butter residual and break down food proteins (Perry et al., 2004). It is unclear if that is what students mean or if they are just referring to hand cleaning using multiple methods. In some instances, participants were not explicit and only mentioned “hand hygiene”,

"surfaces wiped", while others clearly said, "wash hands", "sterilize equipment", "hand sanitize". This is important to note because alcohol-based hand sanitizers can be found everywhere as part of public-health safety precautions for COVID-19. Given their ubiquity many people might incorrectly believe that if sanitizer is making their hands free from viruses that it would eliminate food protein.

Finding 1: Changing Patient 2's Diet to meet Patient 1's Allergy Needs

In Chapter 6: Results: Actions to Prevent Allergies and Competing Priorities, a recurring code mentioned by participants was to change Patient 2's diet based on Patient 1's allergies. This study did not address the legal implications and context surrounding how far-reaching accommodations like this can be made. This was beyond the scope of this study, and there are many factors that could influence the outcomes of that suggestion. However, this remedy is not mentioned in the current literature on preventing food allergic reactions during a hospital stay. For example, in Israel where a study was conducted reviewing how to manage allergies with hospital dietary options and across the hospital, changing the patient's roommate's diet was not listed (Harari et al., 2021). Similarly, Wallace (2015) did not mention changing the roommate's diet. How this accommodation may be perceived in the eyes of law is unclear.

The previous studies were specific to non-Canadian contexts; how an allergy-free room or altering patient roommate diets would work in Canada is unclear. In Canada, food allergies have been identified as a disability in Ontario and the Ontario Human Rights Commission requires that employers, education institutions, and various other organizations or providers have a "comprehensive allergy strategy" (Murdoch et al., 2018, p. 2). Murdoch et al. (2018) have identified that in the Canadian Charter of Human

Rights and Freedoms, there may be wording that allows for a ban on foods for individuals who do not have an allergy, especially when it involves an individual with anaphylaxis. Murdoch et al. (2018) also suggested that that the Charter does include allergies as protected by the physical disabilities' definition. Murdoch et al. (2018) did note, that while it is likely that allergies do fit within the current wording of some provincial disability definitions, such as Ontario's, it may be limited to allergic reactions in the most severe form, or anaphylaxis, as it has been identified in cases involving human rights (i.e., Ontario Human Rights Commission, n.d.). In the United States (which borders with Canada), allergies may be applicable under the American Disabilities Act (i.e., when it affects the ability to eat, U. S. Department of Justice Civil Rights Division Disability Rights Section, 2013).

Canadian human rights policy responses have included requiring institutions to have spaces that are allergy-free, and by using food bans (i.e., Peesker, 2015; see also Murdoch et al., 2018). However, it has been found that bans like this do not drastically change the outcomes of needing epinephrine for a reaction (i.e., Bartnikas et al., 2017). Even new guidance for school settings in North America do not recommend allergy-free spaces except in special cases like being unable to manage an allergy due to age (i.e., Waserman et al., 2021).

Returning back to the point of not serving Patient 1's allergen to Patient 2, it is unclear if the patient is unable to manage his allergy, as participants indicated further information is needed about the patient's allergy and acknowledged that the patient may have such as limited allergy-comprehension compared to an older patient because of his age. Additionally, based on the allergists' opinions identified by Simons et al. (2012), it

appears unlikely that the patient would be fully self-managing of his allergy, except for being able to share anaphylaxis symptoms they are experiencing and recognizing when they need epinephrine. Therefore, further research into whether having an allergy-free room for both patients, where one of the patients without an allergy to the banned food would be ethical, feasible, and beneficial, and whether the recommendations in a community childcare and school setting are applicable in a hospital setting is warranted.

Finding 2: Prevention of an Allergic Reaction in Hospital Care

Prevention. Some participants mentioned the allergy information bracelet, which is mentioned by the NCLEX-RN competencies as a step to take when caring for a patient (NCSBN, 2019b, p. 13).

Participants mentioned the following: a food-free room, supervised eating, keeping patients separate, making sure patients engaged in hand hygiene before interacting, and providing more allergy education for Patient 1 and 2 (i.e., staying allergy-safe in hospital and general allergy information). It may follow that there are additional tasks that nurses may take on beyond those needed for the patient's initial reason for hospital care, as seen in Table H4. Although it is not initially apparent how much is expected of the patient, as explained in the next section, Shared Responsibilities between the Hospital and Patients, when reviewing how nursing students address responsibilities, they still showed that they assume a lot of responsibilities regarding allergy prevention. Additionally, they mention some family involvement, such as Patient 1's or 2's family.

In terms of the patient-nurse/patient-family-nurse relationship, past research suggests family involvement is sometimes beneficial for both the family themselves (i.e., when parental stress can be reduced by providing the parent ways that they can still feel

useful to their child, Heurer, 1993, as cited in Thompson et al., 2003), and the nurses (i.e., Irish nurses felt that they rely on family (parental) to provide care to the child patient in order to manage their other tasks, Coyne, 2013). However, having family involvement can interfere with nurses and can affect the trust relationship, etc. (i.e., being overinvolved, or giving food that does not align with the patient's care plan, Hupcey, 1998).

Recognizing the many care tasks mentioned by the present study's participants, acknowledging that Patient 1 is not a nurse's only patient, and Coyne (2013)'s finding of the suggested need for parent support by nurses, it may be beneficial to research whether parental/guardian help would have been useful in this situation. Examples of the care tasks included ensuring allergy-safe food, and other allergy-prevention actions, cross-contamination prevention, post-op care like infection prevention other health procedures to follow. Parents of hospitalized American children felt that their role as a "protector" of their kids in the home extended to the hospital (Rosenberg et al., 2016, p. 321). For example, parents saw their role as extending to ensuring that staff performed adequate hand hygiene and were wearing PPE between patients (Rosenberg et al., 2016). This was something that our nursing student participants identified as their own responsibility in the case of allergy prevention. Additionally, it is important for nursing students to know that there are psychosocial, and quality of life (QoL) impacts (i.e., Cummings et al., 2010) for children and families living with FA, when providing care (i.e., vigilance of diet by parents, Primeau et al., 2000).

Additionally, Rosenberg et al. (2016) found that parents of children in hospital care viewed the good communication between 1) the patient's family (parents) and the

hospital staff and 2) among staff as important to the safety of their child. For example, parents wanted to make sure that correct information was being shared between the doctor and the nurses with respect to medication doses. Rosenberg et al. also revealed that some parents had witnessed inconsistencies between what the doctor had planned and what was done by healthcare workers. For the most part the present study's nursing student participants mentioned the importance of communicating with patients more than parents throughout all parts of the scenario.

Rosenberg et al. (2016) reported that participants expressed concern of offending the healthcare staff regarding feeling a need to ask staff and remind them of what parents believed to be expected things such as handwashing and glove wearing. However, there was an acknowledgement that healthcare workers are "human" and that mistakes can happen (Rosenberg et al., 2016, p. 322). Additionally, language was seen as a barrier from being informed about risk and being able to advocate for themselves, as well as personality and assertiveness (Rosenberg et al., 2016).

Recommendations for patients about ways to stay safe while in hospital in the United States have been given by some hospital staff and the Pennsylvania Patient Safety Authority (Gagné, n.d.). These included asking questions ahead of time about the allergy prevention processes in the food services department, identifying your allergies with the "head nurse" and to request an allergy alert bracelet. Other recommendations included not eating food delivered by staff if there are any issues with what is provided, as well as asking for alternative options like putting the patient's own allergy-safe food in a fridge at the nurse's station.

Further research into patient and parent-of-patient expectations and feelings of safety in relation to nurses' expectations when the patients have food allergies or allergies in general is warranted as there appears to be a disconnect in what is expected of patients and what is age appropriate for patients with food allergies. Additionally, future research investigating nurses' experience with fulfilling food allergy prevention actions in addition to COVID-19 protocols would be beneficial to understand how food allergies fit with the demands of COVID-19.

Shared Responsibility between the Hospital and Patients. For shared responsibility, most participants indicated that hospital staff were part of the shared responsibility, as well as Patient 1, Patient 2, and their families. This indicates that there are multiple people involved in ensuring safe admission and care for the patient. The participants also suggested that Patient 1 should know how to use his auto-injector and that he is responsible for being careful. As a reminder, Patient 1 is 4 years old, and Patient 2 is 6. Patient 1 is very young to be trained on auto-injectors, but Patient 2 may be old enough according to allergists surveyed by Simons et al. (2012).

The age-based allergy knowledge described by Simons et al. (2012) should arguably be known by nurses so that it can help with the shared responsibility. Some nursing student participants have expectations of their young patients that are justified given the work by Simons et al. (2012), but it would be useful for the nursing students to learn that children under 6 typically are not expected to "take responsibility for learning to self-inject epinephrine" (p. 323). The findings in Simons, Sicherer et al. (2013) support the findings of the present study that demonstrated some participants identified the need to teach the patient about his allergy, and understand his comprehension level, and

recognized that the patient may be at a different stage of allergy education comprehension.

For example, some allergists Simons et al. (2012) surveyed did mention that children less than 6 years old should be able to describe some anaphylaxis symptoms, as did parents or caregivers of children and teens, who felt that under the age of 6 was a time to start transferring the responsibility of allergies to their child (Simons, Sicherer et al., 2013). Interestingly, Simons, Sicherer et al. (2013) did find that parents and caregivers felt that children under 6 could take on the responsibility of recognizing that they need to have EAI, demonstrate self-injecting, carry EAI and be responsible to learn how to self-inject, and even to the point of being able to self-inject, though the percentage of caregivers that gave these responses was always less than 25%, and shrunk for each additional responsibility. Factors of readiness for allergy responsibility may be of importance for nurses (and nursing students) to know to be able to better understand their patients and better support their patients based on their needs and abilities. For example, certain readiness factors that Simons, Sicherer et al. (2013, p. 309) found from caregivers that include, "a history of anaphylaxis that is severe or life-threatening…", having had "…anaphylaxis triggered by an allergen (eg, [*sic*] peanut) known to cause fatality…", being able to explain why someone needs to inject, and use a training EAI correctly.

How participants discussed the concept of allergy education levels indicates some demonstration of expected responsibility of knowing how to protect oneself (the patient), and to understand what allergies mean. These two points about educating the patients and being aware of their education level are necessary, because if the patients are young, it is important that action is taken to gather as much information as possible about the

patient's allergy, but also to understand what the patient knows, as there are differences in expectations of what youth should be responsible for with respect to their allergies at various ages, as discussed above.

Finding 3: Assessing Risk of an Allergic Reaction in Hospital

Regarding risk assessment, many of the nursing students in this study acknowledged the risks that are present in the hospital and provided high risk scores out of a scale of 1 (not at all) to 10 (absolutely). However, participants provided a moderate risk score when their associated comment mentioned other health concerns, or other reasons not quite related to FA as the reason for choosing that score.

Two perspectives of risk can be applied to this assessment of allergic reaction risk: the first focusing on how nurses (or nursing students) orient themselves towards risk; and the second pertaining to predicting risk of allergic reaction severity, which will be discussed below.

Nurses and Risk Taking. How student nurses arrived at the risk assessment is important to consider, because nurses (and nursing students for the sake of the present study) make many risk assessments when caring for their patients. Dobos (1994) addressed how taking risks for oneself is important in a nurse's job, and nurses engage in risk assumptions that include looking at how the risk affects their patients, their own personal life, and the individuals that they work with at the hospital (Dobos, 1992). These assumptions can impact how they take personal risks to improve their own career, and for their patient's best interests. Dobos (1994) highlighted the risk-taking characteristics of nurses, in relation to risk models, such as the Personal Risk Taking (PRT) that has the Risk Appraisal and Coping (RAC) model that Coyne and Lazarus (1980, as cited in

Dobos, 1994), and Stallen and Tomas (1985, as cited in Dobos, 1994) created (see also Stallen & Tomas, 1988). This model may provide insight as to the process of risk assessment nurses went through when answering the vignette question about risk of an allergic reaction. The model encompasses the questions that nurses would ask themselves during the risk-taking process, such as the likelihood of getting into trouble, and the benefits and costs to themselves because of the risk. Importantly, nurses' (and nursing students) focus is to have the best interests of their patient in mind (Dobos, 1994).

However, if there are competing priorities, as discussed previously, or if there is a lack of FA experience beyond basic FA knowledge, nurses may not understand some of the nuances of FA, and it poses the question if nurses with scant FA knowledge would be more risk taking than those with more FA experience. This would be especially worth reviewing when there are other concerns, like a risk of infection, and other priorities like those mentioned in Table H3, competing for the nurse's attention. While some participants mentioned that as long as certain steps are taken, there should be no risk of a reaction, it is worth noting that some allergens can appear very easily, despite careful steps taken.

The present study focused on the patient, and the patient's best interests; however, the component of nursing and risk assessed was a nursing student's ability to assess the risk of an allergic reaction in a patient. Their responses to other vignette questions demonstrated looking out for their patient's best interests, where some focused on the patient's social well-being, and some suggested alternatives ways for the patients to safely interact due to their current recovery status. While this study did not use any risk measures, the likelihood to act (bystander) factor evaluated in the WilRAFAE (Kagan,

2018) may be helpful in addressing the community aspect of risk taking. However, it still does not address the likelihood of mitigation measures that the participants would take to prevent an allergic reaction in hospital, other than what they list that they have learned about, or that they discuss is a competing priority or action. What is known about nurses and risk taking, is that many factors impact a nurse's risk taking such as situational factors like knowing, predicting and influencing the outcome (Dobos, 1994). If lack of time is a situational factor that introduces a barrier to performance (Blumberg and Pringle, 1982), allergy prevention steps may not be easily enacted, as noted by a participant, for example, when responding to the patient experiencing an emergency is top priority.

Reaction Severity Risk. Although students were asked to provide a rating for the risk of allergic reaction occurring in the vignette, it is worth noting that they acknowledged their inability to provide full details because they needed additional information not included in the vignette to answer. This makes sense, as Lieberman et al. (2015) have highlighted that predicting reaction severity is not feasible. Reasons for this include different risk factors such as reaction history, type of allergy, other comorbidities (as explained in the next section), among others (Liberman et al., 2015).

