"Anaphylactic Shocker!": The Use of a Dynamic QR Code Medical Bracelet to Administer a Practice Epinephrine Auto-Injector During a Staged Medical Emergency

by Katelyn France

Abstract: Medical bracelets can save lives, but often lack the necessary information for appropriate medical care in emergency scenarios. The focus of this research was to determine whether a dynamic QR code medical bracelet connected to a Bluetooth carrying case allowed participants to react faster to a staged medical emergency when compared to standard medical bracelets, static QR code medical bracelets, or non-Bluetooth dynamic QR code medical bracelets.[1] A mock medical scenario for anaphylactic shock was tested in which a staged practice dummy wore one of four medical bracelets (standard, static, dynamic, and dynamic/Bluetooth), and participants were timed in locating and properly administering a practice epinephrine auto-injector. Both dynamic QR code bracelets displayed the location of the auto-injector and how to use it, while the connected Bluetooth carrying case system emitted a buzzing sound, allowing participants to listen and look for the epinephrine auto-injector. The static QR code informed participants of the need for an auto-injector. The standard bracelet displayed only the medical condition. The dynamic QR code bracelet with connected Bluetooth carrying case was faster and more precise in all trials ($p<.0001$). This dynamic scannable-interface (QR code) medical bracelet is unique in its connectivity to Bluetooth and its aim in supporting bystanders (vs. medical professionals) in the case of a medical emergency. Continued improvements in medical bracelet technology could improve medical response time and care in emergency scenarios, leading to fewer hospital stays and lower mortality for those with medical conditions.

Introduction

More than thirty-two million Americans have some form of diagnosed food allergy. The most common of these allergies are the "Big Eight": milk, eggs, peanuts, tree nuts, soy, wheat, fish, and shellfish. These allergens make up approximately ninety percent of all food-based allergies and while not the most common, peanut allergies affect more than 15 million Americans (American Academy of Allergy, Asthma and Immunology [AAAI], 2001).

Peanut allergies are IgE-mediated allergic reactions, where side effects are triggered by an overabundance of Immunoglobulin E (IgE) antibodies. These antibodies are always present in the body in small amounts, but during an allergic reaction, they bind with mast cells, histamine-carrying white blood cells, which trigger the cascading release of various chemicals that cause the symptoms of an allergic reaction (Kemp, 2008).

The immediate symptoms of an IgE-mediated reaction can include runny nose, rashes, hives, itchy or tingly mouth or throat, digestive issues (diarrhea, stomach pains or cramps, nausea, or vomiting), tightness of the throat, or shortness of breath. If left untreated, the pulmonary system could constrict, preventing a necessary flow of oxygen to the lungs, or an overabundance of IgE-bound mast cells could cause organ failure, leading to permanent damage and possibly death (AAAAI, 2001). As stated by Song and colleagues in 2014, in these severe cases, known as anaphylactic shock, immediate care is required and is commonly achieved through the utilization of an epinephrine auto-injector. Epinephrine is a form of adrenaline that can narrow blood vessels and open lung airways, thus reversing some of the harmful side effects of these reactions (Baalman et al., 2016; Frew, 2011).

Emergency epinephrine treatments are not the only IgE-mediated allergy treatment plan. As stated by Moneret-Vautrin and colleagues in 2005,

[1] Note: The author is the owner and operator of Scientists Making Your Life Easier (SMYLE) LLC, the medtech company that produces all types (static, dynamic, and dynamic with Bluetooth) of the QR code bracelets used in this study.

immune systems are most sensitive in childhood and desensitization in childhood can mean lower reactivity in adulthood. Studies of children and adolescent populations have also found non-invasive treatment options instead of traditional mast cell injections (Hsiao et al., 2017; Anagnostou et al., 2014), created comprehensive allergen management plans (Ewan and Clark, 2005), and have shown reduced sensitivity to allergens with early exposure for siblings of severe IgE-mediated allergy sufferers (Begin, et al., 2016).

As for adults, most peanut allergy treatments are tolerance-focused, as these allergies are commonly "outgrown" (Leickly et al., 2018). This is because as people age, their immune symptoms develop and become more desensitized to IgE-mediated allergens (Chafen et al., 2010; Fromer, 2016; Boyce et al., 2011). One example of this comes from a 2016 study by Eigenmann and Zamora that found with lessened reactivity, non-severe adult IgE-mediated allergic reactions could be treated via an antihistamine, such as diphenhydramine.