Finding 4: Responding to An Allergic Reaction in Hospital Care

Identifying Symptoms of an Allergic Reaction and Differential Diagnosis. The common symptoms of FA like hives, swelling, shortness of breath, and itching were correctly identified the most. These are often mentioned in the media more (i.e., Opper, 2015), for example, Ross Geller from *Friends* starts talking differently after eating a Kiwi lime pie, (which he is allergic to) because his tongue was swelling/itching (Crane et

al., 1995) These common (i.e., Simons, Ardusso et al., 2013; see also Lieberman et al., 2015, Table I-1) symptoms were noted by our participants but 20% of participants did not identify all symptoms like pain or cramps, weak pulse, diarrhea, a drop in blood pressure, and dizziness or lightheadedness.

The concern about this is that it is possible for these less common reactions to occur quietly without notice. These symptoms may be early warning signs that symptoms with greater reaction and severity may appear, or that some reaction has occurred in relation to something that the individual was exposed to. In this vignette, because Patient 1 (Jake) has had an appendectomy, it is likely that most participants would expect gastrointestinal (GI) tract symptoms (like pain and cramps) after Patient 1's surgery (as one participant mentioned "checking for bowel movements" and "intake/output" as part of post-op care during the competing priorities part of the vignette). This may also explain why at least one participant asked about differentiating diagnoses. With co-morbidities, and other health conditions that can present similarly to FA, it can be more difficult to identify that FA reaction is taking place if one has limited information about the scene (i.e., Shroba 2020).

In the present study, some participants focused on identifying a trigger, which is important, and should be done, however, it is critical to acknowledge that there might not always be a known trigger. There are diagnostic criteria by Sampson et al. (2006) to help identify if anaphylaxis is likely occurring in a patient of any age. These criteria include whether the patient has a known allergy, and symptoms that are presented. When the patient's allergy status is not known, more strict criteria are used, such as a "known allergic history" or the probability of exposure to allergen, followed by having "specific

symptoms in at least two of four defined organ systems (skin/mucosa, respiratory, cardiovascular, and gastrointestinal). If there is no confirmed exposure, a diagnosis of anaphylaxis requires symptoms involving the skin or mucosa as well as symptoms indicating respiratory problems, as well as possible "end-organ disfunction" (Sampson et al., 2006).

Overall, while some participants explicitly stated that they needed additional information before taking specific actions or making decisions about handling the situation the patient was experiencing (see Chapter 6: Results: Steps to Treat a Suspected Allergic Reaction), and others stated they would ask further questions, some did not make it clear that they would seek more information. When participants did indicate a need for more information, they provided hypothetical courses of action that would be taken dependent on the Patient 1's allergy. This is demonstrative of the skills from clinical judgment (Tanner, 2006), where participants used *analytical processing*, by making decisions and determining best courses of action with incomplete information. Additionally, participants displayed information seeking skills, part of the effective noticing domain from the Lasater's Clinical Judgement Rubric (Lasater, 2007), as they identified when they needed to seek out further information about the patient in order to make decisions about treatment actions.

A caveat related to the above comes from Shroba (2020) who highlighted that some patients, especially infants, may not present easily identifiable symptoms. Many symptoms such as drooling and crying frequently appear with other health conditions in children, (Rudders et al., 2011; Simons & Sampson, 2015), or it may be seen as acceptable for the child (i.e., Dosanjh, 2013). This piece of information is important,

because the issue of differentiating diagnosis of anaphylaxis or allergic reaction from something else like an infection or related to Patient 1's recovery from an appendectomy, was mentioned by participants.

Overall, it would benefit nursing students to review all possible signs and symptoms of allergic reactions, and how they may present in different age groups. It would also help them to learn how to differentially diagnose anaphylaxis from other similar looking health conditions.

Treatment of Allergic Reaction.

Epinephrine Injection. Interestingly, there was some inconsistency regarding nursing students' views of the best position for delivering the epinephrine intramuscularly (e.g., "sitting", "laying down", or "tripod") and this inconsistency aligns with recent recognition that there is no one best position for epinephrine administration (Wang et al., 2021). The best course of action is to give epinephrine immediately during anaphylaxis.

***Approaches to Responding to Suspected Allergic Reaction*.** Based on the findings from Chapter 6: Results: Responding to a Suspected Allergic Reaction, it appears that nursing students had generally similar approaches to treating a suspected allergic reaction (possible anaphylaxis) in Patient 1, although there were slightly different details provided. The differences in details may be due to the minimum amount of information being provided (i.e., satisficing, Krosnick et al., 1996), or a lack of knowledge in the area. This suggests that although reviewing procedural steps for treating and responding to allergic reactions and anaphylaxis may be useful for these students this particular shortcoming may be an artifact of the study. Nonetheless, reviewing steps for different healthcare settings may be useful, as different nursing roles may require the same and specialized steps. For example, while the steps appear to be similar, there are

steps for recognizing and treating FA, ie., in an allergist's office (Lieberman et al., 2015) and in other healthcare facilities (i.e., Sampson et al., 2006).

Limitations and Future Directions

The main limitation is response rate. An initial power analysis revealed a need for over 100 participants but only 70 participants accessed the survey and of those only 39 participants met exclusion cut-off criteria, as described in the consent form, Appendix E. This is a comparable response rate to the study of allergists (Simons et al., 2012). Because of the low response rate certain analyses were deemed inappropriate (as explained in Appendix J). For example, a linear regression with a single predictor would have required at least 58 participants, to maintain a medium (.80) effect size (Green, 1991), as a result, and because some data were non-normal and missing, some analyses that used parametric tests and descriptive statistics in order to maintain some power, should be considered cautiously. For example, robust measures by trimming means could not be used in hypothesis 1. Additionally, normality could not be assumed when performing normality tests for analyses by Year of Study due to such small sample sizes and is therefore considered a limitation. Therefore, findings in this study are not generalizable, and require further study with larger sample sizes to investigate the findings further for their applicability.

Another limitation is that the WilRAFAE measure was initially used with a larger sample size, and therefore, psychometrics cannot be compared. Nonetheless the findings from this study provide a case or pilot study to understand the knowledge and understanding of FA in community settings at a local program level. Using this measure uncovered some discrepancies that are outlined in Appendix G.

Another limitation was the event of *satisficing* occurring during the responses of this survey (Simon 1957, as cited in Krosnick et al., 1996). Satisficing originally developed by Simon in 1957, defines using the minimal amount of work needed to make a sufficient choice (Krosnick et al. 1996). This may be an explanation for the lack of detailed response during this study, that Krosnick et al. (1996) suggested may be due to motivation issues. Krosnick et al. (1996) also explained that when individuals do not know this information, and are busy, it influences the likelihood of the work put into a task. Moreover, longer tasks may be associated with lower motivation to complete the task (Krosnick et al., 1996). To put this in context, participants may not have been completely familiar with the content and the nuances of everything as they did indicate, that may have contributed to less optimal responses, if some were guessing. Although some participants thoroughly gave clear and direct answers to the questions being asked, some responses gave only enough detail to complete the question but did not provide enough information to provide context or reasoning for the response. Some participants indicated that the options offered to them did not quite fit their opinions, so they had to pick the closest response to what they felt.

For future studies, it would be best to have more interaction, similar tools used in nursing clinical practices, and prompts to reduce satisficing. However, it is worth noting that vignettes do have a tendency to bring out satisficing in participants, and that specific laboratory conditions, such as a quiet space, can potentially reduce this in college students; since this study was conducted during COVID-19, having such conditions are not entirely feasible, as they were outside of the experimenter's control (Stolte, 1994).

Other satisficing-prevention techniques also recommend explaining the contribution of this study; this was available for participants to know at the beginning of the study. Perhaps reminding participants about the study's contribution may be beneficial, as well as to highlight accountability (i.e., Tetlock, 1983) to further encourage the use of providing reasoning behind respondent answers. In the future, providing clarified wording or another form of clarification would be beneficial for participants; however, this may be difficult to balance with prevention of leading questions in an online format. Krosnick et al. (1996) also indicated that satisficing can occur with factual knowledge, not just attitudes and beliefs.

Should the study be replicated, in order to achieve testing of the fourth hypothesis (originally the fifth hypothesis as referred to in Appendix J) that could not be conducted, providing an opportunity for participants to talk aloud about a vignette, or a more interactive scenario and question/answer period set-up of a study would allow for more reflective answering of questions. Additionally, providing improved wording of questions with examples may be beneficial to aid participants' understandings and help them produce clearer responses. Therefore, a longer survey or period of time with participants would be necessary for future studies. Similar studies have been done with clinical nursing scenarios among pediatric nurses to understand clinical decision making (i.e., Twycross & Powls, 2006), and others have highlighted the need to ensure response quality is evaluated as well, as there are differences in the types of information nurses at different stages of their career focus on, and that understanding clinical decision-making is complex (Long et al., 2007).

Although it was expected that some participants would not understand certain concepts due to their level of education, it was unclear at times from their responses if they fully understood the concept because they had not received certain education about the topic yet, or if they did not understand the question itself.

Some respondents did indicate that they felt they did not understand what the question was asking, and some questions were too “ambiguous”, but they did provide suggestions for clarification or reasons they felt the question was unclear. Additionally, when respondents did not understand the question, they either left it blank or just put “not sure”, even when asked to attempt the question despite feeling that they do not know the answer.

Although attempts to ensure relevant terms and items for participants were used in the study, the online nature of the study may have impeded the opportunity to provide clarification and reminders that even incorrect responses are accepted by the researcher. Therefore, some respondents may not have accurately responded or responses may have been misrepresented. Future online studies should establish reminders throughout the survey to encourage participants to try their best when answering the study.

Another limitation was the awareness by participants of their role in the vignette. A few participants throughout the vignette responses, and when responding to treating a suspected allergic reaction suggested calling 911, or calling for help, suggesting that they may not have understood the vignette (i.e., failed to understand they were to be answering as if they were in the nurse role). It may be that they were acknowledging that it is important to get additional help, were distracted from their current train of thought, or they thought they were in a community setting, or were reflecting a lack of knowledge

due to their position in the program. Future studies should incorporate a brief set-up of the scenario that includes the participant's imagined role. For example, in the WilRAFAE measure section (Kagan, 2019), informing participants to consider themselves as regular community members, whereas for the vignette, to imagine themselves as a nurse in a hospital.

An additional limitation is the timeframe allotted for the study. An ideal situation would have been to have participants complete the survey and then complete a post-test once two academic semesters had passed so that pre-and post-test scores could be compared. Themes would also be compared since responses would be fresh from the full year without a summer semester which can look very different for each student. However, due to time constraints and concern for participant attrition, only one time point was used, with Year 1 students representing a baseline education level. It is recommended for future studies to conduct pre-post tests and at different time points to gain more information. COVID-19 may have also impacted the method of education in the program where some clinical simulations had to be moved online, and the simulations, while being as realistic as possible may not represent complex comorbidities that would traditionally be seen in the hospital setting (Personal communication, June 4, 2020).

The findings of this study may also be biased as participants are only a sample of nursing students and those that knew of FA more may have been more willing to participate than those who did not know. Year 1 students made up the lowest sample group and may have been less willing to participate in the study because they may have felt that they didn't have enough information to participate in the study. Those that did

participate may have been more eager and that may have reflected the unexpected findings in hypothesis 1.

To summarize, since the study was hampered by a small sample size and by a lack of direction regarding the vignette, future directions recommend more individual qualitative interviews or focus group sessions, demonstration of their skills in a simulation, or the talking aloud method, and should involve another scenario or vignette as this was something that participants recommended. Another recommendation is to increase the sample size and look at more nursing programs across the province, specifically to include more experiences with allergies such as at a hospital with a food allergy center, to see if they respond differently and how nursing respondents with longer field experience answer the questions and provide their personal feelings about working in FA care. Additionally, it would be important to gather more perspectives of nursing faculty from this program and from others in the region, along with a snapshot of Canadian experiences with allergies and the hospital for a more extensive understanding.

Conclusion

This study provided the foundation for understanding how FA knowledge impacts the general care provided to a patient with FA. The findings may be beneficial for the nursing faculty to review and provide additional knowledge for their students in the classes they teach when talking about FA. As an alternative, it may be useful to provide resources and links for students to learn more about FA on their own if they have additional questions that go beyond the nursing field. It may also be worthwhile to provide students the opportunity to ask additional questions they have about a health condition they are learning about, since the lived experiences of people with health

conditions is not always clearly documented and taught in courses. It is expected that not all students are interested or willing to learn more about a concept taught in class but providing the resources may help with additional care. For example, some of the questions participants posed (see Table H8) have been addressed in literature in response to providing information for people that need to know (i.e., Lieberman et al., 2015).

The findings presented here can act as a catalyst for further exploration of nurses' experiences, attitudes and perspectives relating to general care for a patient with FA next. General protocols must be followed in healthcare like handwashing, but due to the known factors that influence performance, and other health concerns in the field, it is worth knowing how allergy prevention would fit in. With the onset of COVID-19 pandemic, specific protocols being followed for personal protection, and there being physical consequences if protocols are not followed, it is extremely important to capture this situation between what was done before (where possible), during, and post-COVID-19.

Although time in program and *Willingness* and *Readiness to Act* constructs did not emerge as statistically relevant variables, qualitative responses from nursing students suggest that there are additional tasks that should be taken when caring for a young patient with food allergies while in hospital. Generally, both the patient and the hospital staff (i.e., nurse), have responsibilities to ensure safe care like educating the patient about their allergies, engaging in handwashing procedures to prevent cross-contamination and ensuring patients do too, along with checking food, and monitoring patient interactions when the patient's roommate eats food with the concerning allergen. Findings also suggest that nursing students would benefit from additional education to support consistent allergy procedures between students, and to support their additional inquiries

beyond the education they currently have. It is clear nursing students have FA knowledge and can consider the implications FA may have on patient care in hospital.

This research expands on current education research and fills gaps of understanding the potential impact of FA knowledge on overall patient care, even when the patient isn't actively having an allergic reaction. This study provides nursing programs a starting place to review their current allergy curriculum for students, to help students improve their skills in caring for patients with allergies, and in turn to provide safer hospital environments for patients with allergies. This is only one part of a larger multistep process of a program evaluation and needs assessment to research food allergy knowledge among nurses in healthcare. Next is to identify areas where further education may be necessary to help improve the patient experience and nurse-patient relationship, to better understand the shared responsibilities and expectations between these parties.

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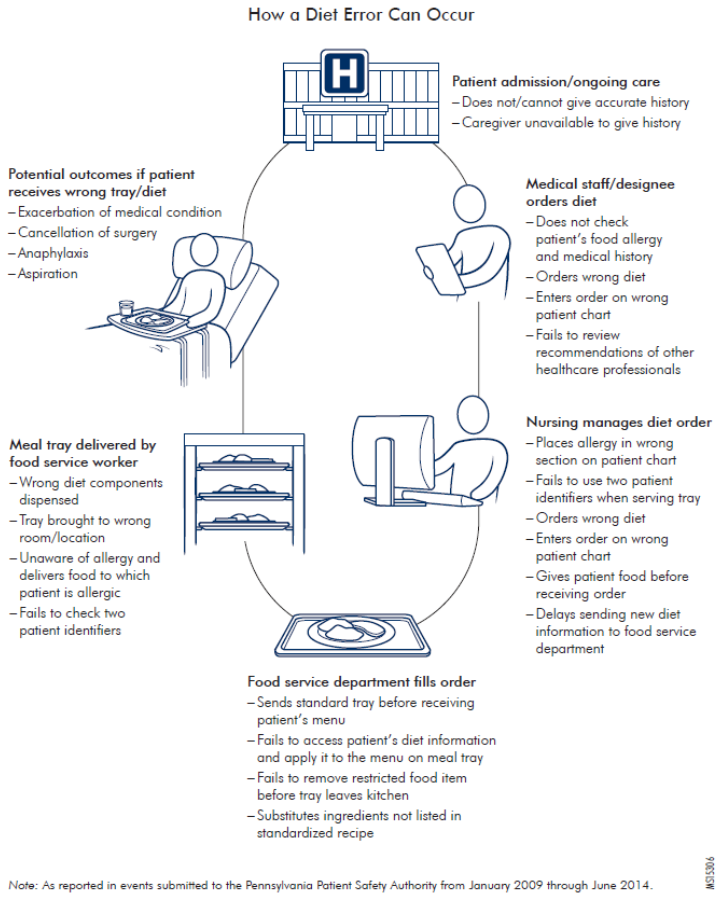
APPENDICES

Appendix A:

Figure

How a Diet Error Can Occur



Note. Figure of the ways diet errors can happen. Source: Patient Safety Authority. From "Delivering the Right Diet to the Right Patient Every Time," by S. C. Wallace, 2015, *Pennsylvania Patient Safety Advisory, 12*(2), p. 66, (https://www.researchgate.net/publication/278962675_Delivering_the_Right_Diet_to_the

_Right_Patient_Every_Time). Copyright 2015 Pennsylvania Patient Safety Advisory. Reprinted with permission.

Appendix B:

Clinical Vignette

Vignette 1:[2]

Jake, a 4-year old boy, was admitted with nausea and vomiting, a white blood cell count of 2 x 10^9/L, and pain at McBurney's point (right lower abdominal quadrant). His temperature was slightly elevated at 37.44 ℃. His allergies include food allergies to eggs, and he experiences hives and has an epinephrine auto-injector. As you admitted Jake, he experienced a sudden pain relief although nothing has been administered for pain management. You understand that this is a concern and notify the primary care provider. The primary care provider makes the diagnosis of appendicitis. Jake is taken to surgery immediately for an appendectomy.

Postoperatively he is given broad spectrum antibiotics and maintained on IV fluids for 24 hours. In the same room as Jake is a 6-year old boy, Michael, who also has had an appendectomy. Michael has resumed his normal diet slowly, a day ahead of Jake, and had ordered hard-boiled eggs for breakfast, and Jake, who cannot yet read resumes

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[2] Adapted from "Unfolding Case Study #14-5: McKenzie: Chapter 14: Nursing Care of Children with Gastrointestinal Health Care Needs," S. Parnell Sholtz, V. A. Martin, F. H. Cornelius, in R. A. Wittmann-Price (Ed.), *Pediatric Nursing Test Success: An Unfolding Case Study Review* (pp. 219-220), 2015, http://search.ebscohost.com.ledproxy2.uwindsor.ca/login.aspx?direct=true&db=e000xna&AN=834629&site=ehost-live&ebv=EB&ppid=pp_220. Copyright 2015 Springer Publishing Company. Adapted with permission.

his diet with some restrictions. Throughout the day, Michael will come over to Jake's side of the room to show him his toys.

Appendix C:

Survey Flow

Food Allergy Knowledge and Experience Among Nursing Students

Start of Block: Consent Form

See Appendix E.

Consent_1 Please respond:

Will you be asked about your personal experiences with food allergies?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Consent_2 Do you consent to participate? (To withdraw at this stage, click the No, I do not consent). Otherwise, please use the Withdraw button at the bottom of each page to withdraw throughout the study).

- ○ I consent. (1)
- ○ No, I do not consent. (2)

ConsentTime Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

End of Block: Consent Form

Start of Block: Year of Study

Year What year are you going into (or just started)?

- ○ First Year (1)
- ○ Second Year (2)
- ○ Third Year (3)
- ○ Fourth Year (4)

YearTime Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Year of Study

Start of Block: Food Allergy Experience

FAEx_INST ***Experience-Related Questions***
Please answer the following questions. REMEMBER: There are no right or wrong answers for the purpose of this study.

FAEx_1 What do food allergies mean to you?

_____

FAEx_2 Do you personally live with food allergies?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Display This Question:

If FAEx_2 = Yes

Or FAEx_2 = Maybe

FAEx_3 What types of food allergies do you have and how do you feel about your allergies?

_____

_____

_____

_____

_____

FAEx_4 Do you personally know someone who lives with food allergies?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

Display This Question:

If FAEx_4 = Yes

Or FAEx_4 = Maybe

FAEx_5 If Yes, explain your relationship with them and how you feel about their food allergies.

_____

FAETime Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Food Allergy Experience

Start of Block: Food Allergy Knowledge

FAK_INST ***Education-Related Questions***
Please answer the following questions. REMEMBER: There are no right or wrong answers for the purpose of this study.

FAK_1 Which nursing courses have you taken where you learned about food allergies or allergies in general?
What did you learn?

_____

_____

_____

_____

_____

FAK_2 Can adults have food allergies?

- Yes (1)
- No (2)

FAK_3 Do all allergies disappear as children get older?

- Yes (1)
- Maybe (2)
- No (5)

Display This Question:

If FAK_3 = Yes

And FAK_3 = Maybe

And FAK_3 = No

FAK_3exp Explain your response.

_____

_____

_____

_____

_____

FAKTIME Timing

First Click (1)

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End of Block: Food Allergy Knowledge

Start of Block: WilRAFAE

WilRAFAE_INST
Final WilRAFAE Survey[3]
The following survey is part of a study aimed at identifying individuals willing and ready to act in a food allergy emergency on a college campus.

WilRAFAE_DEM
DemographicsPlease answer the following questions

WilRAFAE_Dem4 How many children do you have? Mark only one oval.

- ○ 0 (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ More than 4 (6)

WilRAFAE_KNOW **Knowledge**
In this section you will be asked general questions about Food Allergies and Epinephrine auto-injector

[3] WilRAFAE items Adapted from "Development of a Measure to Assess Factors Associated with College Students' Willingness and Readiness to Act in a Food Allergic Emergency (WilRAFAE): A Pilot," by O. Kagan, 2018, *Cogent Psychology, 5*(1), Supplemental Material (https://doi.org/10.1080/23311908.2018.1549006). CC BY-NC. Adapted with permission.

WilRAFAE_KNOW8 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	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all knowledgeable											Very knowledgeable

WilRAFAE_KNOW9 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	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all knowledgeable											Very knowledgeable

WilRAFAE_KNOW10 Please read statements below and select True/False/ Don't Know for each statement. Mark only one oval.

	True (1)	False (2)	Don't Know (3)
Food Allergy involves immune system (1)	○	○	○
Severe allergic reaction can result in death if untreated (2)	○	○	○
In an allergic reaction Epinephrine should be used as a last line of treatment (3)	○	○	○
It is necessary to call 911 after using Epinephrine auto-injector (4)	○	○	○
Clothing must be removed in order to use Epinephrine auto-injector (5)	○	○	○
Fast heart beat can be a side effect of using Epinephrine (6)	○	○	○
Epinephrine auto--injector comes in two doses: adult and junior (7)	○	○	○
A main symptom of an allergic reaction is fever (8)	○	○	○
Only healthcare workers can administer Epinephrine auto-injector (9)	○	○	○
Food manufacturing recalls are often due to allergen contamination (10)	○	○	○

Anaphylaxis is a severe allergic reaction (11)	○	○	○
Anaphylaxis symptoms can occur suddenly and progress quickly (12)	○	○	○
Peanut is not one of the major allergens (13)	○	○	○
Lactose intolerance is different from allergy to milk proteins (14)	○	○	○
Epinephrine auto-injector contains needle (15)	○	○	○

WilRAFAE_FLCE **Familiarity/ Level of Contact/ Exposure** In this section you will be asked about your familiarity with Food Allergies and experience with Epinephrine Auto-Injector

WilRAFAE_FLCE11 Please read each of the following statements. After you read all of the statements below, click 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 (1)
- [ ] My job involves providing care services/treatment for persons with food allergies (2)
- [ ] I have observed, in passing, a person I believe may have had an allergic reaction (3)
- [ ] I have observed persons with allergies on a frequent basis (4)
- [ ] I have food allergy/allergies (5)
- [ ] I have worked with a person who had a food allergy in my place of employment (6)
- [ ] I have never observed a person that I was aware had a food allergy (7)
- [ ] My job includes providing services to persons with food allergies (8)
- [ ] A friend of the family has food allergy/allergies (9)
- [ ] I have a relative who has a food allergy (10)
- [ ] I have watched a documentary on the television about food allergies (11)
- [ ] I live with a person who has a food allergy/ allergies (12)

WilRAFAE_EE **Experiences/Exposure**

WilRAFAE_EE12 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.

	Yes (1)	No (2)
Self-injected at least once (1)	○	○
Injected a patient or client at least once (2)	○	○
Injected my child at least once (3)	○	○
Watched on TV (in commercial/ show) (4)	○	○
Injected my family member at least once (5)	○	○
Practiced with a trainer device (6)	○	○
Viewed demonstration (7)	○	○
Saw poster/ brochure/picture of injection (8)	○	○
Was a recipient of Epinephrine auto-injector (9)	○	○
Injected a stranger at least once (10)	○	○

WilRAFAE_EE13 On the scale from 1 through 10, how experienced are you in using Epinephrine auto-injector? Mark only one oval.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)
(1)	○	○	○	○	○	○	○	○	○	○

WilRAFAE_EE14 On the scale from 1 through 10, how experienced are you in using medications not related to Epinephrine auto-injector (examples: Insulin, Hormones, Epogen, Antiretroviral or other injectable medications)? Mark only one oval.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)
(1)	○	○	○	○	○	○	○	○	○	○

WilRAFAE_TRAIN **Training**
In this section you will be asked about you training in recognizing and treating an allergic reaction

WilRAFAE_TRAIN15 Have you ever been trained how to recognize an Allergic Reaction and how to inject Epinephrine AutoInjector? Mark only one oval.

- ○ Yes (1)
- ○ No (2)

Display This Question:

If WilRAFAE_TRAIN15 = Yes

WilRAFAE_TRAINED **Trained**

Display This Question:

If WilRAFAE_TRAIN15 = Yes

WilRAFAE_TRAINED16 Please select all that apply. I received training as part of my: Check all that apply.

- ○ Job Responsibility (1)
- ○ Volunteer Work (2)
- ○ First Aid Class (3)
- ○ Basic Life Support (BLS)/ Advanced Cardiac Life Support (ACLS) (4)
- ○ Parent/Caregiver Responsibility (5)
- ○ Social/Community Involvement (6)
- ○ Other: (7)

Display This Question:

If WilRAFAE_TRAINED16 = Other:

WilRAFAE_TRAINED16ot If you selected "Other" please explain.

_____

WilRAFAE_NOTRAINED **Not Trained**

WilRAFAE_NOTRAINED17 How willing are you to be trained in recognizing an allergic reaction and acting in an allergic emergency? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all willing	○	○	○	○	○	○	○	○	○	○	Very willing

WilRAFAE_Conf **Confidence**

WilRAFAE_Conf18 On the scale from 1 through 10, 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	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all Confident	○	○	○	○	○	○	○	○	○	○	Very Confident

WilRAFAE_Conf19 On the scale from 1 through 10, 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	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all Confident	○	○	○	○	○	○	○	○	○	○	Very Confident

WilRAFAE_BYST **Bystander**
Please read the following scenario and respond to question below.

WilRAFAE_BYST20 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 (1)	Probably Not (2)	Neutral (3)	Probably Yes (4)	Definitely Yes (5)
I would help if no one else intervened (1)	○	○	○	○	○
Someone else should intervene (2)	○	○	○	○	○
I would help if asked (3)	○	○	○	○	○
I would feel guilty if I did not help (4)	○	○	○	○	○
If my actions will save a life I would intervene (5)	○	○	○	○	○
I would call 911 (6)	○	○	○	○	○
I would help inject Epinephrine auto-injector (7)	○	○	○	○	○
I would walk away (8)	○	○	○	○	○
It is my professional obligation to help (9)	○	○	○	○	○
It is my moral obligation to help (10)	○	○	○	○	○

WilRAFAE_FEAR **Fears**
You decide to call 911 and are instructed to use Epinephrine AutoInjector right away while paramedics arrive. You find instructions written on the Epinephrine AutoInjector device: 1) remove safety cap, 2) place injector firmly against outer thigh, and 3) hold in place for 5 seconds. You are also told that the device has a retractable needle, and you will not be able to see the needle. Please respond to questions below

WilRAFAE_FEAR21 Would fear of seeing blood or needle prevent you from helping? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all	○	○	○	○	○	○	○	○	○	○	Always

WilRAFAE_FEAR22 Would fear of being legally responsible or sued prevent you from helping? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all	○	○	○	○	○	○	○	○	○	○	Always

WilRAFAE_FEAR23 Would fear of being legally responsible or sued prevent you from helping? Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all	○	○	○	○	○	○	○	○	○	○	Always

WilRAFAETime Timing
First Click (1)
Last Click (2)
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End of Block: WilRAFAE

Start of Block: Vignette

Vignette_INST ***Scenario***
Please read the following scenarios and answer the following questions clearly.
REMEMBER: There are no right or wrong answers for the purpose of this study.