In addition to desensitizing and managing allergen exposure, an appropriate care plan for IgE-mediated allergies must consider all facets of the allergy. A commonly overlooked factor is the distribution of allergies and how socioeconomic and geographic distribution of disease can affect not only the severity of reactions, but also the ease of access to treatment for those with allergies (Gupta et al., 2011; Alpert, 2016). The US does not have standardized healthcare and therefore does not have standardized access to care (Branum & Lukacs, 2009). This can place additional strain on rural communities that lack access to close, reputable healthcare facilities, as speed and reaction to the emergency are key components of a shortened recovery time (Patel et al., 2011). In a medical emergency, these factors may be additionally compounded, as trained medical professionals are often not the first on scene of an allergic reaction in rural towns. The need for basic yet comprehensive information to assist in time-sensitive medical emergencies aimed toward bystanders and non-medical professionals is critical.

One common way to provide more access to information and assistance during a medical emergency is to wear a medical ID bracelet. These bracelets provide information that may allow bystanders to provide basic assistance before trained medical professionals arrive. The question posed by Rahman and colleagues in 2017 was the actual efficacy of these bracelets in emergencies. The result of wearing a standard medical bracelet in a medical emergency had mixed results and room for improvement, as the study found that the lack of bracelet regulations caused substantial differences in the quality of care. In their 2019 study, Farhy and colleagues found that when more relevant information was provided in a medical emergency, better patient outcomes could be seen. Therefore, if medical ID bracelets are improved, appropriate medical response time and care could be provided, leading to better patient care in allergic reaction events, and possibly reducing the number of fatal severe anaphylactic shock events.

In summary, many adults eventually become desensitized to IgE allergens as they age, as their immune systems develop and are able to produce appropriate responses to their allergen. Peanut and other IgE-mediated allergies can pose bigger problems in children and adolescents, as they lack the immune response necessary to avoid going into anaphylactic shock when encountering their allergen. While treatment options for careful and gradual desensitization do exist and are constantly improving, the case of severe reactions requires an immediate medical response, which makes the epinephrine auto-injector an integral component of treatment for these scenarios. The use of an epinephrine auto-injector can significantly improve the recovery of a person following an anaphylactic shock event largely due to its ability to react to a situation immediately, regardless of the sensitization levels or the type of allergen involved. As severe cases of anaphylaxis can result in permanent internal damage or death in a matter of minutes (AAAAI, 2001), reduction of reaction time is the most critical goal of medical bracelets.

While these auto-injectors are clearly beneficial in the case of an allergic reaction, much can still be done to improve treatment in emergency scenarios. One way to improve treatment is to improve access of information to bystanders looking to help in an emergency by expanding the amount of information the medical ID bracelets provide for assistance in an emergency. By allowing bystanders to play a more active role in a medical emergency given the necessary information, some of the gaps and shortcomings of the current technology could be fulfilled, possibly leading to fewer anaphylaxis-related deaths. This study aims to compare the speed of response when using one of several different types of medical bracelet and related medical equipment (standard, static QR code, dynamic QR code, and dynamic QR code with connected Bluetooth carrying case) and hypothesizes that the more information and access to equipment that is provided, the faster the response time.

Materials

Medical Bracelet Types

For additional materials, see Photo Annex.

- Standard: an engraved metal bracelet; typically uncovered by insurance and costing $100 or more; includes name, date of birth, and allergy/key concern; one to two lines more of information are available for an additional cost (*A*)
- Static QR code: the small square QR code cannot be updated; if another allergy is discovered, a new bracelet must be made; information includes name, date of birth, allergies, and how to assist in the case of a medical emergency (*B*)
- Dynamic QR code: an updatable code linking to a webpage that allows for a nearly limitless amount of information to be stored; requires an internet connection (*C, E*)
- Dynamic QR code with connected Bluetooth carrying case: the QR code for this bracelet is the same as the other dynamic QR code, with the addition of an activation link to the Bluetooth module that activates a Piezo buzzer (*D, F*)

Method

This experiment tested four age groups (12/13, 14/15, 16/17, and 18+) with four volunteers per each of the four medical bracelets categories (standard, static QR code, dynamic QR code, and dynamic QR code connected to a Bluetooth carrying case) for a total of 64 volunteers recruited from Hinckley-Finlayson High School. All volunteers were shown a basic training video about epinephrine auto-injectors before participating in the experiment. The experiment was conducted in a private testing environment that consisted of a practice dummy in staged anaphylactic shock and a table with 5 backpacks on or near it with the practice epinephrine auto-injector stored in one of the bags. The participants were timed on how long it took for them to locate the epinephrine auto-injector from its location within one of the five backpacks and then properly administer it on the practice dummy based on the information provided to them from their medical bracelet type.