VIGNETTE_1INST **Vignette 1**

Jake, a 4-year old boy, was admitted with nausea and vomiting, a white blood cell count of 2 x 10^9/L, and pain at McBurney's point (right lower abdominal quadrant). His temperature was slightly elevated at 37.44 ℃. His allergies include food allergies to eggs, and he experiences hives and has an epinephrine auto-injector. As you admitted Jake, he experienced a sudden pain relief although nothing has been administered for pain management. You understand that this is a concern and notify the primary care provider. The primary care provider makes the diagnosis of appendicitis. Jake is taken to surgery immediately for an appendectomy.

Postoperatively he is given broad spectrum antibiotics and maintained on IV fluids for 24 hours. In the same room as Jake is a 6-year old boy, Michael, who also has had an appendectomy. Michael has resumed his normal diet slowly, a day ahead of Jake, and had ordered hard-boiled eggs for breakfast, and Jake, who cannot yet read resumes his diet with some restrictions. Throughout the day, Michael will come over to Jake's side of the room to show him his toys.

VIGNETTE_1a Please identify the top 3 to 5 priority-related actions that would be taken when interacting with this patient.

_____

_____

_____

_____

_____

Display This Question:

If If Please identify the top 3 to 5 priority-related actions that would be taken when interacting with this patient. Text Response Is Not Empty

VIGNETTE_1b What potential competing priorities may occur with and complicate caring for this patient with food allergies?

_____

_____

_____

_____

_____

VIGNETTE_1c What factors influence the shared responsibility when interacting with this patient?

_____

_____

_____

_____

_____

Vignette_1d Was something given for pain before Jake experienced relief?

_____

Vignette_1e Do you feel that a risk of an allergic reaction is a major concern here? Please rate on a scale of 1 to 10.

	1	2	3	4	5	6	7	8	9	10	
	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	10 (10)	
Not at all	○	○	○	○	○	○	○	○	○	○	Absolutely

Vignette_1eExp Explain why you chose the rating you picked.

_____

_____

_____

_____

_____

Vignette_2INST You arrive to do you rounds. You notice Jake, your patient, has been coughing and his voice sounds off. You determine that there might be an allergic reaction occurring.

Vignette_2a What symptoms do you check for with this 4 year old patient?[4]

- [ ] Swelling of tongue, lips, face (2)
- [ ] blurred vision (37)
- [ ] itching (3)
- [ ] unusual thirst (36)
- [ ] coughing (6)
- [ ] foamy urine (34)
- [ ] hives (1)
- [ ] shortness of breath (7)
- [ ] throat tightness (10)
- [ ] loss of appetite (38)
- [ ] watery eyes, sneezing (12)
- [ ] nausea (14)
- [ ] pain or cramps (15)
- [ ] low blood sugar (35)
- [ ] diarrhea (17)
- [ ] swollen ankles and feet (24)

- [ ] skin with a blueish colour (18)
- [ ] weak pulse (19)
- [ ] weight loss or gain (23)
- [ ] drop in blood pressure (28)
- [ ] distended abdomen (31)
- [ ] dizzy or lightheaded (21)
- [ ] warmth (32)
- [ ] blue urine (33)

Vignette_2b What steps do you take to treat this allergic reaction? Write them out step by step. Please indicate if you are describing severity.

_____

_____

_____

_____

_____

[4] Symptoms (i.e., Canadian Diabetes Association, n.d.; Food Allergy Canada, 2019b; Mayo Foundation for Medication Education and Research, n.d.-a, n.d.-b; National Kidney Foundation, 2020).

VignetteTime Timing
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End of Block: Vignette

Start of Block: Personal Questions about Food Allergies

QUEST_INST ***Questions about Food Allergies***
Please respond in question-based answers.

QUEST_1 Do you have questions about Food Allergies? These can be anything about how someone might live with allergies, how they might feel, or anything more you'd like to know about. Please write as many as you have, and number them.

_____

_____

_____

_____

_____

QUEST_2 How did you feel about this survey?

	Extremely satisfied (11)	Moderately satisfied (12)	Slightly satisfied (13)	Neither satisfied nor dissatisfied (14)	Slightly dissatisfied (15)	Moderately dissatisfied (16)	Extremely dissatisfied (17)
Please indicate. (2)	○	○	○	○	○	○	○

QUEST_3 Did you feel like you could confidently answer the questions based on your current knowledge?

	A great deal (32)	A lot (33)	A moderate amount (34)	A little (35)	None at all (36)
Please indicate. (31)	○	○	○	○	○

QUEST_4a Were there any questions you felt were not familiar to you? Please indicate yes or no.

○ Yes (1)

○ No (2)

QUEST_4b Were there any questions you felt were not familiar to you? Please explain.

_____

_____

_____

_____

_____

QUEST_5 Do you have any suggestions about the material or types of questions? Please list them.

_____

QUESTTime Timing
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End of Block: Personal Questions about Food Allergies

Start of Block: Demographics Questionnaire

Dem_Inst ***Demographic Questions***
Please answer the following questions.

Dem_1 Which program do you belong to?

- ○ [University Name & Program Withheld] ([The University] Only) (1) Site A
- ○ [College Name & Program Withheld] (2) Site B
- ○ [College Name & Program Withheld] (4) Site C

Dem_2 Are you taking another major or minor program in addition to your nursing program at the same time? If so, please specify.

- ○ Yes (1)
  _____
- ○ No (2)

Dem_3 Have you completed a clinical placement(s)?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Dem_3 = Yes

Dem_3a If you selected "Yes" to completing clinical placement(s), please indicate the setting(s) you have worked in. Do not provide any identifying details about your placement, except for the setting.
For example: hospital, long term care, nursing home, school, community, etc.

- ☐ Hospital (1)
- ☐ Long Term Care (2)
- ☐ Nursing Home (3)
- ☐ School (4)
- ☐ Community (5)
- ☐ Other (6) _____

Dem_4 Did you come to the nursing program directly from high school?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Dem_4 = No

Dem_4a Did you come from a health-related program/job? If you did, please explain.

- ○ Yes (1) _____
- ○ No (2)

Dem_5 Do you have or did you have a health-related job before or while concurrently being in the nursing program.

- ○ Yes (4) _____
- ○ No (5)

Dem_6 Please indicate the ethnicity that best represents you.

- ☐ Black (1)
- ☐ African Canadian (2)
- ☐ Indigenous People (3)
- ☐ Asian Canadian (4)
- ☐ Pakistani Canadian (5)
- ☐ American (6)
- ☐ White (7)
- ☐ European Canadian (8)
- ☐ Arabic Canadian (9)
- ☐ Ethnicity not listed here (10)

_____

Dem_7 What is your age in years?

_____

Dem_8 What gender do you best identify with?

_____

DemTime Timing
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End of Block: Demographics Questionnaire

Start of Block: Participant Letter of Explanation

JS

Please see Appendix F for Letter of Explanation.

LetterTime Timing
First Click (1)
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Page Submit (3)
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End of Block: Participant Letter of Explanation

End of Block: Question to Proceed to Compensation

Start of Block: Question to Proceed to Compensation

CompensationQ Would you like to receive a $5.00 CAD electronic [The University] gift card? Remember, this information is kept separate from your participant data. Information will be shared with [The University] Card office only.

- ○ Yes (1)
- ○ No (2)

CompTime Timing
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Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Question to Proceed to Compensation

Compensation Survey:

Compensation Information for Food Allergy Knowledge and Experience Among Nursing Students

Start of Block: Default Question Block

Q3 If you would like to receive a $5.00 CAD electronic [The University] gift card, please fill out the information below. You can only be entered once. Remember, this information is kept separate from your participant data. The following information will be shared with [The University] Card office only. Please check your [The University] account late September 2020 for deposited compensation.

Q1 Please write your full name and [The University] student number.

- First Name (4) _____
- Last Name (5) _____
- [The University] student number (6) _____

End of Block: Default Question Block

Participants are now presented with the Letter of Explanation (See Appendix F).

Withdraw Form:

Withdrawal for Food Allergy Knowledge and Experience Among Nursing Students

Start of Block: Default Question Block

Withdraw You have now withdrawn. Your data will be destroyed and not used in the study.
Thank you.
Please click the next button to proceed to the letter of explanation, and close the browser after viewing/printing the letter.

End of Block: Default Question Block

Participants are now presented with the Letter of Explanation (See Appendix F).

Appendix D:

Letter of Recruitment

Greetings Nursing students,

You are invited to participate in an online study from the [Psychology Department] at the [The University], led by graduate student **Aleksandra Redko**, for the completion of a Master of Arts thesis. This work is supervised by [Supervisor 1] and [Supervisor 2] . This study has been cleared by the [The University] Research Ethics Board.

The purpose of the study is to evaluate nursing students' understanding and knowledge of food allergies from their current curriculum. As a result, understanding the impact food allergy knowledge in nursing education has on nursing students will identify if there are gaps that need to be addressed (if any), and where. It will also provide an opportunity for nursing students to provide input as to what questions nursing students have about food allergies, and their feedback about the topic and study.

The total time to complete the study should take no longer than 30 minutes, and should be done in one sitting at any time that is convenient to you. This study should be done using a laptop or desktop computer, otherwise you may experience issues with viewing the study properly. Please ensure that you do not have any distractions during the time you complete this study, and please use your own knowledge to answer the questions. You must **be currently registered at the [The University] for the upcoming Fall 2020 semester** in order to participate.

To participate in this study, please click on the link below which will take you to Qualtrics, a secure questionnaire website, and review the consent form before proceeding and reading instructions. Please take your time to read the instructions and answer as best as you can. Even if you do not know the answer, put as much information as you know/can. There are no wrong answers for the purpose of this research study. Please do not use any resources to assist you; only your personal knowledge. Please note: Your responses to this survey have no impact on your academic performance, and no individual responses and no personal information will be shared with the Faculty of Nursing, only results at a group level (i.e. year of study).

Please note: responses must be 75% incomplete, and completed in more than 10 minutes in order to be eligible for the gift card compensation. In thanks for participating in this study, upon completion of the study you will be asked to complete a separate form providing your name and email to receive $5.00 CAD [The University] gift card. Please check your [The University] student account for disbursement of compensation during late September 2020. You will not be contacted after this study.

If you have any questions, please contact **Aleksandra Redko** (([email])) for further information.

If you would like to participate, please click on the following link: [link]
Deadline to participate: **Saturday, September 19th, 2020.**

Appendix E:

Consent Form

[The University logo]

CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: **Food Allergy Knowledge & Experiences Among Nursing Students**

You are asked to participate in a research study conducted by **Aleksandra Redko, under the supervision of [Supervisor 1] & [Supervisor 2]** from the [Psychology Department] at [The University] for the purpose of a Masters of Arts Thesis.

If you have any questions or concerns about the research, please feel to contact Aleksandra Redko at ([email]) (Phone Number) or co-supervisors [Supervisor 1] at ([email]) (Phone Number) or [Supervisor 2] at ([email]) (Phone Number).

PURPOSE OF THE STUDY
The purpose of the study is to evaluate nursing students' understanding and knowledge of food allergies from their current curriculum.

PROCEDURES
If you volunteer to participate in this study, you will be asked to:

Complete a series of questionnaires, read a clinical scenario and answer as best as you can via an online study. You will also be able to ask questions that you may have about food allergies and provide feedback about the study. You are asked not to discuss details of this study with others to ensure confidentiality and accuracy.

The study will be as follows:

Food Allergy Experience: You will be asked to describe your knowledge of- and experiences with food allergies.
Food Allergy Knowledge: You will be asked to describe any previous food allergy training you have received, and what nursing courses you have taken that taught about food allergies, and other knowledge questions.
Willingness and Readiness to Act in a Food Allergic Emergency (WilRAFAE): You will be asked a series of questions about food allergies and be asked to rate your opinion to the questions about food allergies, and respond to a scenario.
Clinical Scenario: You will be asked to read and answer one scenario based on your current knowledge. Please answer as best as you can; it is ok if you do not know the answer for the purpose of the study.
Question Writing: You will be given the opportunity to ask any question(s) you have about food allergies, and provide feedback about the study.
Demographic Questionnaire: You will be asked general questions such as age, gender, ethnicity, year of program, if you are in the [Site B], [Site C], or [Site A] track, if you came directly from high school or not, and past experience with health-related programs.

The total time to complete the study should take no more than 30 minutes, and should be done in one sitting at any time that is convenient to you, before the deadline of September 19th, 2020

11:59pm. This study should be done using a laptop or desktop computer, otherwise you may experience issues with viewing the study properly. Please ensure that you do not have any distractions during the time you complete this study. Please do not use any resources to assist you, only your personal knowledge. You may print a copy of this form for your reference.
You will not be contacted after this study, except for the purpose of informing of your gift card compensation. In terms of compensation, you will be asked to fill out a form with your first and last name and [The University] Student Number if you would like to receive an electronic [The University] gift card.

POTENTIAL RISKS AND DISCOMFORTS

Potential risks may include eye strain or dry eyes due to staring at a computer screen for a prolonged period of time, however these are expected to be minor. You may experience feelings of discomfort when answering certain questions, although these are likely to be temporary, such as with disclosing experiences with food allergies, or with responding to food allergy knowledge and scenario questions. It is ok if you do not know the answer; just try to respond as best you can using your current knowledge. There are no wrong answers for the purpose of this study. Should you feel you do need emotional or mental health support, please refer to the [The University Counselling Services Name – withheld for confidentiality]'s; a link to their website will be provided on the Letter of Explanation at the end of the study.
You may experience concern about disclosing your personal information and knowledge, however no identifying information will be shared with the [Nursing Department]; all data will be described at a group level by year of study, and **will have no impact on your academic performance or future career plans.**
Since this is an online study and information is being transmitted through the internet and stored on a cloud for hosting surveys, there is a minor risk, however Qualtrics is a secure website and server host, and personally identifying information will be kept separate from your responses, to prevent the chance of linking your data. Data will be kept in encrypted files on password protected computers. Personally identifying information (for compensation purposes) will be shared with the [The University] Card office. After providing this information and receiving confirmation of disbursement from the [The University] Card office, this information will be destroyed. After 5 years, all data will be destroyed by the student researcher or co-advisors.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

Although there are no direct benefits to participants, they will reflect on their current nursing education, their knowledge and experience of food allergies, and may be encouraged to do their own research about food allergies to educate themselves. As well, they will be able to have input about their current nursing curriculum.

Understanding the impact food allergy knowledge in nursing education has on nursing students will identify if there are gaps that can be addressed, and where. It will also provide a snapshot as to what questions nursing students have about food allergies, and how nursing students are learning about food allergies.

COMPENSATION FOR PARTICIPATION

Participants who wish to fill out the link (First and last name and [The University] student number) at the end of the study will be entered in to receive a $5.00 CAD electronic [The University] gift card, as compensation for the study.

Participants who complete the study in less than 10 minutes and/or who do not complete more than 75% of the study are not eligible for the compensation.

CONFIDENTIALITY
Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission.
Participant data and compensation information will be kept separate using a link to separate your responses and your personal information.
Since this is an online study and data will be transmitted online and stored on the Qualtrics survey website, all steps to protect confidentiality will be taken as possible.
All personally identifying information such as your name and student number from the compensation link will be kept on the main researcher's personal computer in encrypted files, and compensation information and participant data will be kept in separate files. Participant data will be anonymized for viewing by coders/research assistants during data analysis for one section of the data. The [The University] Card Office will only have access to your name and student number.
All data will be stored on Qualtrics during the study period. Compensation data will be kept stored on Qualtrics until after Monday September 21, 2020 and will be destroyed after disbursement (late September). Participant responses will be held for 5 years, however it will be deleted off of Qualtrics after Monday September 21, 2020 as well. After 5 years, it will be destroyed by the researcher. If the study is published at a time in the future, no personal information will be discussed; any data will be discussed at the group level, and not at the individual participant level in subsequent studies, publications, or presentations.

PARTICIPATION AND WITHDRAWAL
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time. If you do not consent before starting the study, you can do so by clicking on the "No, I do not consent" button at the bottom of the consent form. Throughout the study there will be a button that will allow you to withdraw at any time by clicking "Withdraw", and you will access an exit message and letter of explanation.
If you do choose to withdraw, then your data will be excluded from the analyses, and will be deleted at the end of the survey deadline. If you withdraw, do not complete more than 75% of the study, and/or finish within 10 minutes or less, then you will be ineligible for the compensation of a $5.00 CAD [The University] gift card.
The investigator may withdraw you from this research if circumstances arise which warrant doing so. After your data is submitted by accessing the Letter of Explanation and going to the separate webpage for the compensation information, your data will not be available to be withdrawn as it will be kept separate from your participant data.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE PARTICIPANTS
Findings of this research conducted will be available for viewing on the REB's Summary for Participants platform at the end of September 2021. Please see link and date below.
Web address: [Research Ethics Board Summary Page link]
Date when results are available: September 2021

SUBSEQUENT USE OF DATA
These data may be used in subsequent studies, in publications and in presentations.

RIGHTS OF RESEARCH PARTICIPANTS
If you have questions regarding your rights as a research participant, contact: [The University Research Ethics Board Address & Contact information]

SIGNATURE OF RESEARCH PARTICIPANT/LEGAL REPRESENTATIVE

I understand the information provided for the study Food Allergy Knowledge & Experiences

Among Nursing Students as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

Click Here: **I consent.** Click Here: **No, I do not consent.**

Appendix F:
Letter of Explanation

Letter of Explanation

Study: **Food Allergy Knowledge & Experiences Among Nursing Students**
Dear Participant,

Thank you for participating in a study by Aleksandra Redko ([email]) from the [Psychology Department] under the supervision of [Supervisor 1] and [Supervisor 2].

Your participation in this study has helped to understand the type of information nursing students know at different years of the nursing program at the [The University] with respect to food allergies. The goal of the present study was to evaluate what nursing students are learning in their curriculum regarding food allergies.

For the purposes of this research study, there was no right or wrong answer; it was to establish an understanding and a baseline for food allergy education at the [The University] and to identify where improvements (if any) can be made. As mentioned in the consent form, your personal responses will not be made public to the [Nursing Department], and will have no impact on your academic performance. All data will be discussed at a group level (i.e. by year of study).

Thank you for your participation. Please do not share this information or details of the study to maintain confidentiality and the accuracy of the results. Should you need to seek emotional or mental health support, please refer to the [The University Counselling Services Name – withheld for confidentiality]'s Website: [The University counselling website – withheld for confidentiality]

If you have any further questions or concerns, please contact:
Main Researcher: Aleksandra Redko ([email])
Faculty Co-Advisor: [Supervisor 1] (([email]))
Faculty Co-Advisor: [Supervisor 2] (([email]))

Findings from this study will be made available after September 2021 on the [Research Ethics Board]'s Summary for Participants platform. See link: [The University Research Ethics Board study summary page link]

Compensation: If you fill out the compensation information to receive a $5.00 CAD electronic [The University] gift card, you will be contacted to receive the compensation late September. You can only receive compensation if you completed 75% of the study and in more than 10 minutes.

You may print this page off at this time before proceeding.

Appendix G:

Discrepancies Identified with WilRAFAE Measure

With the WilRAFAE, it is important to note some coding discrepancies between Kagan (2019)'s original coding scheme, and the performed coding for the present study. Specifically, it was not explicitly clear that the FEAR factor scores that form the *Willingness to Act* construct were to be reverse coded; the official coding scheme obtained from Kagan did not explicitly state to reverse code, therefore initial interpretation would assume that those that scored high on each FEAR item, indicated lower fear score, that would be then interpreted as greater unwillingness to act, while lower fear numbers would then lead to higher scores and would be indicative of more willingness to act. Kagan (2018) however discussed that higher willingness scores are indicative of more willingness to act, and higher fear scores are more willing when joined with the Likelihood to React (Bystander) scores. Additionally, as explained in the coding of WilRAFAE, *Experience* scores for the *Readiness to Act* construct had to be recoded to 0 (No) and 1 (Yes), instead of 1 (Yes), 2 (No) as it currently stood, due to unusually high scores beyond the highest possible score. Additionally, there is a chance that individuals engaging in the self-assessment of FA knowledge score could end up carrying more weight when added to the knowledge score that is coded as correct or incorrect. Additionally, how the constructs of training were addressed could be improved, with further information about how they are calculated as contributing to the overall measure. Future use of this study would need possible revisions to refine the measure.

Appendix H:

Content Analysis Supplemental

Table H1

Themes of FA Content Learned in Program

Theme	Category	Code	Segment Examples Partially - Paraphrased
Theme 1: *Food allergies, Body Response, and how they differ from other intolerances / diseases,*	Differential Diagnosis	Basic FA, FA general; various allergies; food hypersensitivity; food intolerance; FA vs Intolerance; Allergy Vs Celiac; Intolerance enzyme inability breaking down proteins	"…Allergy and Intolerance is not the same, such as with lactose – in an allergy, the body sees dairy as foreign and the immune system responds, while intolerance is that proteins cannot be broken down by the body's enzymes."
	Long-term Prevalence	Child allergies; children outgrow; come common in kids; allergies leave when you get older; allergy lifelong; adult onset; prevalence in adults	"…not everyone can outgrow allergies – some do and some can even be diagnosed with allergies later in life."
	FA Body Response	Specific part of food; foods cause allergies; adverse reaction; body response; FA effects; severity increases with repeated exposure; severity varies; life threatening; immune response; overreaction of body; histamine; anaphylactic shock; allergies possibly fatal; fight or flight response	"…we were taught about allergies that can possibly result in death, as well as that allergy severity may increase if a person is repeatedly exposed to the allergen."

Theme	Category	Code	Segment Examples Partially - Paraphrased
Theme 2: *How to treat, and how to care for FA allergens*	Symptoms	Signs/symptoms; tongue swollen; throat swells; hives; itchiness in throat, mouth, ears; generalized hives; symptoms range	"…Also learned that common symptoms include the throat, mouth and ears being itchy."
	Patient Care	PANDAS food guide; health promotion; wellbeing promotion; child diet integration; dietary substitutions; impact on proper nutrition; gather allergy information; check allergies prior to medication administration; awareness; prevention; other allergies i.e. meds, food, environment; food substitutions to maintain nutrition; insight into nutrition	"…We were taught to gather patient's allergy information which includes medications, foods, and the environment during our assessments."
	Treatment	Auto-injector; epinephrine; necessity for hospital follow-up; effects of auto-injector; treatment; treat immediately; improve breathing	"…as well as the treatment for allergic reactions which is an auto-injector with epinephrine. It is used only in severe cases."
	Common Allergens	Common allergies; common allergens; peanuts; milk; wheat; nuts; shellfish; eggs	"…common allergies are taught (i.e., peanuts, milk, shellfish, eggs, etc.) and that patients in our care may have them."

Note. N = 39. Developed themes from open response questions about *What nursing courses have you taken that cover FA?*. *Auto-injector* is used due to EpiPen (Mylan Inc., Mylan Specialty, L. P.), being a trademarked product.

Table H2

Themes of What Food Allergies Mean to Nursing Students

Theme	Category	Code	Segment Examples Partially - Paraphrased
Theme 1: *Food Allergies involve a varied response in the body after an interaction with food,*	FA Referred to as a Sensitivity	Sensitivity; Hypersensitivity	"…can activate symptoms of hypersensitivity."
	FA Referred to as a Response / Reaction	Response; Body Response; Immune Response; Histamine distinguishes from Intolerance; Adverse Reaction; Physical; Recognition of Foreign object; Body; Effects; Consequences; Illness; Reaction; React; Issues	"Immune response has been activated."
	FA Mentioning Anaphylaxis	Anaphylaxis	"An anaphylactic shock can result."
	Symptoms	Symptoms; Varied Symptoms	"Examples of symptoms: hives, vomit, throat tightness, shock."
	Descriptors of FA	Minor; Severe; Dangerous; Varied Degrees; Localized; Systemic; Fatal; Negative; Mild; Important; Life-threatening; unpredictable; Harmful; Varied	"Varied responses: localized (minor) or life-threatening - widespread body response."

Theme	Category	Code	Segment Examples Partially - Paraphrased
	Source / Type of Allergy	Food; Food/ Proteins; Exposure; Airborne; Ingestion; Contact	"Reaction could occur after a specific food has been eaten, or if there is contact with the body (skin, mouth) or by inhalation."
Theme 2: *Food Allergies from a relational perspective*	General FA Comments	Food Services; Health & Safety; Customers	"It is important for Food Services to think about, regarding the health and safety of consumers."
	FA Relating to Respondents (Personal)	Being Around Loved Ones; Patient Care; Relevance; No Personal FA Danger; Acknowledgement	"FA are very relevant during patient care and when I am around people I love."
Theme 3: *Food Allergies Described as What Cannot be Done,*	FA as a Limitation	Inability to Eat; Avoidance; Impact Daily Life; Inability to Touch; Alter Life	"Can't eat specific foods."

Note. N = 38. Developed themes from open response questions about *What do food allergies mean to you?*.

Table H3

Mentioned Competing Priorities During the Care of Patient with FA

Theme	Category	Codes	Examples Paraphrased
Theme 1: Priorities Related to Allergies	Allergy-safe foods	Correct food; Difficulty finding allergy-safe food with dietary restriction; finding allergy-safe foods; restricted diet; allergy safe food may not be part of post-op diet; finding allergy safe foods that help with healing	"Due to dietary restriction, finding foods that the patient (P1) likes and do not contain their allergens could be hard."
	Allergy prevention	Avoiding cross contamination; allergy severity; interference with allergy management; allergy prevention; avoiding egg (ingestion & proximity); hand wash prior to patients interacting; separate spaces for eating; cross contamination during interactions; allergy exposure prevention; P1 allergy competence level	"There could be difficulty maintaining distance between the two children and avoiding cross-contamination."
	Interactions with other patient	Difficult separating kids; P2's food containing allergens; P2's food choices; patients sharing food; risk of reaction from patient interaction; no sharing between patients; no food sharing between patients	"Consideration of Patient 2's dietary requirements."
Theme 2: Priorities Related to Patient 1's General Care	Post-op care	Post-op care monitoring; post-op care recovery; infection prevention; differential diagnosis; post-op pain levels; pain affecting treatment compliance during allergic reaction; antibiotics working; preventing antibiotic reaction; sepsis prevention;	"Greater concentration on making sure that the antibiotics work, and that there is no reaction to the Antibiotics, as well as preventing sepsis from occurring."

Theme	Category	Codes	Examples Paraphrased
Regarding Admission		surgery recovery; infection monitoring; white blood cell count; internal infection; sepsis risk; life-threatening risk	
	Other care	Care for both patients; patient comfort; emergency responses supersede allergy prevention; airways, breathing, circulatory; awareness of patient needs and concerns; affect patient/nurse relationship; P2's dietary needs; Balancing P2's dietary/health needs	"The relationship between the patients and the nurses caring for them will be affected, as Patient 2 will be told about things he can't do, such as share items with Patient 1."

Note. n = 29. Developed categories from open response question about competing priorities that are anticipated during the care of a patient with FA.