The standard medical bracelet group was the control and was given the information on the bracelet, which was name, date of birth, and statement of the allergy. The static QR code group was told to scan the code with a smartphone, alerting of the need for an epinephrine auto-injector. The dynamic group was told to scan the code, which displayed a written description of where the epinephrine auto-injector was located as well as how to properly administer it. The last group was told to scan a dynamic QR code that gave them the same written information as the non-Bluetooth bracelet and also activated the Bluetooth module, causing the carrying case holding the epinephrine auto-injector to produce a high-pitched noise, alerting the scanner of the bag's precise location. Each of the sixty-four participants were timed using only one of the bracelet types to avoid previous knowledge biases. All QR code medical bracelets and the Beetle BLE Bluetooth/Piezo buzzer carrying case were created by the researcher.

Participants were timed in order to assess response to the staged emergency using the four bracelet types. The average reaction time was graphed using one standard error bar (65% of the data). The sub-trial times are defined as the time it took participants to locate the practice epinephrine auto-injector, but not to administer it. The statistical computer program SPSS was used to analyze if the differences in reaction time was due to the treatment (type of bracelet) or due to chance. Significance was determined using a p-value of $p<0.05$, indicating there was a five percent chance the difference was due to chance and a 95% chance due to the treatment.

Results

The experiment was conducted to see if a dynamic QR code medical bracelet connected to a Bluetooth medical carrying case would allow participants to react faster in providing appropriate medical care in a staged medical emergency than a standard medical bracelet, a static QR code medical bracelet, or a dynamic QR code medical bracelet that is not connected to a Bluetooth medical carrying case. For test subjects, there were four groups, with four in each group, with four bracelets and/or modules, for a total of sixty-four participants. The statistical program SPSS was used to run ANOVA tests on all collected data for the experiment. Error bar graphs were used with one standard error (65%) of the data, a p-value of p<.05 indicates significant differences. All figures were created by the researcher.

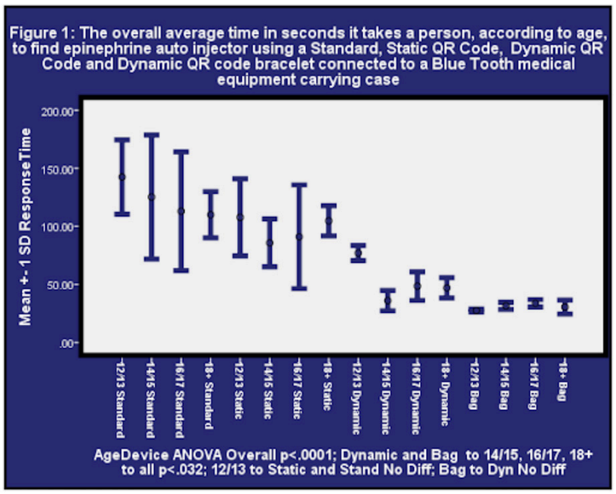

Figure 1: The overall average time in seconds it takes a person, according to age, to find epinephrine auto injector using a Standard, Static QR Code, Dynamic QR Code and Dynamic QR code bracelet connected to a Blue Tooth medical equipment carrying case

Figure 1 compares the average time in seconds for human participants (by age) to address a staged medical emergency and find the practice epinephrine auto-injector. When all age groups were compared, the dynamic QR code and dynamic bracelet QR code connected to the Bluetooth medical equipment carrying case took significantly less time to respond to the medical emergency than those using the static QR code or standard bracelet, with a p<.0001. The dynamic bracelet connected to the Bluetooth carrying case took significantly less time to respond to the emergency and locate the epinephrine auto-injector than the dynamic bracelet not connected to the case (p<.032), except for the students ages 12 and 13, years old whose response time was similar to the dynamic bracelet not connected to the Bluetooth.