Table H4

Mentioned Themes from Top Actions During the Care of Patient with FA

Theme	Category	Codes	Examples Partially Paraphrased
Theme 1: Actions Related to P1's Allergy	Allergy Prevention	Allergy alert bracelet; avoid cross contamination; cleaning room; clean toys; food free room; ensure auto-injector close by; have allergy signs near patient; observed eating (i.e., eat all, or remove); separate eating; verify meals prior to eating; clean surfaces.	"Avoid cross-contamination, have the patients stay separate, and remove food after observing mealtimes and if there's food leftover…"
	Patient Interaction	Avoid sharing food (patient interaction); avoid touching each other (patient interaction); not sharing toys; separate kids; avoid touching eggs (P1; observe patient interactions.	"Explain similarly to Michael [about allergies in an age appropriate way] and recommend washing his hands prior to interacting with Jake with his toys."
	Hygiene / PPE	Hand hygiene between patients; hand hygiene (both patients); patient 2 hand hygiene after eating; sanitize hands; sterilize shared items between patients (medical equipment); use fresh PPE between patients; P2 wash hands; P2 good oral and hand hygiene.	"Ensure that Patient 2 engages in hand washing before going close to Patient 1."
	Diet	Adjust patient 2 food based on patient 1 due to cross contamination; check for and order safe food for patient 1 (due to how young they are"; check what dietary restrictions are in patient 1 and what is involved (maintenance); observe diet; Avoid restart of patient 1 normal diet.	"Order Patient 1's meals based on his allergy, and due to not yet being able to read, assisting Patient 1 is needed."
	Allergy Education	Advise patient 2 about allergy alert; educate patient 1 about allergies using age-appropriate tools; educate	"Educate P1 about allergies using big pictures, that show and

Theme	Category	Codes	Examples Partially Paraphrased
		patient 1 on health development and general care re: allergies; educate patient 1 on not sharing food (due to age)- using age appropriate terms and tools; educate patient 2 and parents of patient 2 on allergies and prevention; educate patient 2 on recognizing signs of allergic reaction and next steps; patient 1 competence re: allergies; teach patient 1 & 2 on how to use auto-injector; know how to recognize allergic reaction (nurse); knowledge about P1 epi-pen (nurse).	help him comprehend what he can eat and what he cannot."
	Allergy Assessment	Assess allergy severity; check for allergies in P1; check for P1 antibiotic allergy; Gather allergy information from P1; further information about P1's allergies from guardian i.e., how P1 reacts; identify P2 allergies; gather info about allergies P1 (i.e., cause)	"Find out from Jake's mother if he has a reaction from eating or touching eggs, or from the air if he's close to eggs maybe?"
	Allergy Emergency Response	Administer epi-pen; call 911 (emergency); comfort patient 1 and family re: allergic reaction; check for administration of auto-injector.	"…check to see if he administered his epinephrine auto-injector."
Theme 2: Actions Related to Regular Care as Being a Patient in Hospital	General Care	Check for changes in patient's condition; check what medications patient 1 takes; patient 1 general care; safety; vital assessment; well-being.	"Check patient vitals…"
	Main Care Surrounding Admission	Antibiotic monitor; assess for infection; assess patient 1 has bowel sounds; avoid high antibiotic use to prevent future resistance; check for pain; check patient 1's diet in last few hours; infection control; infection monitoring; monitor intake and output; allow alternative interactions.	"Avoid excess antibiotics to prevent antibiotic resistance."

Theme	Category	Codes	Examples Partially Paraphrased
	Non-Allergy Education	Patient 1 education – re: surgery.	"Provide education to Patient 1 to ensure comprehension about the surgery and precautions to take post-operation."
Theme 3: Couldn't Respond	Don't Know Response	Don't know; respond.	"I'm uncertain about how to respond to this."

Note. n = 29. Developed themes from open response question about top actions to take when caring for patient with FA. Sometimes more than one category was identified in a response.

Table H5

Themes from Factors Affecting Shared Responsibility in Care of Patient

Theme	Category	Codes	Examples Partially Paraphrased
Theme 1: Factors that Pertain to the Patient's Care and Responsibility	Patient 1 (P1)	P1 diagnosis comprehension; P1 comprehension of diet; P1 comprehension of condition; P1 comprehension of prevention; should not follow normal diet; should know how to use EAI; education; difficulty with kids' comprehension is different than adults'	"…they [P1] can understand what they are diagnosed with, and can comprehend the restrictions of their diet that need to be taken."
	Patient 2 (P2)	P2 interactions; P2 cautious around P1; can eat without choice limitations; avoid close contact with P1 with food	"P2's interactions and the nurses' are factors that should have responsibility in interactions with P1."
	Parents	P2 family cautious around P1; Parents responsible for keeping patients safe; Parents monitor for egg brought to P1	"With P1 being young, the parents should be more responsible to make sure that the interactions between both patients do not create a risk."
	Other	Likelihood of cross-contamination; needs introduce conflict	"Conflict may arise from other patient needs."
Theme 2: Factors that Pertain to the Hospital's Care and Responsibility	Hospital Staff (HS)	Accessibility of Auto-injector; nurse (general); hand hygiene between patients; hand hygiene for contact with items in room; hand hygiene; allergy knowledge; medication care; communication with patient; correct meal delivery; educate P1 & P2; Care team allergy awareness; nurse communicating age appropriately; increased nurse attention of P1; balance social needs with allergy needs; awareness of allergy and protocol; know	"P1's epinephrine auto-injector should be close by and visible."

Theme	Category	Codes	Examples Partially Paraphrased
		who is aware of P1 allergies; contact awareness with P1; P1 wellbeing and interactions; primary care provider; education; knowledge; explain situation and narrate steps; nurse monitor for egg brought to P1	
Theme 3: Responses that Indicate Confusion About Shared Responsibility	Don't Know / Understand (DKU)	Not sure; Don't know; Don't understand	"I do not know."

Note. n = 28. Identified themes from open response question about factors that influence shared responsibility when caring for patient with FA.

Table H6

Risk Themes Identified Regarding Risk Assessment of Allergic Reaction

Themes	Category	Codes	Examples Partially Paraphrased
Theme 1: Risk Related to Factors Other Than Allergies, or Allergies Not of Concern	Other Health Concerns	Other high-risk concerns i.e., infections after surgery, complications, recovery[3]; burst appendix; P1 currently immunocompromised from medication; There are other important concerns[6].	"[Jake] is immunocompromised as a result of the medications he was given…"
	Other Reasons	Proper hand-hygiene – risk is not high risk (med – low); P1 isn't eating allergen; avoiding eggs in hospital should not be that difficult; if P1 & P2 were properly educated about FA, then comprehension should be good[2]; Hand hygiene prior to P1 and P2 interacting – reaction low risk.	"Jake is not eating the egg [allergen]."
Theme 2: Kids & Knowledge/ Understanding/ Awareness of Allergies	Not Knowing / Understanding Awareness	P2 may not know of P1 allergy; Kids may not understand what cross contamination is – thus P2 can put P1 at risk regarding allergen exposure; P1 unaware of allergy risk[3].	"Michael may not know that Jake is allergic to eggs."
	Kids are Typically…	P1 and P2 are kids and may not remember[2]; Kids may not pay attention ("not careful")[4]; Kids can be energetic and unpredictable[5]; Kids want to play with roommates; Kids don't remember to clean their hands – and also forget others' health status Kids often put their hands in their mouth – possible lead to cross-contamination[7].	"Kids often will not wash their hands before touching their mouth."
	Previous Allergy History	P1 info about hives and auto-injectors; P1 had a reaction before, and allergy reaction severity	"Jake gets hives and has an epinephrine auto-injector."

Themes	Category	Codes	Examples Partially Paraphrased
Theme 3: Other Allergy Related		increases each time an individual is exposed to the allergen.	
	Allergies and Medication	P1 had not been checked for allergies to antibiotics before administration of this medication; High risk for allergic reaction due to antibiotics administered without w/o allergy verification.	"Jake was administered *broad spectrum* of antibiotics without verifying his allergies."
	Allergies in General	Reaction risk could be dangerous and be fatal; allergies can be aggravated without treatment[6]; Risk of incorrect meal to P1; anaphylaxis"	" There is a chance for a mistake and Jake can get the incorrect meal."
Theme 4: Cross Contamination & Patients Interacting / Eating	Possible Source of Allergy	Possible contact allergy; Possible airborne allergy; Possible ingestion allergy; Risk of reaction from cross contamination – dependent on severity	"I'm not sure if his reaction is by ingesting [the allergen] only."
	Patient Interaction & Risk of Reaction & Cross Contamination	P2 eating food with allergen & near P1 – risk of second allergic reaction; P1 and P2 may share; Risk from sharing food with P2 & cross contamination; Others (nurse and caregiver) should keep P1 away from eggs since kids can put themselves at risk (eat & touch)[4]; P1 and P2 interacting (playing) – P1 may be influenced to eat "normal food" & possible contact with allergen;; Cross-contamination risk with proteins; Potential cross-contamination from toy sharing; Cross-contamination from toy sharing[7]; P2 may have egg (allergen) on himself.	"Michael (P2) got eggs for breakfast and Jake is continuously close by, which may risk a second reaction."

Note. n = 29. Many participants mentioned more than one theme, and more than one item within a theme. These themes are only counted once in analyses for just mentioning the theme. Some codes are not listed as they are similar to those listed here.

Table H7

Themes of Steps to Take to Treat Suspected Allergic Reaction

Themes	Category	Codes	Examples Partially Paraphrased
Theme 1: Providing Medical Treatment to the Patient	ACFC = Additional Care / Follow up Care;	Avoid 2nd hospital reaction by avoiding allergen; Administer oxygen if not enough; follow allergy protocols; change P1 diet and set up new one; follow up; follow-up care; provide EAI refill upon discharge; observe for needed 2nd dose	"If the patient doesn't have enough oxygen, provide them more."
	AM = Administer Medication;	Inject EAI; follow EAI instruction of injecting needle on outer thigh; inject EAI into side of P1 thigh – hold 5s; administer EAI upon receiving consent from P1; epinephrine; give medical treatment; anti-histamine; if no sign of anaphylaxis, administer Benadryl to P1; EAI; administer EAI; carefully inject EAI; administer something to treat allergic reaction; inject EAI ASAP; administer additional patient meds if available and should severity require them; administer meds for symptoms; administer epinephrine if no change	"Follow the instructions of the epinephrine auto-injector to inject on the outside of the thigh."
	Assessing Patient - Pre-Epinephrine Auto-Injector	Monitor reaction; see if P1 is communicating and ask if ingested eggs; give oxygen at the beginning; known P1 need EAI, so has severe allergy; assess scene and identify allergy trigger and remove; monitor P1 symptoms & if no improvement, severity increases, act; check	"Airway – if P1's voice sounds different, then that may mean their airway is potentially obstructed, and their throat is tight. P1 could have trouble getting enough oxygen supply,

Themes	Category	Codes	Examples Partially Paraphrased
		ABC's – Airway, breathing, circulation – each will indicate if allergic reaction happening; perform an assessment of vitals; ABC's (airways, breathing, circulation) and auscultate; perform assessment on patient for anaphylaxis; determine if allergic reaction occurring; identify source of allergic reaction; perform assessment and review P1 chart to figure out situation	which could mean he stops breathing…."
	Assessing Patient - Post-Epinephrine Auto-Injector	Identify the source of patient's reaction; Check vitals again; Observe P1's vitals, and determine if there is a therapeutic response from the Antihistamines; observe for improvement of symptoms; observe P1 for improvement; observe patient post administration of EAI; monitor patient's condition (changes); observe P1 for decline in condition/symptom improvement	"Check [the patient's] vitals again…"
	LCAI = Locate / Checking for Auto-Injector;	Find EAI; Have EAI ready or other treatment; know P1 has EAI, find it and verify appropriateness; have another nurse find EAI; check for P1 EAI	"Find the epinephrine auto-injector."
Theme 2: Working With the Patient Via Communication and Preparation for Treatment	COM = Communication;	Narrate steps to calm P1; Calm P1 and focus on calm deep breathing; Inform P2 to avoid P1 side; Reassure P1 and family	"Describe to Jake what you are doing to keep him calm…"

Themes	Category	Codes	Examples Partially Paraphrased
	PSPE = Patient Set-up / Environment;	Have patient sit to prevent falling if they pass out; Obtain help from P1 caregiver (mother) or another nurse to keep P1 down; Have P1 to tripod position; Clear the air; Move bring patient to different area; Sit P1 up to allow better flow of air; P1 lay on his back; P1 loose fit clothing and comfortably positioned.	"Make sure that Jake's wearing loose clothing and that he is in a position that is comfortable."
Theme 3: Getting Assistance from Others	CALL = Call 911;	Call 911; If indeed allergic reaction, call 911	"Call 911."
	GHNS = Get help / Notify Staff;	Contact a nurse using call bell to not leave P1 alone; alert doctor; call for additional nursing team members; get doctor to stabilize patient; alert primary care provider; call for assistance	"Contact another nurse with the call bell so you don't leave Jake alone."
Theme 4: Discussion of How Severity Impacts Actions	SR = Includes Separate Reference to Severity.	EAI is used in anaphylaxis situations; steps are for any severity; not related to a specific reaction severity	"[The steps] are not tied to any type of severity."

Note. n = 29. Many participants mentioned more than one theme, and more than one item within a theme. These themes are only counted once in analyses for just mentioning the theme. Auto-Injector is in reference to EpiPen (Mylan Inc., Mylan Specialty, L. P.), or Epinephrine Auto-Injector. Categories are based on how participants organized responses.

Table H8

Themes of Questions Participants had about FA

Theme	Category	Code	Examples Partially -Paraphrased
Theme 1: Epidemiological, Diagnostics, Long-term Prevalence	Incidence	Incidence of contact allergies; incidence of FA; Differences in incidence; increased incidence;	"What percentage of allergies are due to touch?"
	FA Precautions	Precautions of general allergy safety	"Outside of a nursing role, what steps should I take to protect someone from FA reactions?"
	Differentiating FA from Alternative Conditions	Differential Diagnosis; Safe Diagnostic Methods	"How would you know someone is having a FA reaction and not something else?"
	Outgrowing FA and Long-Term Prevalence and Prognosis	Reducing Long-term prevalence of FA; prognosis; long-term prognosis; differences in long-term prognosis;	"Why do some individuals outgrow their FA?"
	Coping	Coping with Allergies	"How would a person cope with having an allergy to a food they love?"

Note. *n = 12*. Developed themes from open response questions about *What questions do you have about food allergies?*.

Table H9

Themes for Questions about Unfamiliar Topics Covered in Study

Theme	Category	Code Examples	Examples Partially -Paraphrased
Theme 1: It was unfamiliar & I wasn't sure how to answer because …	Unfamiliar	Vignette unfamiliar; vignette questions; some unfamiliar allergy knowledge; don't know a lot about auto-injector	"*I found the scenario questions unfamiliar to me,* since I don't know a lot of information about auto-injectors."
	Uncertain Answering/Responding	Uncertain answering; T/F uncertain; no personal experience; unsure how to respond + i.e., steps for treating reactions; uncertain about responses + goal + wording issues; self-doubt; uncertain about how to do task; don't know answer; unsure	"The wording of the questions [made it unfamiliar]. *I was not sure if I was providing answers for what you were intending to find."*
Theme 2: I don't know about it (yet)….	Don't have the education/ Haven't learned about it yet	Need additional allergy training; hard to remember treatment steps; less obvious signs and symptoms; confused about identifying/ treating allergies + not learned about yet; no classes taken + didn't think vignette applied; not enough education; need more patient history information	"…I need additional information about Patient Jake's health history so I can answer accurately."

Note. *n = 12*. Developed themes from open response questions about *Were there any questions you felt were not familiar to you? Please explain.* Note that italicized segments of examples represent the meaningful unit from the original quote that related to the respective category.

Appendix I:

Example of Audit Trail

Figure I1

Organization of Example Coding of a Response

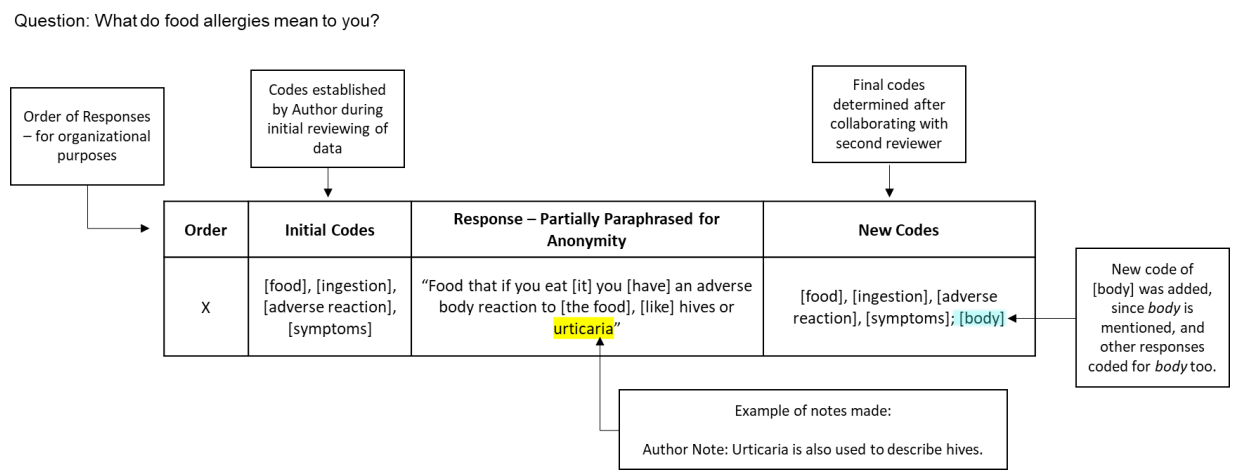


Figure I2

Example of Changes Made with Second Reviewer Collaboration

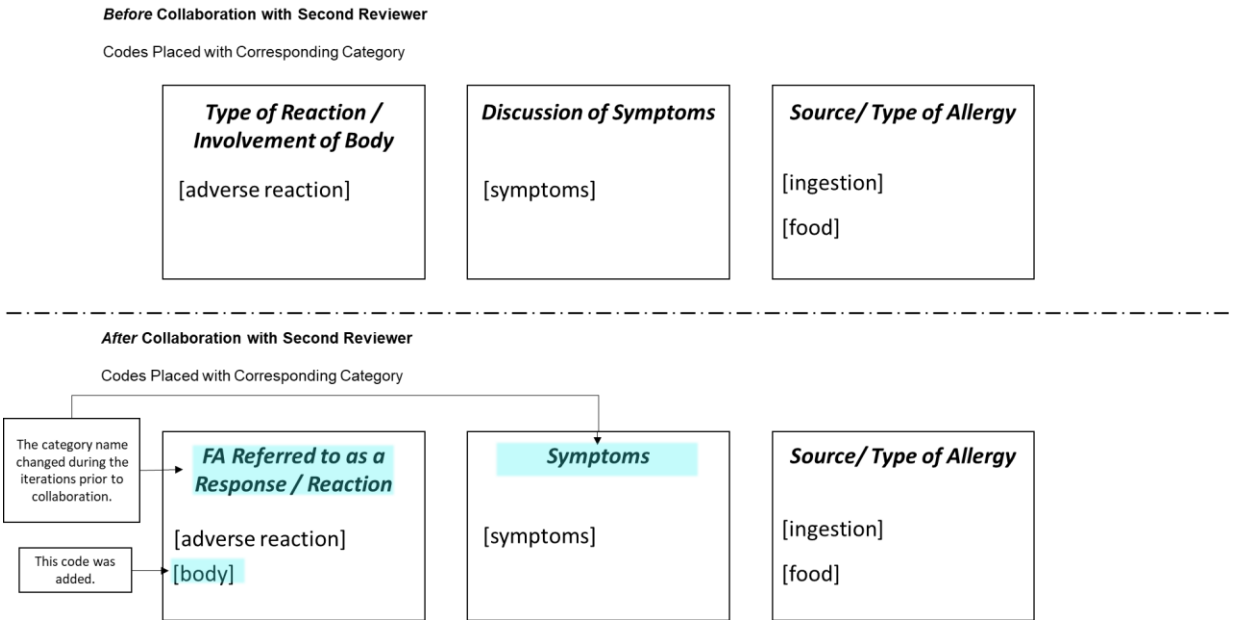
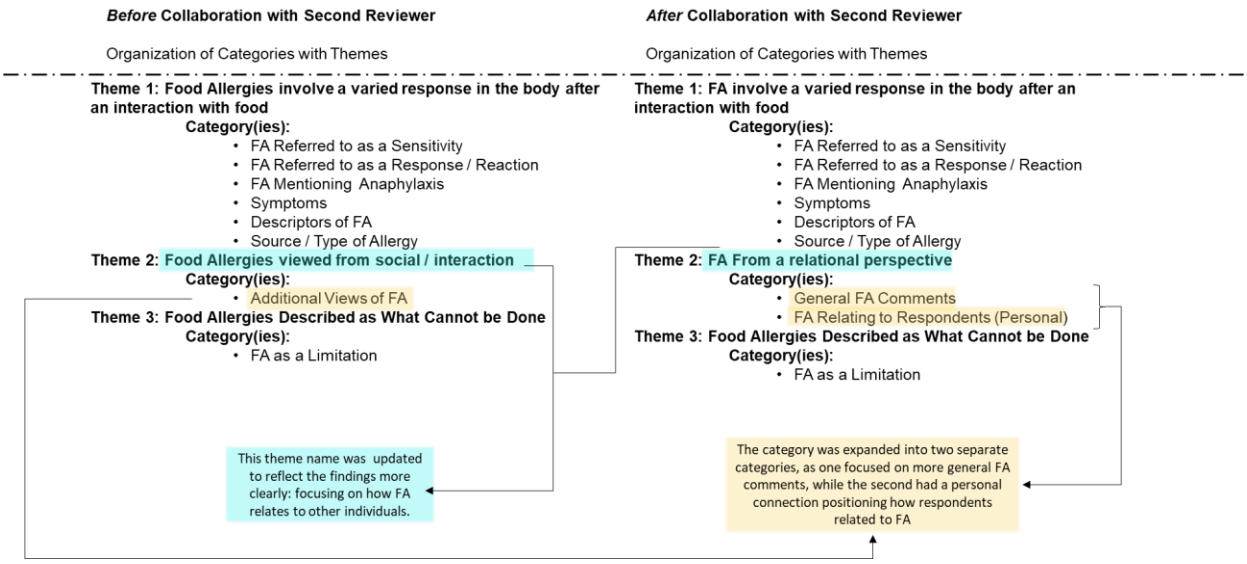


Figure I3

Organization of Themes, Categories, & Codes after the Coding/Analysis Process



Appendix J:

Methodology Originally Planned for But Not Used in the Study

Material in this appendix covers aspects of the originally proposed study, but were not used in the final study based on the data obtained and the direction that the study took.

Needs Assessment

A needs assessment was supposed to be conducted to determine if nursing students believed they understand FA based on their current education. The use of open-response questions was intended to ensure this program evaluation/needs assessment was broad enough to capture relevant needs (Grant, 2002). Additionally, in consideration of the balance between learning at individual and group levels (Grant, 2002, p. 157), the focus of this study is primarily at the group level, with some individual level aspects relating to individual years of study.

The study initially proposed to take the *gap or discrepancy analysis* approach to needs assessment (Grant, 2002). This approach uses the comparison of performance against outlined competencies based on various methods of assessment such as reports by others, "objective testing", and self-reports (Grant, 2002, p. 157; Gillam & Murray, as cited in Himmel, 1998; Knowles, 1973; Moore, 1998). A needs assessment also uses various pieces of informal information (Grant, 2002) that included learning about what topics are taught to nursing students. Unfortunately, since the outlined competencies were unable to be measured using data obtained in the study, the needs assessment portion of the study could not be conducted.

Virtual Patient Lasater's Clinical Judgement Rubric [vpLCJR] (Georg et al., 2018)

The vpLCJR (Georg et al., 2018) was developed to be objective for the cognitive and affective dimensions that are unique in an online simulation compared to an in-person simulation. It is taken from the original Lasater's Clinical Judgment Rubric [LCJR] (Lasater, 2005), which is explained below.

Lasater's Clinical Judgement Rubric

Lasater's Clinical Judgement Rubric was created based on the Tanner (2006) Clinical Judgement Model, that is used to measure nursing students' competency and judgement skills at various stages of their learning: *beginning, developing, accomplished*, and *exemplary*, (scores of 1 to 4), for 11 different dimensions, that include the 4 concepts of *effective noticing* that has 3 dimensions, *interpreting* that has 2 dimensions, *responding* that has 4 dimensions, and *reflecting* that has 2 dimensions, with a total achievable score of 44 points (Laster, 2005). Examples of the stages of learning under the concept *effective noticing* includes the following:

> *Exemplary:* "Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information";
>
> *Accomplished*: "Regularly observes and monitors a variety of data, including both subjective and objective; most useful information is noticed; may miss the most subtle signs";
>
> *Developing:* "Attempts to monitor a variety of subjective and objective data; focuses on the most obvious data, missing some important information";

Beginning: "Confused by the clinical situation and the amount and kind of data; observation is not organized and important data are missed, and/or assessment errors are made" (Lasater, 2005).

This rubric is used by students and faculty to provide an understanding of various expectations of nursing students; usually used over time to identify the "progress" of their clinical judgement skills in various simulation situations for faculty to evaluate students and vice versa (Lasater, 2007).

While the LCJR is a standard tool for nurses to evaluate nursing students' clinical judgement abilities, especially for the Site A/Site B/Site C, it is meant for in-person simulations, rather than virtual. And since the study is done online, the vpLCJR was used instead.

What distinguished the vpLCJR from the LCJR is that there are three dimensions rather than four (Georg et al., 2019). These dimensions include *understanding the patient* that involves *noticing*, *interpreting*, and one of the items of *responding*; *care planning*, that involves the rest of *responding*, since it looks at how nurses can react to issues that arise with the patient, along with the requirements of the patient. The last dimension is *reflecting*, which involves the in-action reflecting on the interaction and the responses they provide, along with on-action reflection, which looks at how the situation was handled.

Georg et al. (2019)'s data using the vpLCJR yielded Cronbach's alpha ($\alpha = .931$), and all items were interrelated to one construct, and the three factors explained 81.8% of the variance. This measure still uses Lasater's 44 items, and same (maximum of 44) scoring technique.

Hypotheses

Originally there were 5 hypotheses, however the first two were combined, and the fifth one was not used as planned, where hypothesis 5 suggested that the vpLCJR (Virtual Patient Lasater Clinical Judgement Rubric) scores would be higher if students have more personal food allergy experience and higher WilRAFAE and are upper year students and was to be tested using the vpLCJR rubric (Georg et al., 2019).

For the purpose of the present study, although the rubric was used as a learning tool in education, it was supposed to be used to measure specifically how nursing students handled the three clinical vignettes involving a written simulation of a medical patient for quality of response and for level of clinical judgement. However, due to the fact that participant responses were not formulated in a way that could be tested using the rubric, and as no nursing expert could review the data, the rubric and therefore this hypothesis were not used due to the data received and concerns for erroneous interpretation of the performance of participants on certain rubric domains.

As a result, the vignette and open response questions that would have been evaluated with the vpLCJR rubric were instead qualitatively analyzed using conventional content analysis as described by Hsieh & Shannon (2005) in Chapter 4 Qualitative Analysis Approach to develop themes from categories identified in participant responses, rather than ranking their judgement with a rubric

Additionally, this study also planned to examine aspects of compilation, automaticity, verbal knowledge, attitude and motivation, using recognition and recall to target behavioural observations and secondary task performances in consideration of the

knowledge transfer theory (Kraiger et al. (1993), however that became beyond the scope of the project.

Originally Planned Statistical Analyses

It was initially anticipated that to appropriately and sufficiently analyze the data, a minimum sample size of 204 participants was needed, according to a power analysis. To compare the difference of knowledge and understanding between 1st and 2nd & 3rd and 4th years respectively, a total sample size of 102 for each year's comparison (or smaller equal groups of 51 were necessary for each year), with a medium effect size of (f = .50) and a power of .80 (Faul et al., 2007). To compare all 4 years (each independent groups) using a MANOVA with global effects, a minimum of 116 students total were needed, with 4 equal groups of 29 students each (Faul et al., 2007). To ensure group sizes are enough, up to 179 or 200 participants would have been desirable; as explained in Chapter 5, Participant Make-Up, that was not achieved, and many of the planned statistical analyses and power analyses were unusable.

Additionally, the minimum number of participants that were needed for a multiple regression is N = 77, for a power of .80, and with a medium effect size (f = .15), according to a power analysis F-test for a fixed model of a linear multiple regression with R^2 deviation from zero, using G*Power with 3 predictors (Faul et al., 2009). Unfortunately, sufficient sample sizes were not obtained, and data was analyzed as presented in Chapter 4: Methodology. Initial plans to test the hypotheses involved a MANOVA for the variable of year against knowledge and WilRAFAE, where year would have been the independent variable and the other two variables would be dependent. Overall, there were 4 independent groups – the year of program. A multiple regression

was planned to test hypotheses 3,4, and 5, with 2 predictor variables each (both Personal food allergy experience and WilRAFAE), but instead themes were discussed descriptively.