Figure 2 compares the overall average time in seconds for human participants to address a staged medical emergency and locate a practice epinephrine auto-injector. The standard bracelet participants took significantly longer to find the auto-injector, with a time of 122.68±39 seconds when compared to the static QR code (p<.008) bracelet response time of 97.31±28 seconds. Using the dynamic bracelet,

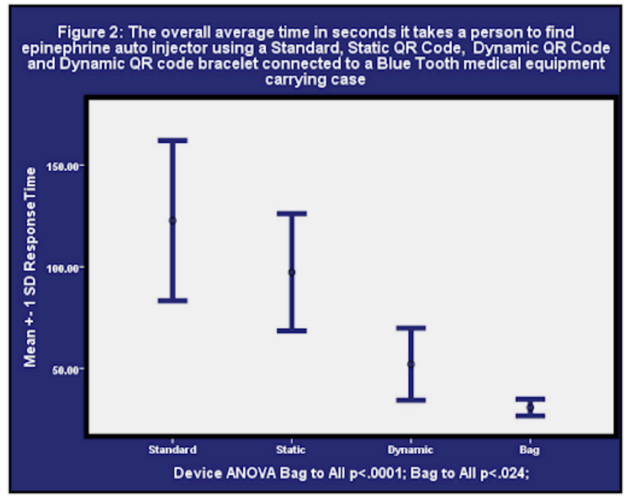

Figure 2: The overall average time in seconds it takes a person to find epinephrine auto injector using a Standard, Static QR Code, Dynamic QR Code and Dynamic QR code bracelet connected to a Blue Tooth medical equipment carrying case

participants found the epinephrine auto-injector significantly faster (p<.0001) when compared to participants that used static or standard bracelets, with a response time 52.12±17 seconds. Using the dynamic bracelet connected to the Bluetooth medical equipment carrying case, participants found the epinephrine auto-injector significantly faster (p<.0001) when compared to just the dynamic bracelet, with a response time 30.81±4.11 seconds (p<.024).

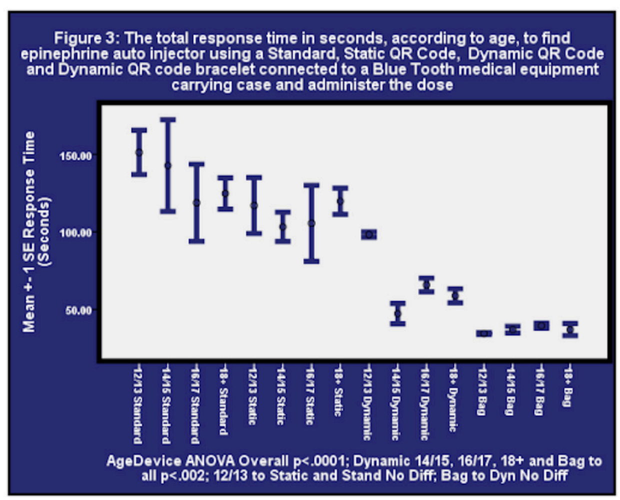

Figure 3: The total response time in seconds, according to age, to find epinephrine auto injector using a Standard, Static QR Code, Dynamic QR Code and Dynamic QR code bracelet connected to a Blue Tooth medical equipment carrying case and administer the dose

Figure 3 compares the total average response time in seconds, for human participants (by age) to address a staged medical emergency and find the practice epinephrine auto-injector using a standard, static (QR Code), dynamic (QR Code), and a dynamic (QR Code) connected to a Bluetooth medical equipment carrying case and administer the dose. When all age groups were compared, both dynamic types took significantly less time to respond to the medical emergency than those using the static QR code or standard bracelet with a p<.0001. The dynamic bracelet connected to the Bluetooth carrying case took significantly less time to respond to the emergency and administer the epinephrine auto-injector than the dynamic bracelet not connected to the case (p<.004), except for the participants whose response time was similar to the dynamic bracelet not connected to the Bluetooth (p<.555).