Appendix K:

R Packages

Table K1

R Package & R Guidance References

Package Name	Citation
base	R Core Team. (2021a). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
boot	Canty, A., & Ripley, B. (2021). *boot: Bootstrap R (S-Plus) Functions* (R package Version 1.3-27). Davison, A. C. & Hinkley, D. V. (1997) Bootstrap Methods and Their Applications. Cambridge University Press.
car	Fox, J., & Weisberg, S. (2019). *An {R} Companion to Applied Regression* (3rd ed). Sage. https://socialsciences.mcmaster.ca/jfox/Books/Companion/
carData	Fox, J., Weisberg, S., & Price, B. (2020*). carData: Companion to Applied Regression Data Sets* (R package version 3.0-4). https://CRAN.R-project.org/package=carData
data.table	Dowle, M., & Srinivasan, A. (2021). *data.table: Extension of `data.frame`* (R package version 1.14.0). https://CRAN.R-project.org/package=data.table

Package Name	Citation
datasets	R Core Team. (2021b). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
dplyr	Wickham, H., François, R., Henry, L., & Müller, K. (2021). *dplyr: A grammar of data manipulation* (R package version 1.0.7). https://CRAN.R-project.org/package=dplyr
finalfit	Harrison, E., Drake, T., & Ots, R. (2021). *finalfit: Quickly create elegant regression results tables and plots when modelling* (R package version 1.0.3). https://CRAN.R-project.org/package=finalfit
forcats	Wickham, H. (2021). *forcats: Tools for working with categorical variables (factors)* (R package version 0.5.1). https://CRAN.R-project.org/package=forcats
Formula	Zeileis, A., & Croissant, Y. (2010). "Extended model formulas in R: Multiple parts and multiple responses". *Journal of Statistical Software, 34*(1), 1-13. https://doi.org/10.18637/jss.v034.i01
ggplot2	Wickham, H. (2016). *ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org
gmodels	Warnes, G. R., Bolder, B., Lumley, T., & Johnson, R. C. (2018). *gmodels: Various R Programming Tools for Model Fitting* (R package version 2.18.1). https://CRAN.R-project.org/package=gmodels
	Contributions from Randall C. Johnson are Copyright SAIC-Frederick,

Package Name	Citation
	Inc. Funded by the Intramural Research Program, of the NIH, National Cancer Institute and Center for Cancer Research under NCI Contract NO1-CO-12400.
graphics	R Core Team. (2021c). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
grDevices	R Core Team. (2021d). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
gridExtra	Auguie, B. (2017). *gridExtra: Miscellaneous functions for "grid" graphics* (R package version 2.3). https://CRAN.R-project.org/package=gridExtra
haven	Wickham, H., & Miller, E. (2021). *haven: Import and export 'SPSS', 'Stata' and 'SAS' files* (R package version 2.4.1). https://CRAN.R-project.org/package=haven
Hmisc	Harrell, F. E. Jr. (2021). *Hmisc: Harrell miscellaneous* (R package version 4.5-0). https://CRAN.R-project.org/package=Hmisc Contributions from others not provided.
knitr	Xie, Y. (2021). *knitr: A general-purpose package for dynamic report generation in R* (R package version 1.33).

Package Name	Citation
lattice	Xie, Y. (2015). *Dynamic documents with R and knitr* (2nd ed.). Chapman and Hall/CRC. Xie, Y. (2014) knitr: A comprehensive tool for reproducible research in R. In V. Stodden, F. Leisch and R. D. Peng (Eds.), *Implementing Reproducible Computational Research*. Chapman and Hall/CRC. Sarkar, D. (2008) *Lattice: Multivariate data visualization with R.* Springer.
magrittr	Bache, S. M., & Wickham, H. (2020). magrittr: *A forward-pipe operator for R* (R package version 2.0.1). https://CRAN.R-project.org/package=magrittr
markdown	Allaire, J. J., Horner, J., Xie, Y., Marti, V., & Porte, N. (2019). *markdown: Render Markdown with the C Library 'Sundown'* (R package version 1.1). https://CRAN.R-project.org/package=markdown
methods	R Core Team. (2021e). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
mice	van Buuren, S., Groothuis-Oudshoorn, K. (2011). mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software, 45*(3), 1-67. https://www.jstatsoft.org/v45/i03/.

Package Name	Citation
mvnormtest	Jarek, S. (2012). *mvnormtest: Normality test for multivariate variables* (R package version 0.1-9). https://CRAN.R-project.org/package=mvnormtest
naniar	Tierney, N., Cook, D., McBain, M., & and Colin Fay (2021). naniar: Data Structures, Summaries, and Visualisations for Missing Data. R package version 0.6.1. https://CRAN.R-project.org/package=naniar
pacman	Rinker, T. W. & Kurkiewicz, D. (2017). pacman: package Management for r. version 0.5.0. Buffalo, New York. http://github.com/trinker/pacman
pastecs	Grosjean, P. & Ibanez, F. (2018). pastecs: Package for Analysis of Space-Time Ecological Series. R package version 1.3.21. https://CRAN.R-project.org/package=pastecs
psych	Revelle, W. (2021) psych: Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, https://CRAN.R-project.org/package=psych Version = 2.1.6.
purrr	Henry, L. and Wickham, H. (2020). purrr: Functional Programming Tools. R package version 0.3.4. https://CRAN.R-project.org/package=purrr
rio	Chan, C.-h, Chan, G. C.-H., Thomas J. Leeper, T. J., & Becker, J. (2021). rio: A Swiss-army knife for data file I/O. R package version 0.5.27.

Package Name	Citation
stats	R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.
stringr	Wickham, H. (2019). stringr: Simple, Consistent Wrappers for Common String Operations. R package version 1.4.0. https://CRAN.R-project.org/package=stringr
survival	Therneau, T. (2021). A Package for Survival Analysis in R (R package Version 3.2-10) https://CRAN.R-project.org/package=survival Terry M. Therneau, T. M., & Grambsch, P. M. (2000). *Modeling survival data: Extending the Cox Model*. Springer.
tibble	Müller, K., & Wickham, H. (2021). *tibble: Simple data frames* (R package Version 3.1.2). https://CRAN.R-project.org/package=tibble
tidyr	Wickham, H. (2021). *tidyr: Tidy messy data* (R package Version 1.1.3). https://CRAN.R-project.org/package=tidyr
tidyverse	Wickham, H., Averick, M., Bryan, J., Chang, W., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, M., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., Takahashi, K., Vaughan, D., Wilke, C., ... Yutani, H. (2019). Welcome to the tidyverse. *Journal of Open Source Software*, *4*(43), 1686, https://doi.org/10.21105/joss.01686

Package Name	Citation
utils	R Core Team. (2021g). *R: A language and environment for statistical computing* (Version 4.0.5). R Foundation for Statistical Computing. https://www.R-project.org/.
viridis	Garnier, S., Ross, N., Rudis, R., Camargo, A. P., Sciaini, M., & Scherer, C. (2021). *Rvision - colorblind-friendly color maps for R* (R package Version 0.6.1).
viridisLite	Garnier, S., Ross, N., Rudis, R., Camargo, A. P., Sciaini, M., & Scherer, C. (2021). Rvision - *Rvision - colorblind-friendly color maps for R* (R package Version 0.4.0).
WRS2	Mair, P., & Wilcox, R. R. (2020). Robust statistical methods in R using the WRS2 package. *Behavior Research Methods, 52*, 464-488.

R Resources Used

aggregate: Compute summary statistics of data subsets. (n.d.). RDocumentation. Retrieved October 9, 2021, from https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/aggregate

Auguié, B. (2019, July 13). *Arranging multiple plots on a page*. Cran R-Project. https://cran.r-project.org/web/packages/egg/vignettes/Ecosystem.html

Factor variables | R Learning Modules. (n.d.). UCLA: Statistical Consulting. Retrieved October 9, 2021, from https://stats.idre.ucla.edu/r/modules/factor-variables/

ProgrammingR. (n.d.). *How to Make A QQ plot in R (with Examples)*. Retrieved October 9, 2021, from https://www.programmingr.com/animation-graphics-r/qq-plot/

Programming*R*. (n.d.). *R merge - How to merge two R data frames*. Retrieved October 9, 2021, from https://www.programmingr.com/examples/r-dataframe/merge-data-frames/

Appendix L:

PDF Copies of Permission for Reprinted Figures/Tables Used

Figure L1

Permission for Use of WilRAFAE Measure

From: Olga Kagan [redacted]
Sent: Monday, April 27, 2020 5:52 PM
To: Aleksandra Redko
Subject: Re: Request to use WilRAFAE Measure
Attachments: Article_Factors associated with college students willingness and readiness to act in a food allergic emergency WilRAFAE.pdf

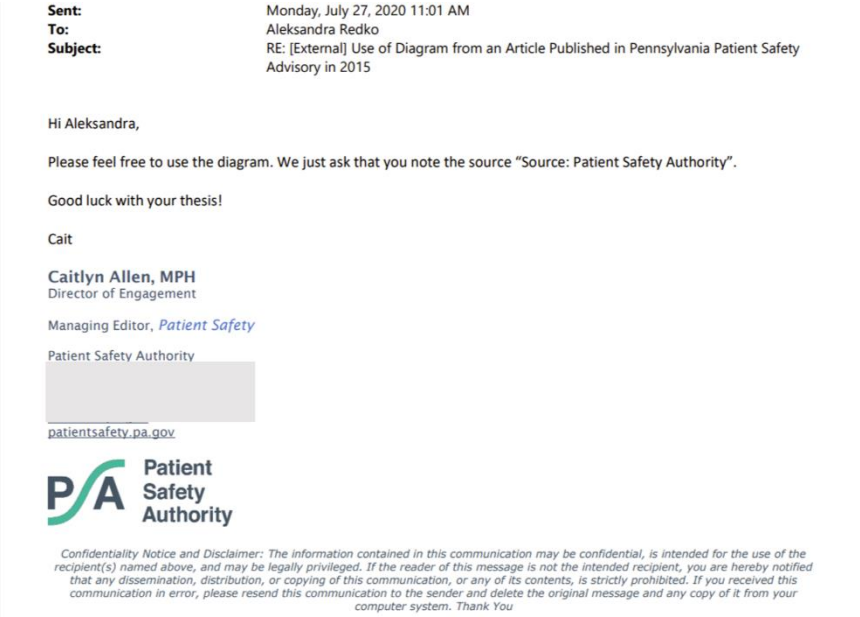
Flag Status: Flagged

Dear Alexandra,
You can have permission to use the WilRAFAE tool for your Master's thesis. It had good psychometrics as used in its current version. However, if you alter it in any way, I would be interested in knowing your results and sections of the tool you did or did not use, or modified. If you would like to use the Social Desirability Scale for which I was granted permission to use in my study, you may need to get a separate permission for this tool.

Please see attached article, as well as this link to the tool development pilot study with supplemental materials (the questionnaire) https://www.cogentoa.com/article/10.1080/23311908.2018.1549006
Wishing you best of luck in your academic endeavor. If you have any questions, please do not hesitate to reach out.
Sincerely,
Olga Kagan, PhD, RN

Figure L2

Permission to Use Diagram "How a Diet Error Occurs"



Sent: Monday, July 27, 2020 11:01 AM
To: Aleksandra Redko
Subject: RE: [External] Use of Diagram from an Article Published in Pennsylvania Patient Safety Advisory in 2015

Hi Aleksandra,

Please feel free to use the diagram. We just ask that you note the source "Source: Patient Safety Authority".

Good luck with your thesis!

Cait

Caitlyn Allen, MPH
Director of Engagement

Managing Editor, *Patient Safety*

Patient Safety Authority

patientsafety.pa.gov

Patient Safety Authority

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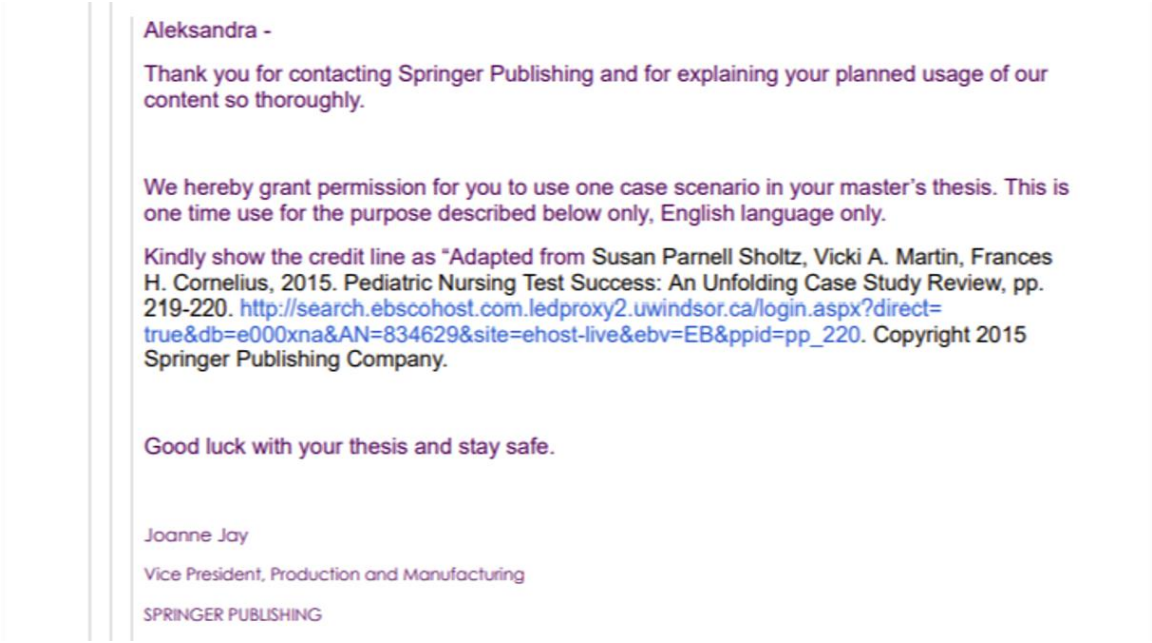
Figure L3

Permission for Adaptation of Case Study for Vignette in Survey



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