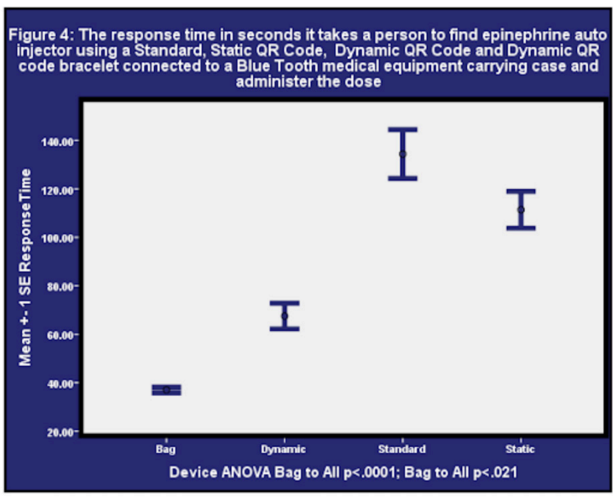

Figure 4: The response time in seconds it takes a person to find epinephrine auto injector using a Standard, Static QR Code, Dynamic QR Code and Dynamic QR code bracelet connected to a Blue Tooth medical equipment carrying case and administer the dose

Figure 4 compares the total average response time in seconds for participants to address a staged medical emergency and find the practice epinephrine auto-injector using a standard, static (QR Code), dynamic (QR Code), and a dynamic (QR Code) connected to a Bluetooth carrying case and administer the practice auto-injector. The standard bracelet participants took significantly longer to find the auto-injector, with a time of 134.37±4.64 seconds when compared to the static QR code (p<.021) bracelet response time of 111.37±30.38 seconds. Using the dynamic bracelet, participants found the epinephrine auto-injector significantly faster (p<.0001) when compared to participants that used static or standard bracelets, with a response time 67.5±17 seconds. Using the dynamic bracelet connected to the Bluetooth carrying case, participants found the epinephrine auto-injector significantly faster (p<.003) when compared to just the dynamic bracelet, with a response time 67.50±21.25 seconds.

Discussion

The hypothesis and basis for this experiment was that a dynamic QR code medical bracelet connected to a Bluetooth medical carrying case would allow participants to react faster in providing appropriate medical care in a staged medical emergency than a standard medical bracelet, a static QR code medical bracelet, or a dynamic QR code medical bracelet that is not connected to a Bluetooth medical carrying case. This was supported, as the dynamic QR code connected to a Bluetooth carrying case allowed participants to respond faster and more accurately than any other bracelet type (Figure 4).

The dynamic QR code bracelet and connected Bluetooth carrying case elicited faster response times as compared to all bracelet types. Though information was provided in the form of written text, participants commonly did not take the time to properly read and comprehend instructions. As seen in Figure 2, this resulted in a high level of variability in response times for the dynamic QR code bracelet compared to the dynamic with the carrying case.

When using the dynamic bracelet with the connected Bluetooth carrying case, the participants were given both words and sound, allowing them to quickly locate and administer the practice auto-injector. Periodically, a standard or static bracelet user found the epinephrine auto-injector fairly quickly, yet they were unsure how to properly administer it. This resulted in a prolonged overall time trial, yet an expedited sub-trial (Figure 3).

An intriguing result was found in the statistical differences in Figure 4. Because there was a difference in time when locating the epinephrine auto-injector when comparing the standard medical bracelet and the static QR code bracelet, this shows that even at the least comprehensive level, the more information provided in a staged medical emergency, the faster and more accurate the care.

Conclusion

With access to more information in a staged medical emergency, faster and more accurate care was provided. However, determining which bracelet is the correct choice for the given allergies, diseases, or conditions requires the contemplation of several points, such as the need to update information stored on the bracelet, access to an Internet connection, and the use of auxiliary medical equipment.

For those with medical conditions that don't require constant updates, as in the case of heart disease or epilepsy, the static QR code would be able to provide significantly faster care in a medical emergency, without the need to connect to the Internet. This could also be critical for care of those living in rural areas with limited Internet access.

While the Bluetooth carrying case would be a wise investment for those needing emergency medical care with an accessory device, such as an epinephrine auto-injector for allergies or a glucose monitor for diabetes, the dynamic QR code medical bracelet still provides faster and more accurate care at a lower price point when the additional Bluetooth component is not required. It is also common for children who are diagnosed with peanut allergies to be diagnosed with another type of IgE-mediated allergy, as these are often diagnosed in tandem (i.e. general tree nuts with a peanut allergy) (AAAAI, 2001). Therefore, the dynamic QR code medical bracelet would again be a good choice, as it allows for constant updates.

Beyond these core considerations, a key component of this bracelet system is accessibility. By encoding features specifically for bystanders, better understanding and care can be provided during the critical first minutes of a medical emergency. Some of these features include auto-translating the written text of the instruction page to the language of the scanner's phone, the use of a text-to-speech function where the care instructions are spoken aloud in addition to being displayed on the screen, and an updateable medication list that gives information about the wearer's medications, possible side effects, and role within treatment plans.

Beyond internal software customizations, another critical feature of this system is the ability to make a truly customizable bracelet. Medical bracelets are not typically covered by insurance, as they are considered auxiliary medical accessories, and as such, are not regulated in the United States. Typically, they include an image of the Staff of Asclepius, a common indicator of medical technology in the healthcare field and something first responders are trained to look for when assisting in a medical emergency, but as there are no standards or requirements for what needs to be included for a bracelet to be considered a medical bracelet, some do not even include this.

Many standard medical bracelets available today simply consist of a piece of metal, the Staff, and a few lines of basic information and are also not commonly considered aesthetically pleasing. As such, this life-saving medical equipment is severely underutilized. More customizable options will hopefully lead to an increase in use.

In addition to the refinement of the medical ID bracelet, better epinephrine auto-injectors could also enhance care. Better accessibility, storage, and user-friendliness of the auto-injector component may also be a critical avenue of emergency care improvements. More advanced treatments for IgE-mediated allergies are also being developed every day, yet until we can cure the body's overreaction to an allergen, continued improvements in medical bracelet technology are critical to providing fast and accurate emergency medical care. This enhanced non-professionally administered emergency care could lead to fewer and shorter hospital stays and thus help to save many lives.

References

Alpert, J. S. (2016). A Sticky problem: Dealing with industry under unpleasant circumstances. *The American Journal of Medicine, 129*(12), 1235.

American Academy of Allergy, Asthma and Immunology (AAAAI). (2001). *The allergy report: Science based findings on the diagnosis & treatment of allergic disorders, 1996-2001.*

Anagnostou, K., Islam, S., King, Y., Foley, L., Pasea, L., Bond, S., ... & Clark, A. (2014). Assessing the efficacy of oral immunotherapy for the desensitisation of peanut allergy in children (STOP II): A phase 2 randomised controlled trial. *The Lancet, 383*(9925), 1297-1304.

Baalmann, D. V., Hagan, J. B., Li, J. T., Hess, E. P., & Campbell, R. L. (2016). Appropriateness of epinephrine use in ED patients with anaphylaxis. *The American Journal of Emergency Medicine, 34*(2), 174-179.

Begin, P., Graham, F., Killer, K., Paradis, J., & Des Roches, A. (2016). Introduction of peanuts in younger siblings of children with peanut allergy: a prospective, double-blinded assessment of risk, diagnostic tests, and analysis of patient preferences. *Allergy, 71*(12), 1762-1771.

Boyce, J. A., Assa'ad, A., Burks, A. W., Jones, S. M., Sampson, H. A., Wood, R. A., ... & Bahna, S. L. (2011). Guidelines for the diagnosis and management of food allergy in the United States: Summary of the NIAID-sponsored expert panel report. *Journal of the American Academy of Dermatology, 64*(1), 175-192.

Branum, A. M., & Lukacs, S. L. (2009). Food allergy among children in the United States. *Pediatrics, 124*(6), 1549-1555.

Chafen, J. J. S., Newberry, S. J., Riedl, M. A., Bravata, D. M., Maglione, M., Suttorp, M. J., ... & Shekelle, P. G. (2010). Diagnosing and managing common food allergies: A systematic review. *Jama, 303*(18), 1848-1856.

Edlich, R., Cochran, A., Greene, J., Woode, D., Gubler, K., & Long III, W., (2011). Advances in the treatment of peanut allergy. *The Journal of Emergency Medicine, 40*(6), 633-636.

Eigenmann, P. A., & Zamora, S. A. (2002). An internet-based survey on the circumstances of food-induced reactions following the diagnosis of IgE-mediated food allergy. *Allergy, 57*(5), 449-453.

Frew, A. J. (2011). What are the 'ideal features' of an adrenaline (epinephrine) auto-injector in the treatment of anaphylaxis? *Allergy, 66*(1), 15-24.

Ewan, P. W., & Clark, A. T. (2005). Efficacy of a management plan based on severity assessment in longitudinal and case-controlled studies of 747 children with nut allergy: Proposal for good practice. *Clinical & Experimental Allergy, 35*(6), 751-756.

Fromer, L. (2016). Prevention of anaphylaxis: The role of the epinephrine auto-injector. *The American Journal of Medicine, 129*(12), 1244-1250.

Gupta, R. S., Springston, E. E., Warrier, M. R., Smith, B., Kumar, R., Pongracic, J., & Holl, J. L. (2011). The prevalence, severity, and distribution of childhood food allergy in the United States. *Pediatrics, 128*(1), e9-e17.

Hsiao, K. C., Ponsonby, A. L., Axelrad, C., Pitkin, S., & Tang, M. L. (2017). Long term effects of a probiotic and peanut oral immunotherapy (PPOIT) treatment on peanut allergic children. *Journal of Allergy and Clinical Immunology, 139*(2), AB136.

Leickly, F. E., Kloepfer, K. M., Slaven, J. E., & Vitalpur, G. (2018). Peanut allergy: An epidemiologic analysis of a large database. *The Journal of Pediatrics, 192*, 223-228.

Moneret-Vautrin, D. A., Morisset, M., Flabbee, J., Beaudouin, E., & Kanny, G. (2005). Epidemiology of life-threatening and lethal anaphylaxis: A review. *Allergy, 60*(4), 443-451.

Song, T. T., Worm, M., & Lieberman, P. (2014). Anaphylaxis treatment: Current barriers to adrenaline auto-injector use. *Allergy, 69*(8), 983-991.

Patel, D. A., Holdford, D. A., Edwards, E., & Carroll, N. V. (2011). Estimating the economic burden of food-induced allergic reactions and anaphylaxis in the United States. *Journal of Allergy and Clinical Immunology, 128*(1), 110-115.

Rahman, S., Walker, D., & Sultan, P. (2017). Medical identification or alert jewellery: An opportunity to save lives or an unreliable hindrance? *Anaesthesia, 72*(9), 1139-1145.

Farhy, E., Diamantidis, C. J., Doerfler, R. M., Fink, W. J., Zhan, M., & Fink, J. C. (2019). Use of a medical-alert accessory in CKD: A pilot study. *Clinical Journal of the American Society of Nephrology, 14*(7), 994-1001.

Photo Annex

A

Name: **Joe Johnson**

Date of Birth:

Emergency Contact:

Blood Type:

Allergies: **Peanuts**

- Severe allergic reaction, causing victim's throat to swell until they cannot breathe.
- If found seemingly unable to breathe, comatose, etc., retrieve their Epipen, which is stored in front pocket of work shirt.
- Uncap the Epipen and inject into the person's outer thigh for 10 seconds.
- Remove pen, pulling straight out, then rub injection site for another 10 seconds.
- If they do not come to shortly after, seek advanced medical help immediately.

Medications: **None**

E

B *C* *D*

Name: **Katelyn France**

Date of Birth: **1/1/1111**

Emergency Contact: **Father: 555-555-5555 or Mother: 111-111-1111**

Blood Type: **A+**

Donor: **Yes**

Allergies: **Amoxicillin**

- Allergic reaction, causing painful hives, rashes, and swelling of the throat.
- **If found seemingly unable to breathe, comatose, etc., retrieve epinephrine auto-injector, stored in small front pocket of black Under Armour backpack.**
  - The insignia on the bag says, "Grand National". The medical equipment carrying case is pink and floral.
- **Click blue 'epinephrine auto-injector' link to activate carrying case, which emits a high pitched noise.**
  - Once carrying case is found, remove auto-injector from bag.
- **Uncap the blue end of the auto-injector and inject the orange tip into outer thigh for 10 seconds.**
- **Remove auto-injector, pulling straight out, then rub injection site for another 10 seconds.**
  - Only one epinephrine auto-injector is required. If conscious, Benadryl is okay to consume.
  - After injecting, seek advanced medical help immediately. **Dial 911.**

Medications: **Ibuprofen** (20 mg daily)

F